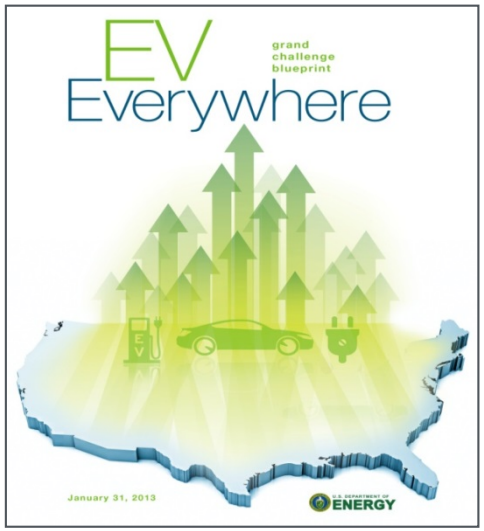
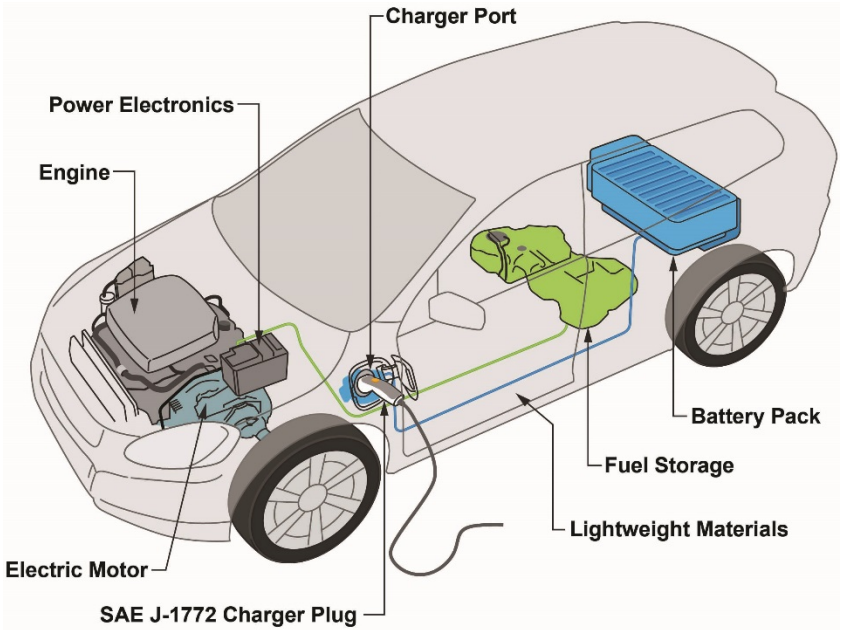
EV Everywhere Grand Challenge



Technical Goal: Enable plug-in electric vehicles by 2022 to be as affordable for the American family as a baseline 2012 conventional gasoline-powered vehicle



Electricvehicles.energy.gov

EV Everywhere Updates

- **November 2014 & February 2015 -** DOE, EEI, and the White House co-hosted two roundtable events
  - Discuss opportunities for utilities and the federal government to **collaborate on accelerating growth of the electric transportation market**

- **May 2015** - Hired Bob Graham as new Director for EV Everywhere
  - Lead strategic EV engagements

- **June 10, 2015 –** DOE Secretary and EEI CEO sign MOU
  - EV Everywhere Utility Partnership ("**EV Everywhere UP"**)
  - Accelerate PEV and charging infrastructure deployment

EV Everywhere Accomplishments

- In three years, helped lower the modeled, high-volume cost of advanced li-ion batteries by 40%
- Patent for electric motor without rare earth
- Cathode developed at Argonne in both current and next-generation Volt
- More than 230 employers have joined the Workplace Charging Challenge
- Through EEI, partnerships with 70 utilities

EV Everywhere Deployment Focus Areas

Multi-unit Dwellings

Utility Involvement

Interoperability

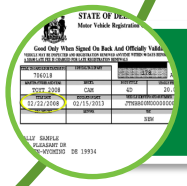
Consumer Experience

Workplace Charging

Public Awareness

Signage

HOV Lane Access



Deployment Data

EV Everywhere Resources: Logo Contest

What will the EV Everywhere logo look like?
It's up to you!

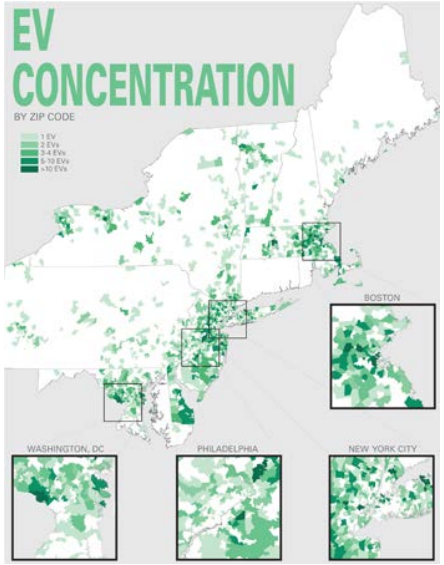
Challenge.gov
Government Challenges, Your Solutions

challenge.gov/challenge/ev-everywhere-logo-challenge/

Deadline for entries: September 25, 2015

Clean Cities Strategic Planning Meeting: Plug-In Electric and Hybrid Vehicles - Opportunities

White Paper Opportunities	Selected Priority Opportunities
• HEV passenger cars • Dense urban electric drive • Workplace charging • Cold climate • New metro edge construction • Nonattainment areas	• **DC Fast Chargers Along Key Transportation Corridors** • **Workplace Charging** (applies to both Consumers and Fleets)



Secondary Opportunities:

- Fleets, including Utility Service Vehicles

Sample Strategic Actions – Information Products

A number of new or updated **materials** or other **informational development** efforts are planned, including:

- **Application- or Sector-Specific Toolkits**, to help coordinators walk fleets, decision-makers, potential project partners, and others through selecting new technologies – may discuss all applicable fuel/technology options (and include some items below plus others)
- **Case Studies and Success Stories**, including ones on different types of organizations – fuel suppliers, retailers, fleets, etc.
- **Model packages/best practices** – bulk purchasing, contracts, etc.
- **"making the business case"** for fuels and technologies
- **Promotional** information/campaigns
- Targeted improvements in **websites and mobile tools**

Sample Strategic Actions – Education, Outreach, and Training

Many efforts in this area have been identified as needs, with significant plans over the next several years, including:

- **Continued revisions** to existing technical information and training, based upon changing technologies
- **Education, Outreach, and Training,** including for:
  - **Users** (both fleets and consumers),
  - **Dealers,**
  - **Technicians,**
  - **First Responders,**
  - **AHJs, and**
  - **Local/state decision-makers**

Key Workshop Takeaways

- Situate stations alongside highways where adequate power infrastructure already exits.
- Strive for good driver experience
- Develop EV charging within regions and then connect regions
- Attain state/local government support and approvals
- Involve state/local transportation agencies in EV corridor process
- Continue to develop/locally customize EV value proposition for consumer education
- Engage legislators to promote EV corridors
- Secure public funding with public-private partnerships
- Establish strong stakeholder network and partnerships to reduce barriers

** Hosted by: Oregon Dept. of Transportation (ODOT), Dept. of Energy (DOE)'s Clean Cities Program and the Federal Highway Administration (FHWA)*

PEV Readiness Scorecard Launched in 2013

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

EERE Home | Programs & Offices | Consumer Information

Alternative Fuels Data Center

Alternative Fuels Data Center

SEARCH

Search Help

FUELS & VEHICLES | CONSERVE FUEL | LOCATE STATIONS | LAWS & INCENTIVES | Maps & Data | Case Studies | Publications | Tools | About | Home

EERE » AFDC

Printable Version | Share

Plug-In Electric Vehicle Readiness Scorecard

The Plug-In Electric Vehicle Readiness Scorecard helps communities assess their readiness for the arrival of plug-in electric vehicles (PEVs) and electric vehicle supply equipment (EVSE).

PEVs are an exciting new transportation option that has the potential to benefit a community's economy, energy security, and environment. As local and regional leaders know, PEV readiness is a community-wide effort, requiring charging infrastructure, planning, regulations, and support services. This scorecard supports these efforts by helping leaders in cities, counties, and larger regions:

- Evaluate a community's PEV readiness
- Receive feedback about strengths and offer ways to improve
- Record and track progress toward PEV readiness.

Scores Communities in 6 Readiness Focus Areas

Electric Vehicle Supply Equipment (EVSE) Permitting and Inspection Process
What legal processes and programs has your community implemented to address charging equipment installation?

Questions
- Application Process
- Information Access and Assistance
- Permit and Inspection Fees
- Installation Workforce Training

Laws, Incentives, and Financing
What sorts of incentives and promotions does your community offer to support plug-in electric vehicle deployment?

Questions
- Laws and Incentives
- Financing

Education and Outreach
What programs has your community implemented to educate the public and businesses about plug-in electric vehicle benefits, opportunities, and considerations?

Questions
- Educational and Outreach Efforts

Utility Involvement
To what degree is the utility (or utilities) in your community engaged in and prepared for the arrival of plug-in electric vehicles?

Questions
- Electricity Rates and Programs
- Utility Planning and Implementation

Plug-In Vehicle Market Conditions
What is the market for plug-in electric vehicles like in your community and how likely are your constituents to adopt them?

Questions
- Plug-in Vehicle, EVSE, and Service Availability
- Plug-in Vehicle Projections

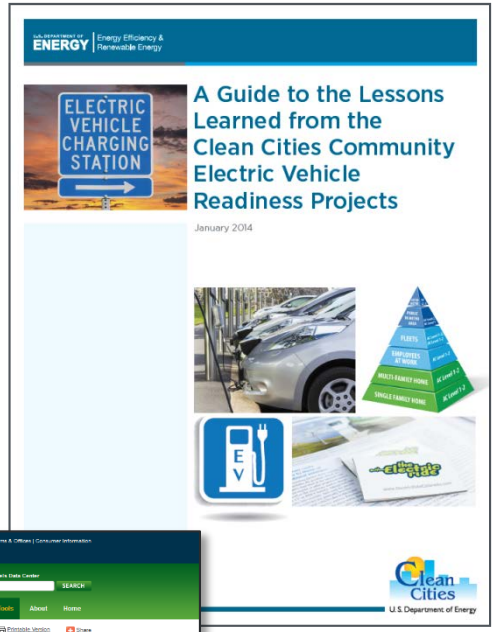
Long-Term Vehicle and Infrastructure Planning
What is the long-term vision for plug-in electric vehicle readiness in your community?

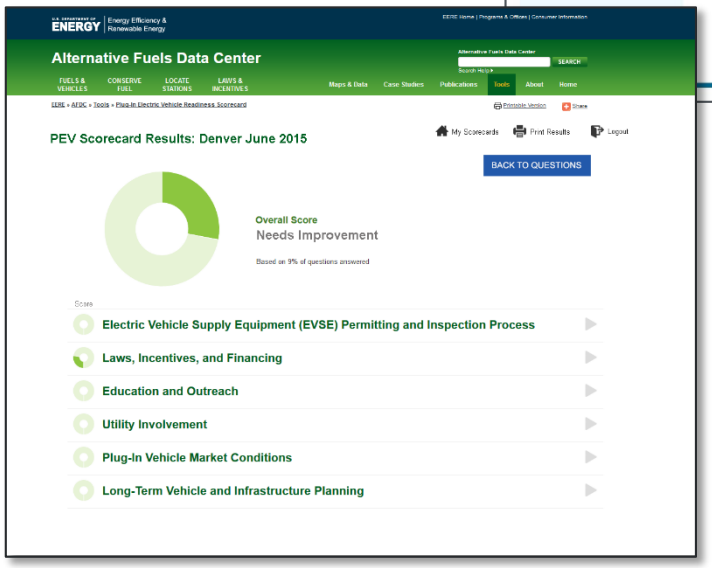
Questions
- Planning and Collaboration
- Market Potential and Analysis

2015 PEV Scorecard Updates

- Integration of additional case studies and lessons learned from the Clean Cities EV Community Readiness Awards will improve results reports

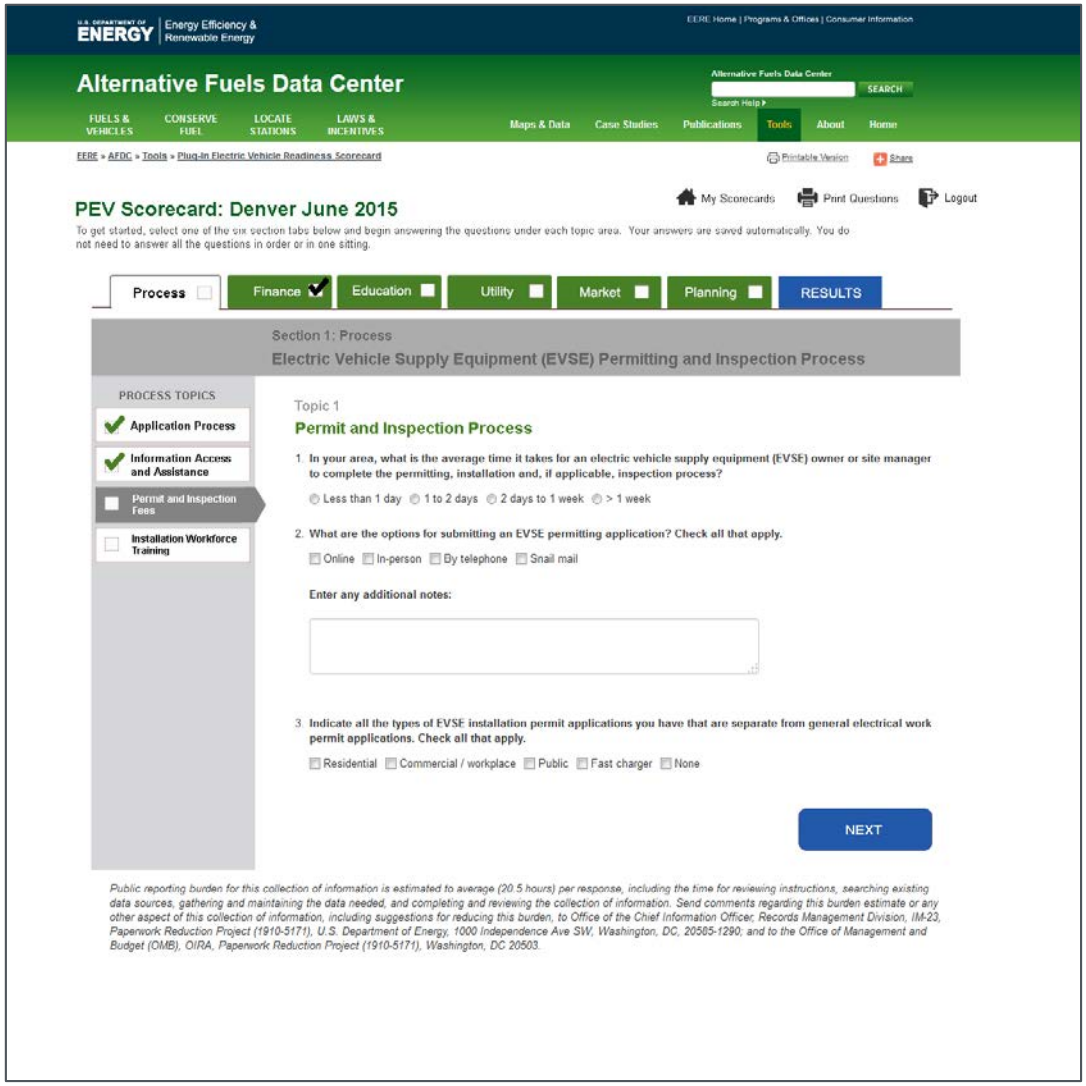
- Feedback from interviews with Scorecard users in 2014 provided valuable feedback:
  - Usability improvements
  - Tool enhancements



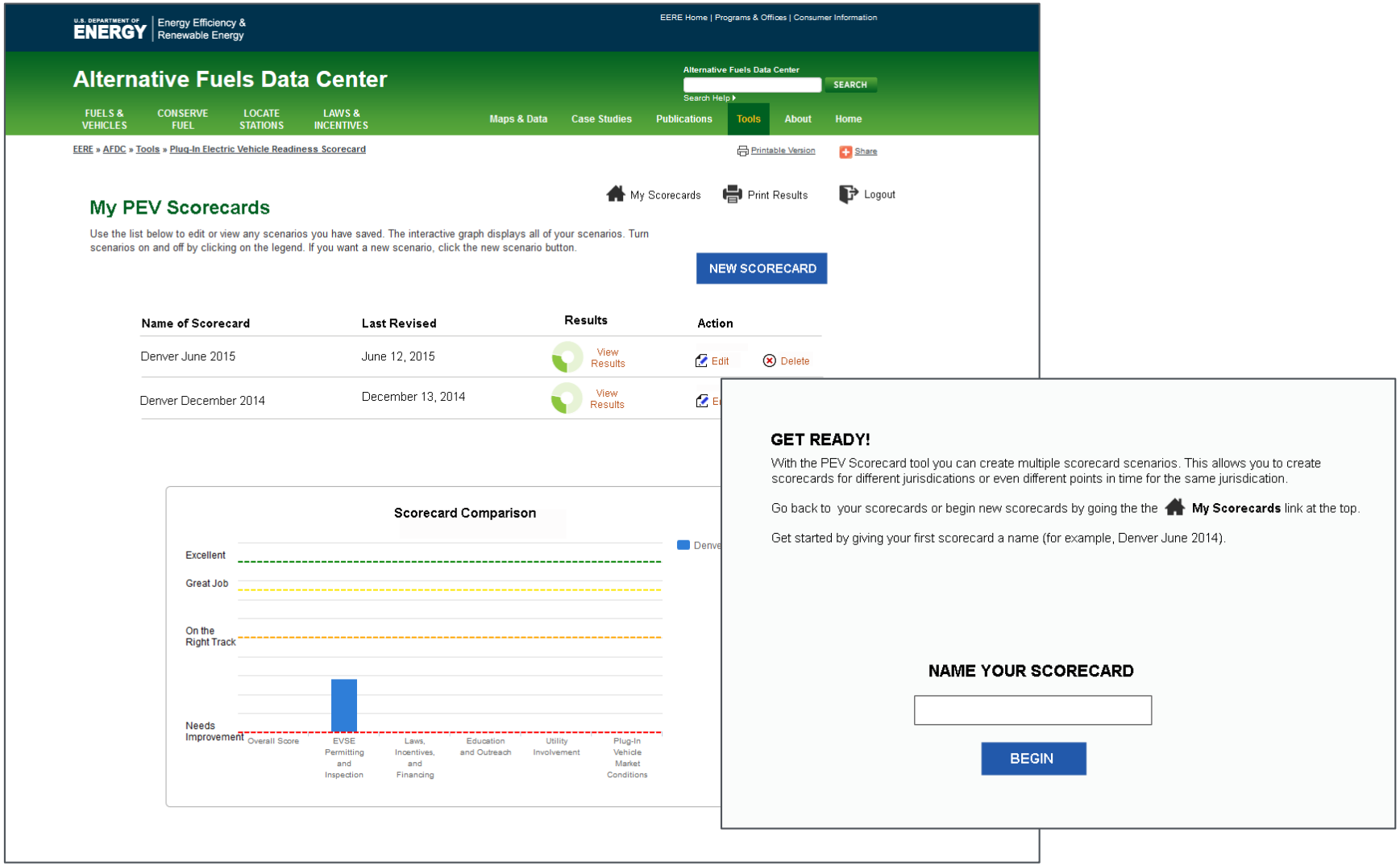


Usability Improvements

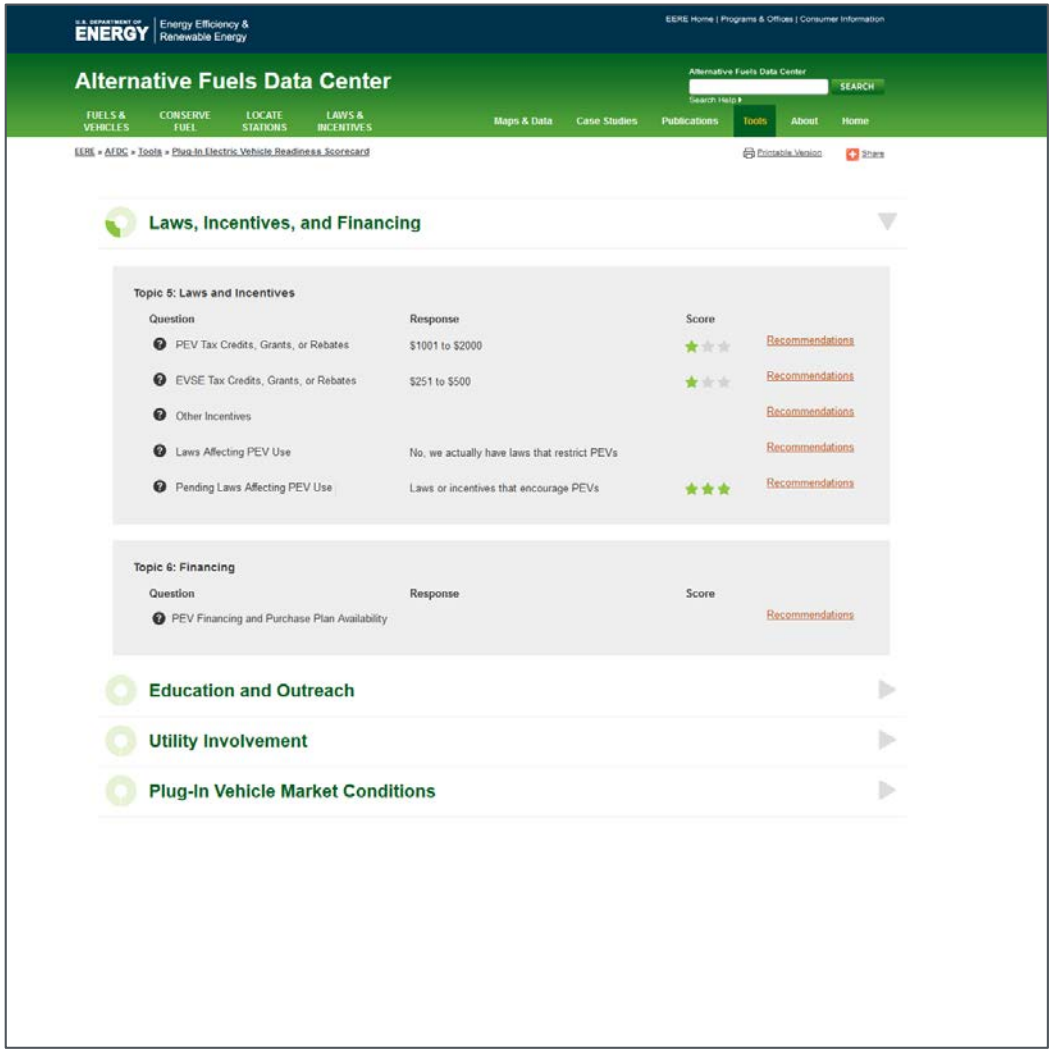
- ✓ Printable Questions
- ✓ Printable Answers
- ✓ Progress Tracking
- ✓ Simplified Language



Comparing Data and Tracking Improvements

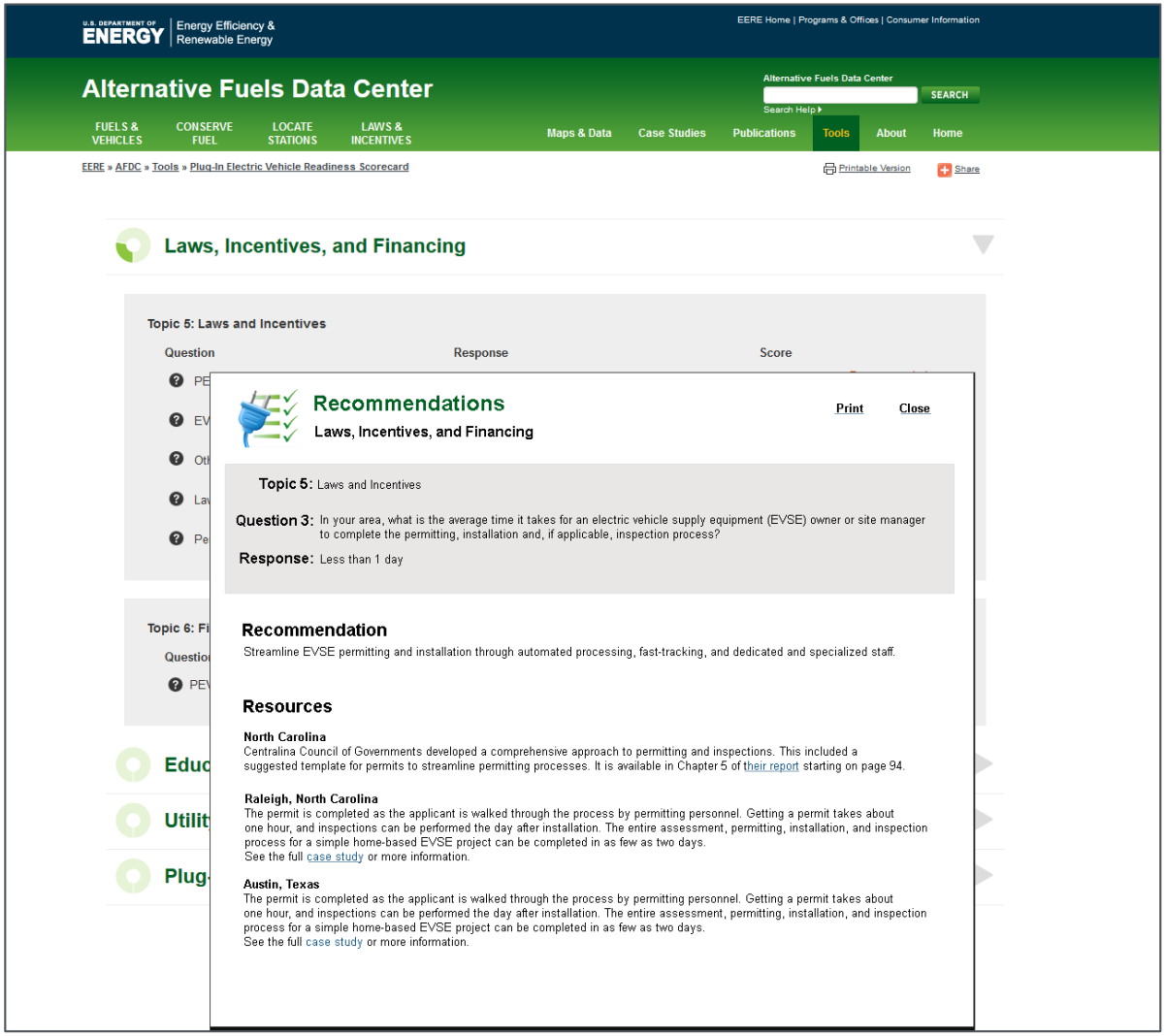


Expanded Results Report



- ✓ Overall results
- ✓ Results by topic area
- ✓ Personalized recommendations for improving your score on each question

Expanded Database of EV Resources



Take the PEV Scorecard Challenge!

- Goal – To engage more communities in proactive planning for PEVs and EVSE
- Work with your Clean Cities Coalitions to make sure your community is EV ready
- Track your score over time

World's Largest Plug-In Electric Vehicle Infrastructure Demonstrations

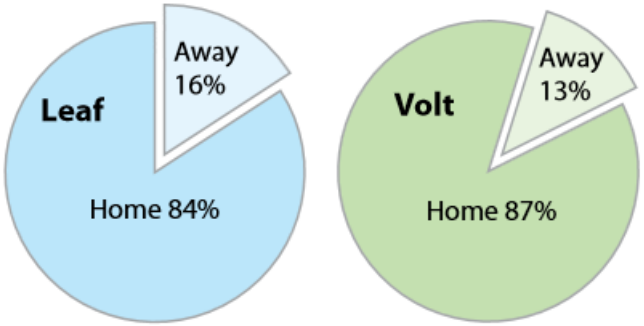
THREE Years

8,300 EVs

22 Regions in the U.S.

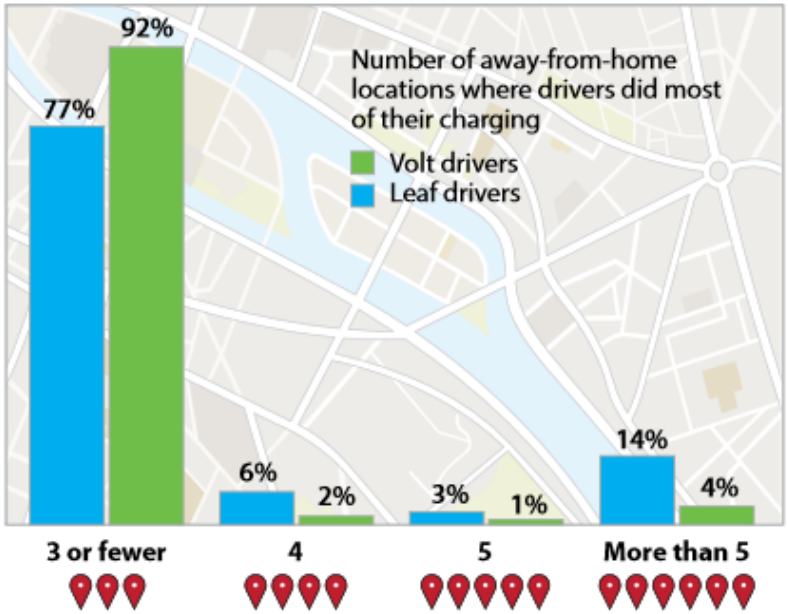
125 Million Miles of driving

Do people charge away from home?



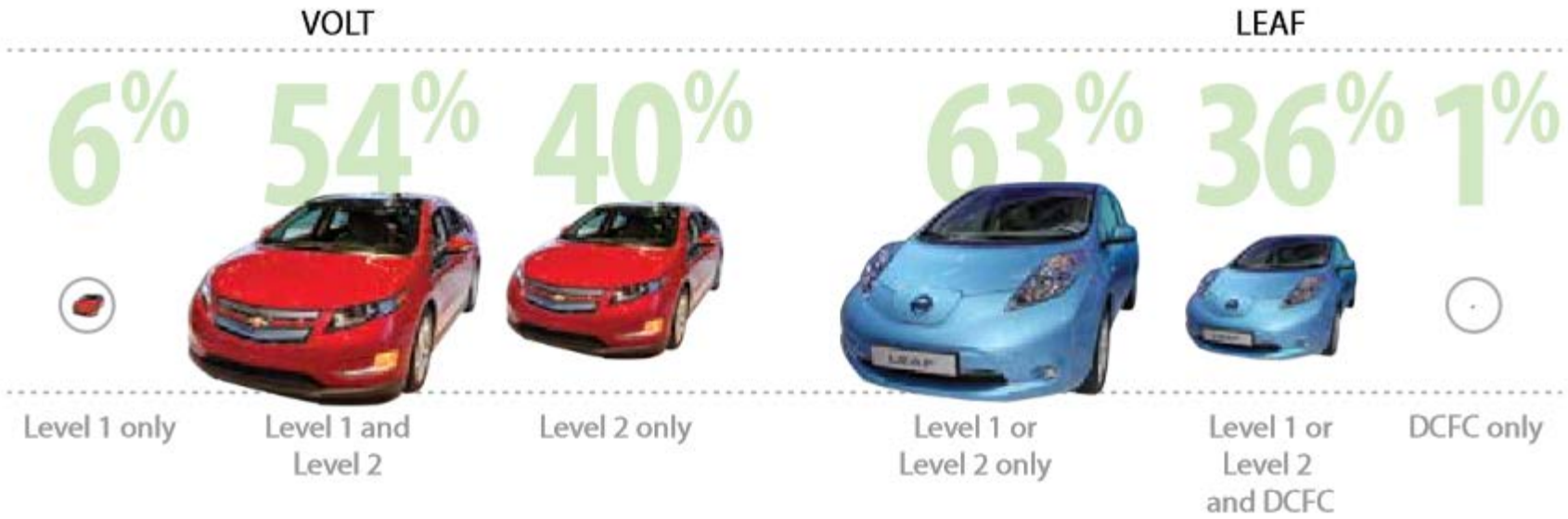
Leaf and Volt drivers performed most of their charging events at home

92% of Volt drivers and 77% of Leaf drivers did most of their away-from-home charging at 3 or fewer locations



Sources:
http://avt.inl.gov/pdf/EVProj/VoltHomeAwayL1L2DayNightCharging.pdf
http://avt.inl.gov/pdf/EVProj/LeafHomeAwayL1L2DCDayNightCharging.pdf

Charging Preference



Sources:
http://avt.inl.gov/pdf/EVProj/VoltHomeAwayL1L2DayNightCharging.pdf
http://avt.inl.gov/pdf/EVProj/LeafHomeAwayL1L2DCDayNightCharging.pdf

Average Costs of Installation

Sources:
http://avt.inl.gov/pdf/EVProj/WhatWereTheCostDriversForDCFCinstallations.pdf
http://avt.inl.gov/pdf/EVProj/HowDoResidentialChargingInstallationCostsVaryByGeographicLocations.pdf
http://avt.inl.gov/pdf/EVProj/HowDoPubliclyAccessibleInfrastructureInstallationCostsVaryByGeographicLocation.pdf
http://avt.inl.gov/pdf/EVProj/WhatWereTheCostDriversForWorkplaceInstallations.pdf

Workplace Charging

6%

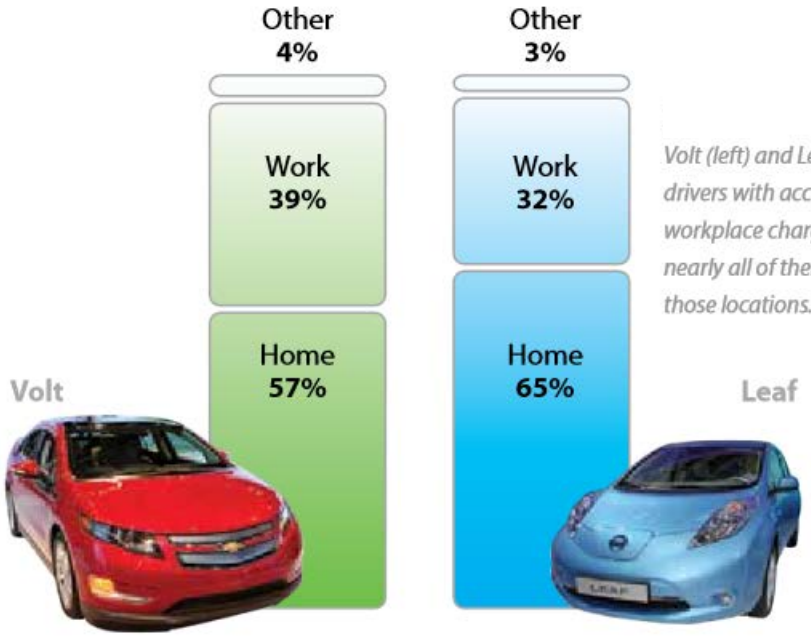
OF DRIVERS DROVE A LEAF TO WORK EVEN THOUGH THEY COULD NOT MAKE IT BACK HOME UNLESS THEY CHARGED AT WORK.

8%

OF LEAF DRIVERS COULD COMPLETE THEIR DIRECT COMMUTE WITHOUT CHARGING AT WORK, BUT THEIR ROUTINE ON MOST DAYS REQUIRED THEM TO DRIVE ADDITIONAL DISTANCE, WHICH NECESSITATED CHARGING AT WORK IN ORDER TO MAKE IT HOME.

40%

OF LEAF DRIVERS RELIED ON WORKPLACE CHARGING ON AT LEAST ONE DAY A MONTH TO COMPLETE THEIR DAILY COMMUTES.



Volt (left) and Leaf (right) drivers with access to home and workplace charging performed nearly all of their charging at those locations.

Sources:
http://avt.inl.gov/pdf/EVProj/WorkplaceEVSEUtilizationAtFacebookJun2014.pdf
http://avt.inl.gov/pdf/EVProj/WorkplaceChargingandDriving-Leaf.pdf
http://avt.inl.gov/pdf/EVProj/ChargingAtSixWorkSites.pdf

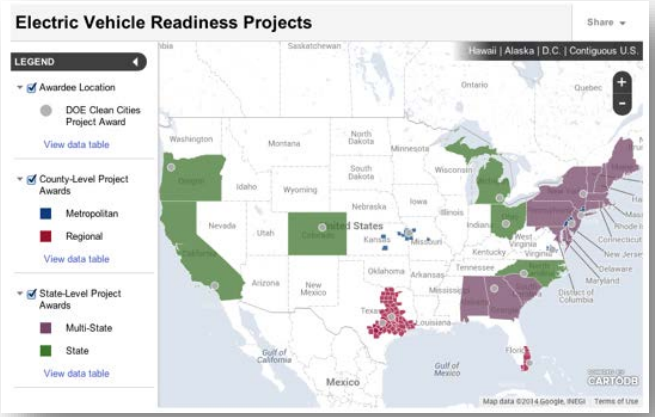
Additional PEV & Charging Research Resources

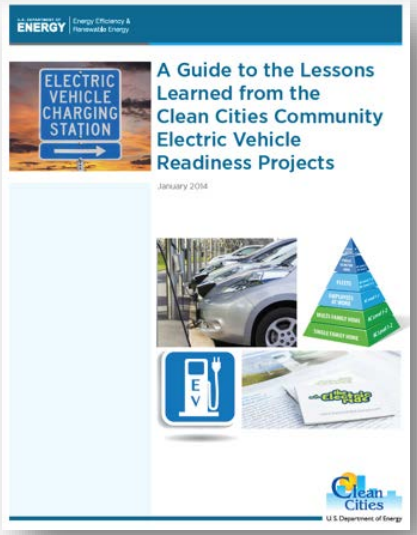
- "EV Project and ChargePoint America" Results
  - 2-Page Fact Sheet: http://avt.inl.gov/pdf/arra/ProjectHighlights.pdf
  - 24-Page Full Report: http://avt.inl.gov/pdf/arra/SummaryReport.pdf
- American Recovery and Reinvestment Act (ARRA): Full Report on PEV Research and Findings
  - High Resolution:
    - http://avt.inl.gov/pdf/arra/ARRAPEVnInfrastructureFinalReportHqltySept2015.pdf
  - Low Resolution:
    - http://avt.inl.gov/pdf/arra/ARRAPEVnInfrastructureFinalReportLqltySept2015.pdf

PEV Community Readiness Resources

- **EV Community Readiness Projects**
  - 16 projects in 24 States, funded in 2011
  - Public-private partnerships collaborated on plans to deploy PEVs
  - Activities included
    - Streamlined permitting processes
    - Revised codes
    - Training emergency personnel
    - Educating the public
    - Developing incentives

- **"A Guide to the Lessons Learned"**
  - Synthesizes findings from funded projects
  - Highlight key grantee activities and outcomes
  - Help readers easily connect with the resources most relevant to them
  - http://www.afdc.energy.gov/uploads/publication/guide_ev_projects.pdf





Publications & Outreach

Hybrid and Plug-In Electric Vehicles fact sheet

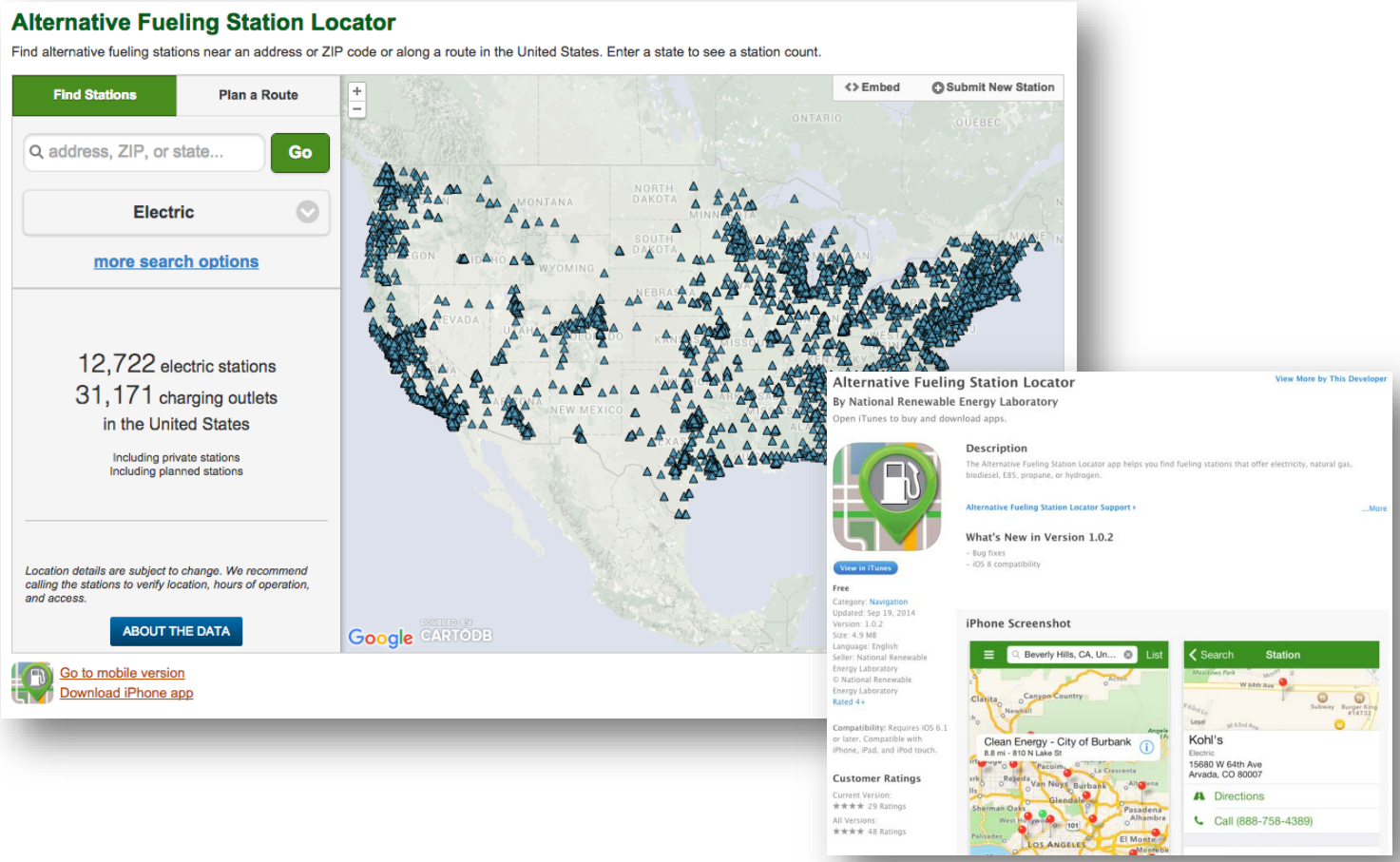
Plug-In Electric Vehicle Handbooks

- Consumers
- Fleet Managers
- Station Owners
- Electrical Contractors
- Workplace

EV Deployment Case Studies

- Raleigh
- Oregon
- Los Angeles
- Many more in case study database

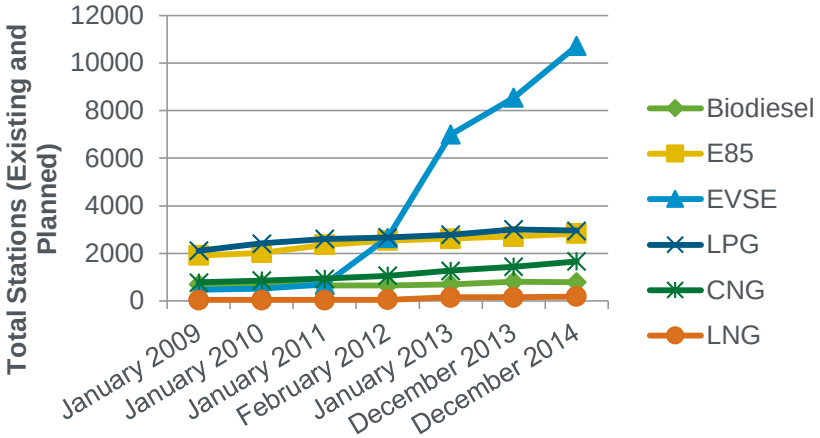
Alternative Fueling Station Locator - EVSE



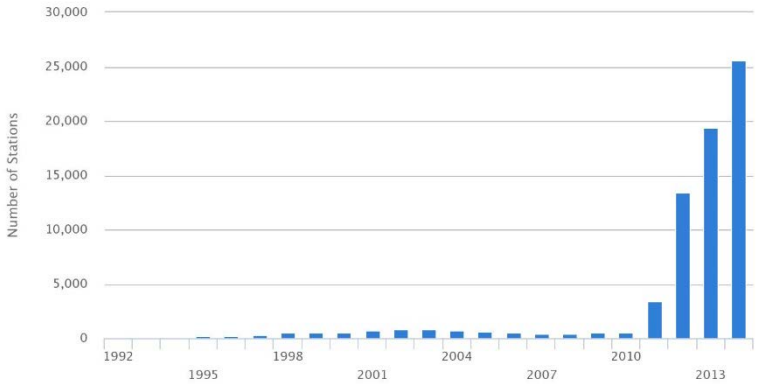
www.afdc.energy.gov/locator/stations/

EVSE Growth in AFDC Station Locator

- The total number of alternative fueling stations continued to grow in 2014.
- The increase resulted primarily from new EVSE locations, which can be attributed to the expanded use of Application Programming Interface (API) data in 2014.
- The growth in EVSE continues to increase, even after a significant growth period in 2012.
  - EVSE increased 21%

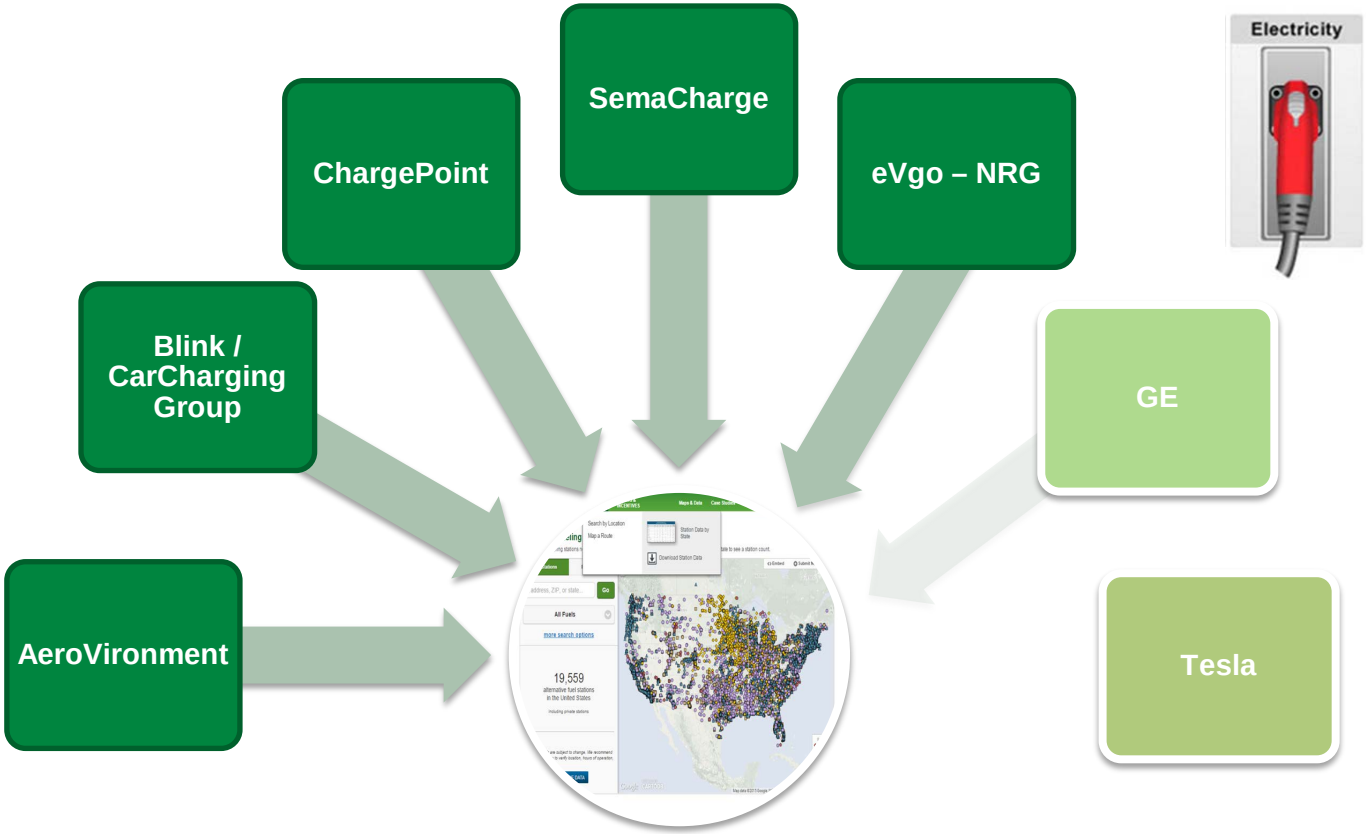


Total Stations by Fuel Type (2009–2014)



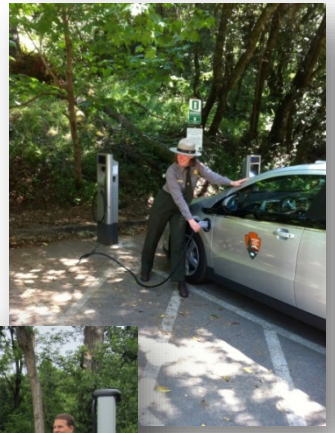
EVSE Growth Over Time

Daily API Imports for Networked EVSE



NPS Units with EVSE

- Acadia National Park
- Catoctin Mountain Park
- Christiansted National Historic Site
- Denali National Park
- Golden Gate National Recreation Area (incl. Muir Woods)
- Great Smoky Mountains National Park
- Mississippi National River and Recreation Area
- Mount Rainer National Park
- National Mall and Memorial Parks
- Petroglyph National Monument
- Point Reyes National Seashore
- Rocky Mountain National Park
- San Antonio Missions National Historical Park
- Santa Monica Mountains National Recreation Area
- Shenandoah National Park
- Sleeping Bear Dunes National Lakeshore
- Yosemite National Park
- Wolf Trap Center for the Performing Arts
- Zion National Park



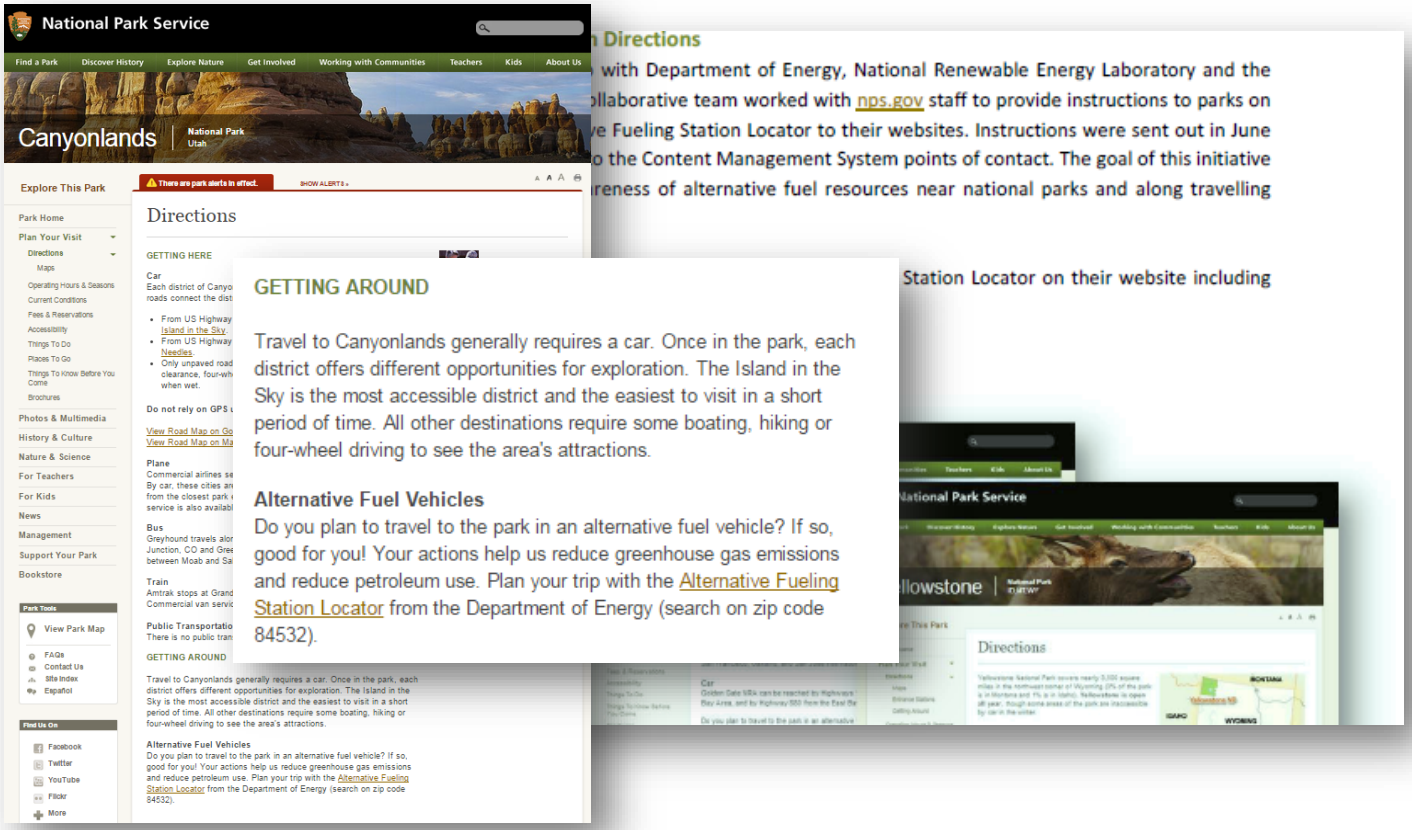
Clean Cities Technical Assistance

- **EVSE Forum for "Clean Cities" parks and other interested parks**
  - Discuss available resources and guidance
  - Leveraging sharing of best practices and lessons learned

- **Formal EVSE Policy Development**
  - Addresses fleet, visitor, and employee use of EVSE in NPS units.

- **Technical Bulletin Development for NPS Commercial Services**
  - Addresses commercial business opportunities and guidance for concessioners interested in deploying EVSE at visitor centers, lodges, campgrounds, etc.

AFDC Station Locator – NPS.gov



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  - Addresses commercial business opportunities and guidance for concessioners interested in deploying EVSE at visitor centers, lodges, campgrounds, etc.

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

235 Partner employers committing to provide EVSE for employees

5,000+ EVSE installed or planned for installation

18 Ambassadors promoting and supporting workplace charging

Meet the Challenge Team

Peter Heywood
NWT, Ambassador Lead

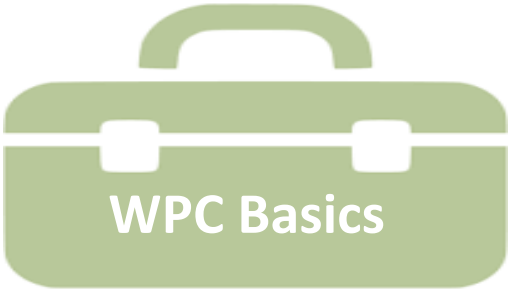
Sarah Olexsak
DOE, Coordinator

Nick Bleich
DOE, Presidential Management Fellow

Carrie Giles, Catherine Cima & Carrie Ryder
ICF, Recruitment and Account Management

Nay Chehab
NWT, Communications Lead

Clean Cities Workplace Charging Outreach Toolkit



- PEV Handbook for Workplace Charging Hosts
- Workplace Charging Challenge fact sheet

Best practices and sample material from 20+ workplace charging outreach events

Template material to promote workplace charging:

- Workplace charging value proposition PowerPoint
- Sample press releases
- Workshop agenda, host/speaker outreach letter, attendee invitation, etc.

Available at: http://www1.eere.energy.gov/cleancities/toolbox

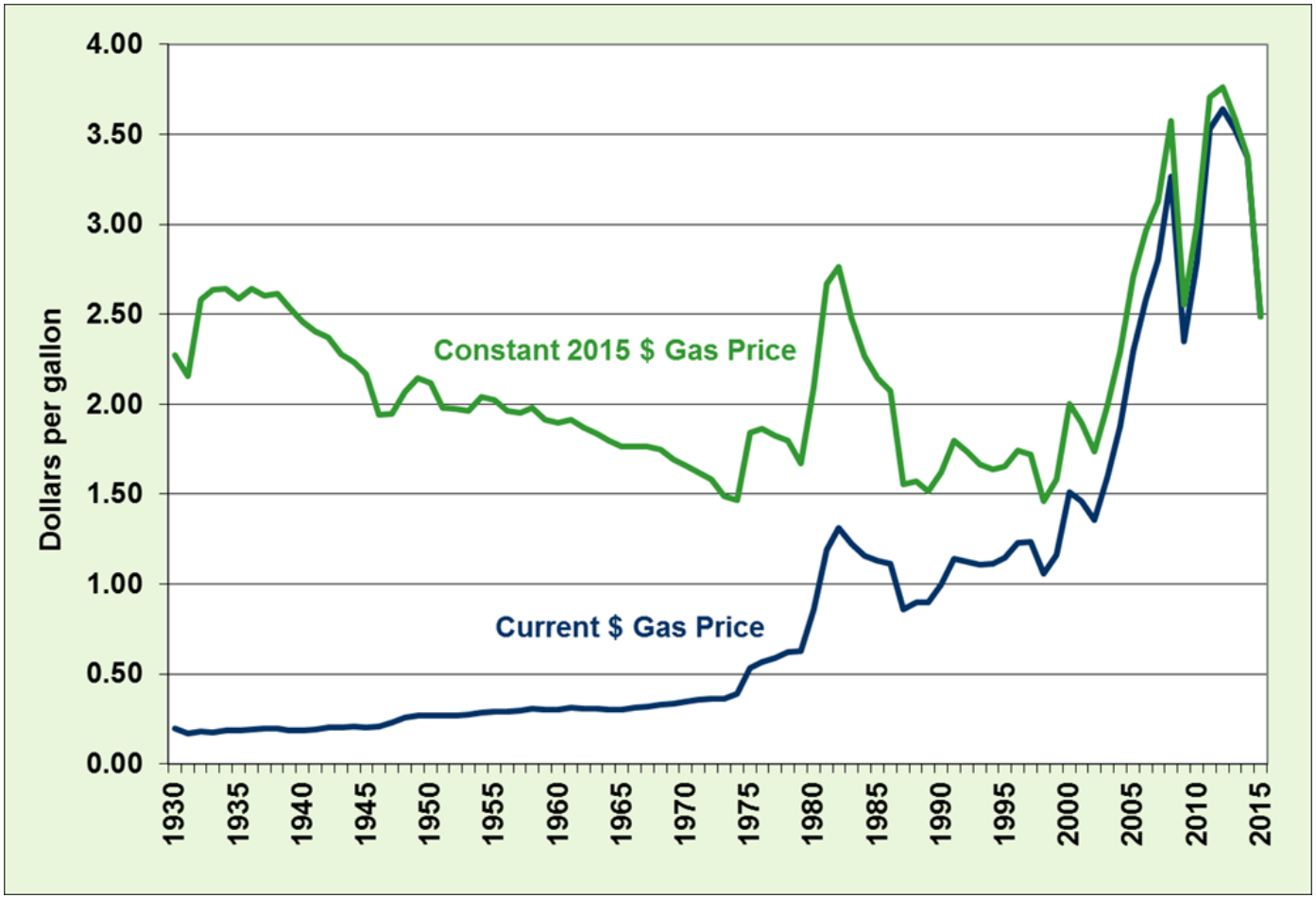
Promoting workplace charging in your community

Clean Cities coalitions have already…

- Held educational workplace charging workshops for employers
- Helped employers through their charging station installation process
- Visited worksites to host brownbag lunch EV 101 presentations for employees
- Put on EV ride and drives at employer campuses
- Engaged employers as new coalition stakeholders

oil markets

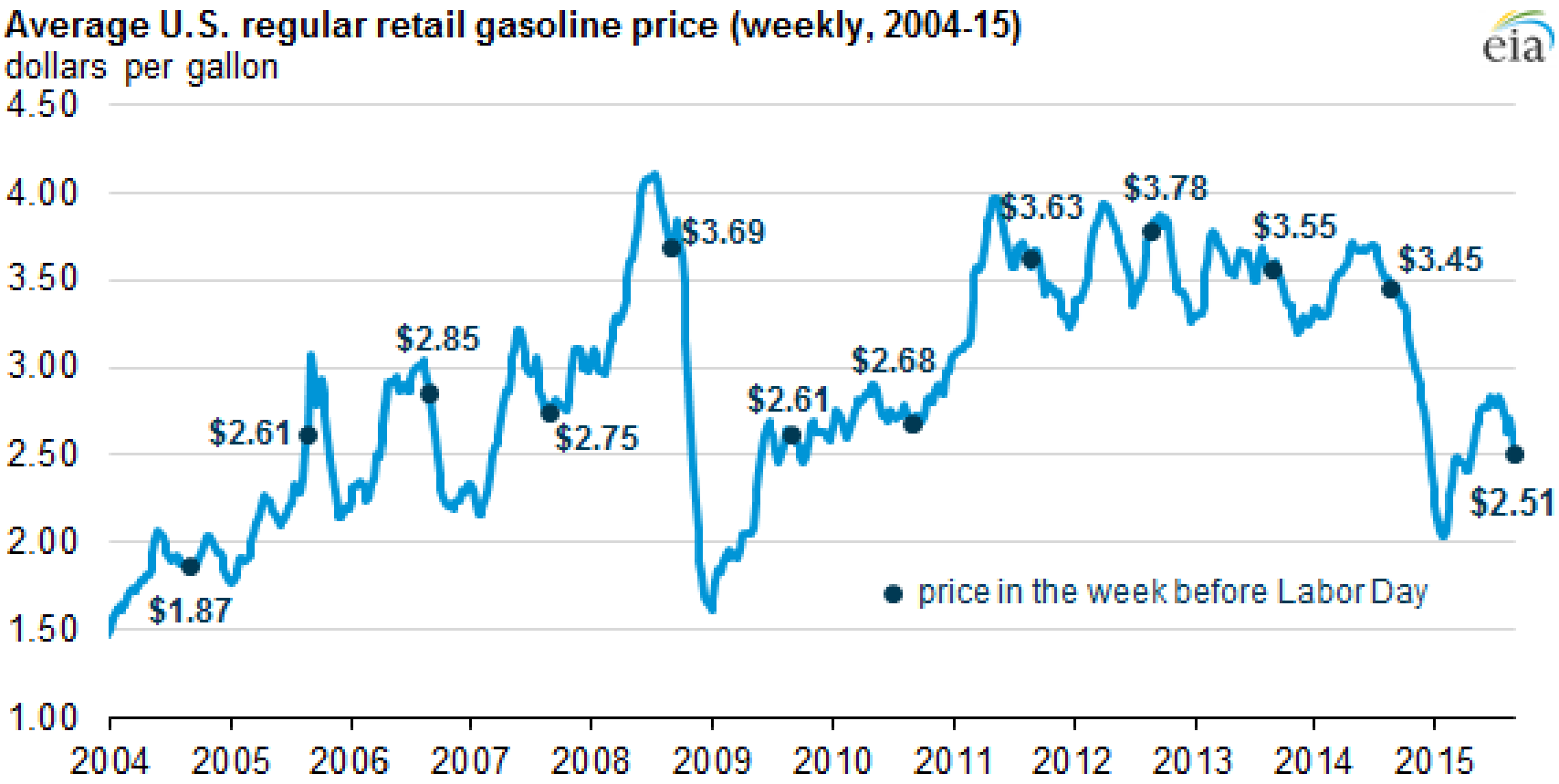
Gas prices are the lowest in ~10 years, but still above average since 1970 (even in real terms).



Source: http://energy.gov/eere/vehicles/fact-888-august-31-2015-historical-gas-prices

oil markets

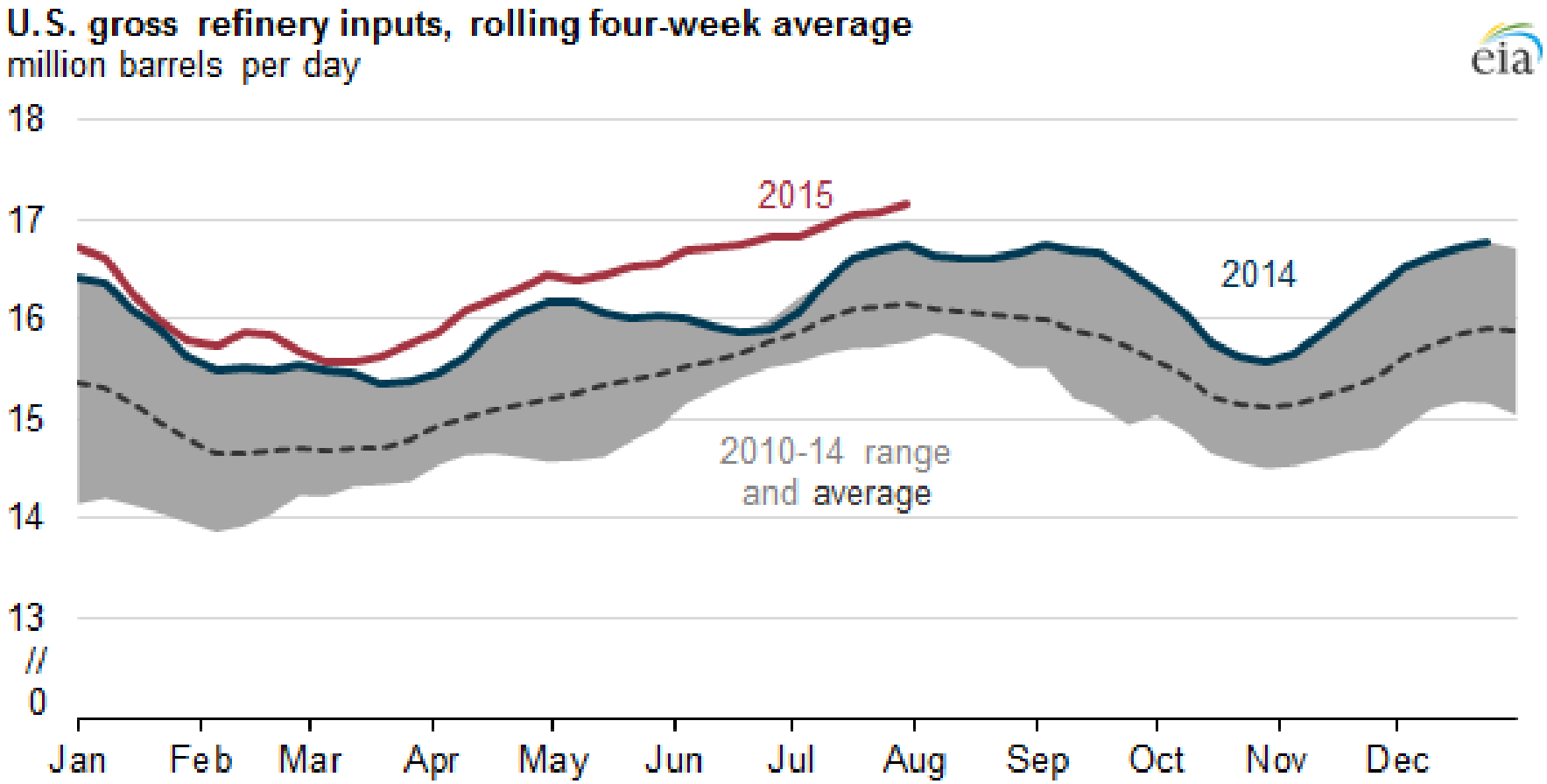
EIA: Labor Day gasoline prices reached their lowest in a decade.



Source: http://www.eia.gov/todayinenergy/detail.cfm?id=22812

oil markets

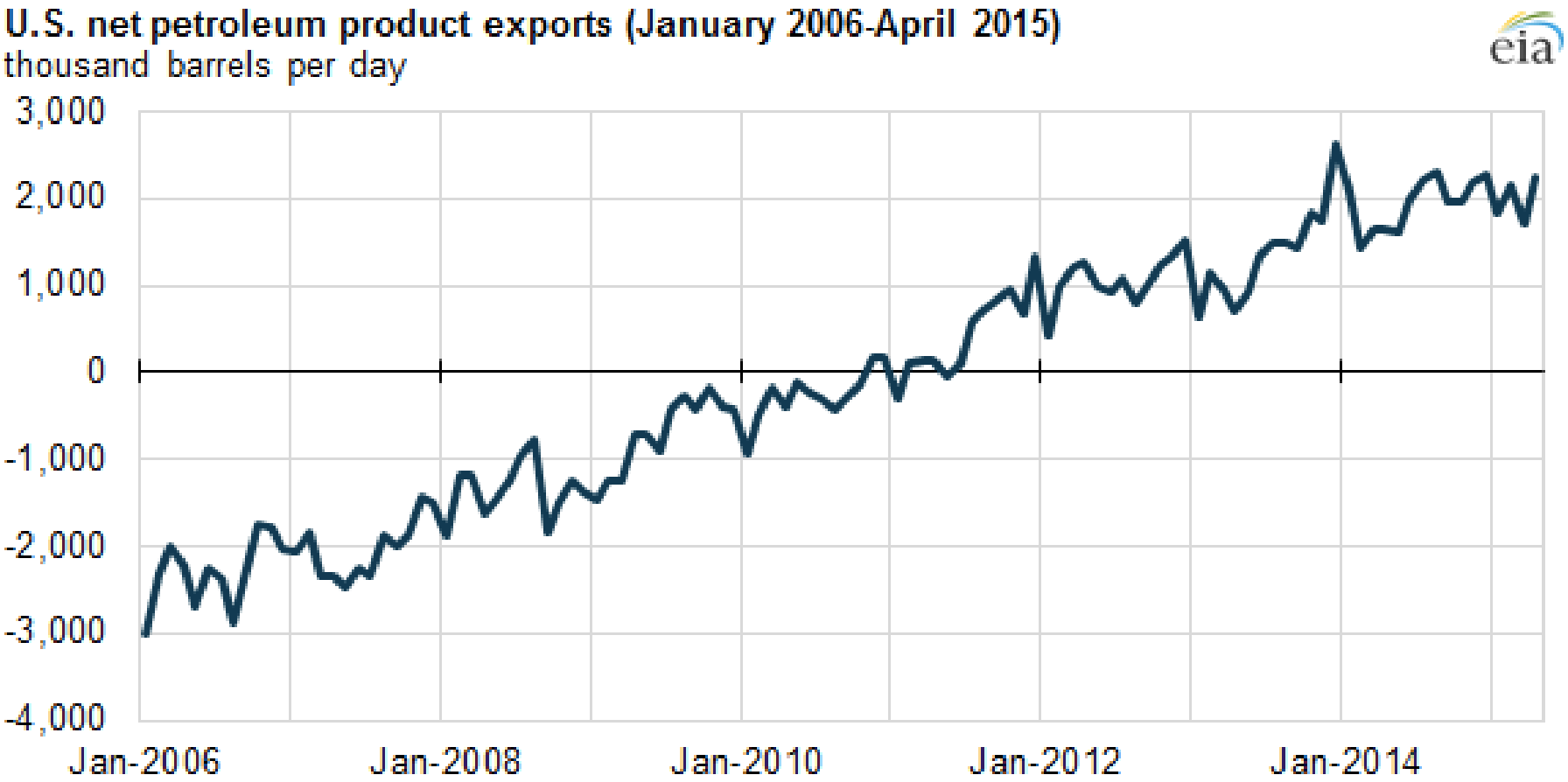
EIA: U.S. refineries are running at record-high levels



Source: http://www.eia.gov/todayinenergy/detail.cfm?id=22412

oil markets

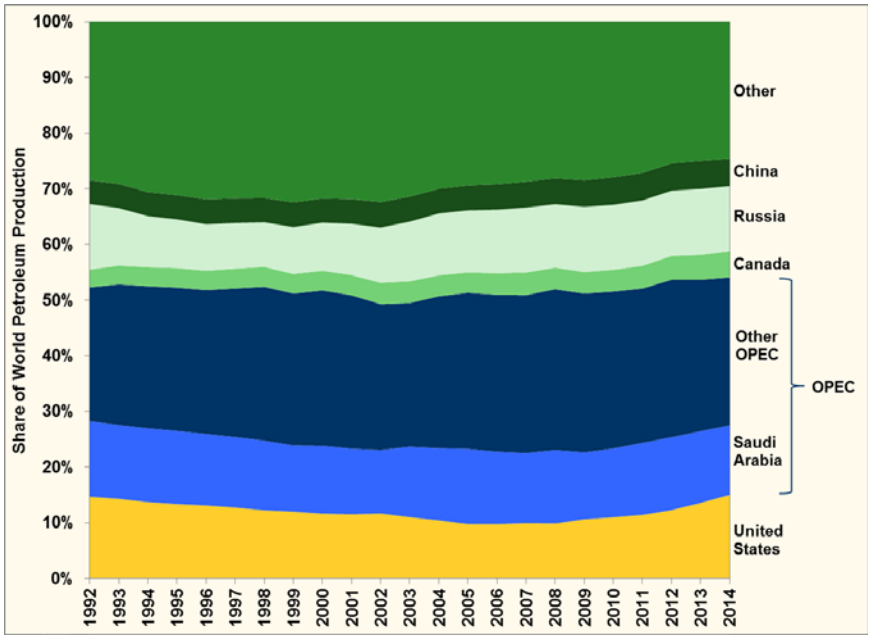
EIA: U.S. net petroleum product exports continue to increase.

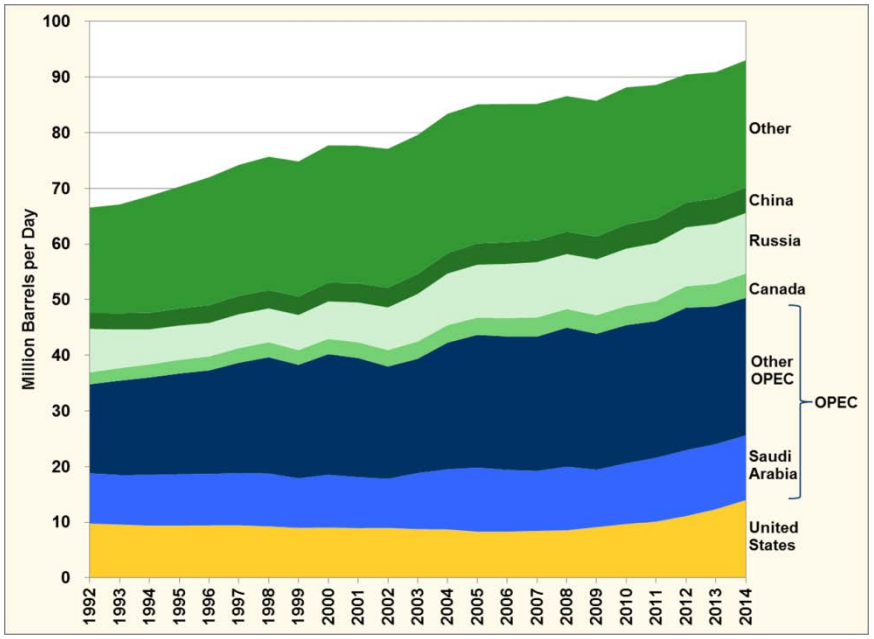


Source: http://www.eia.gov/todayinenergy/detail.cfm?id=21972

oil markets

The U.S. comprises 15% of global petroleum supply; OPEC 39%.



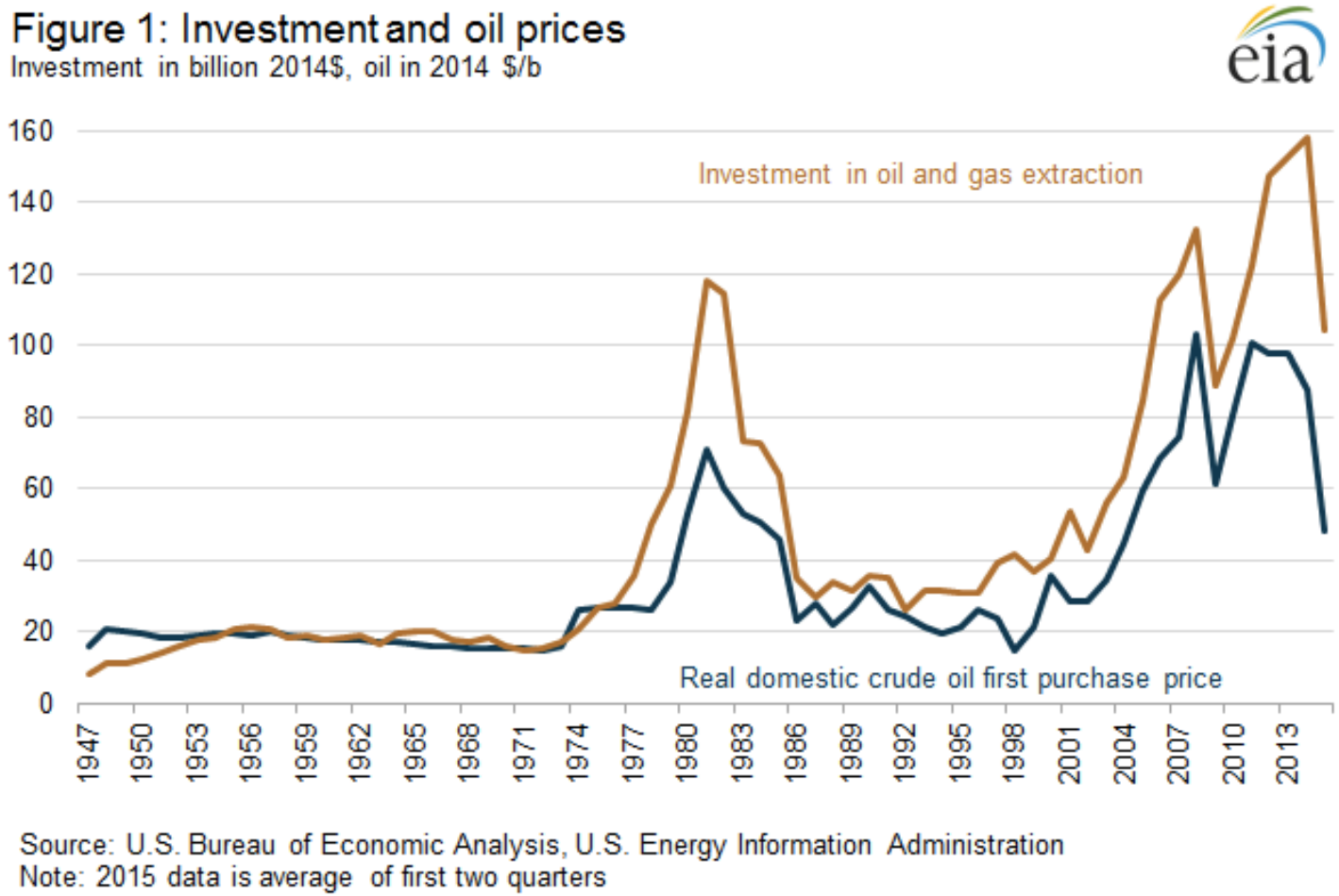


- U.S. increased petroleum production, but accounted for only 15% of World's production in 2014 – the same percentage as in 1992.
- Total petroleum produced world-wide grew from 66.6 mmbd in 1992 to 93.0 mmbd in 2014.
- Production shares by country have changed little over the same time period.
- OPEC accounted for 38% of production in 1992 and 39% in 2014.

Source: http://energy.gov/eere/vehicles/fact-887-august-24-2015-united-states-supplies-15-world-petroleum

oil markets

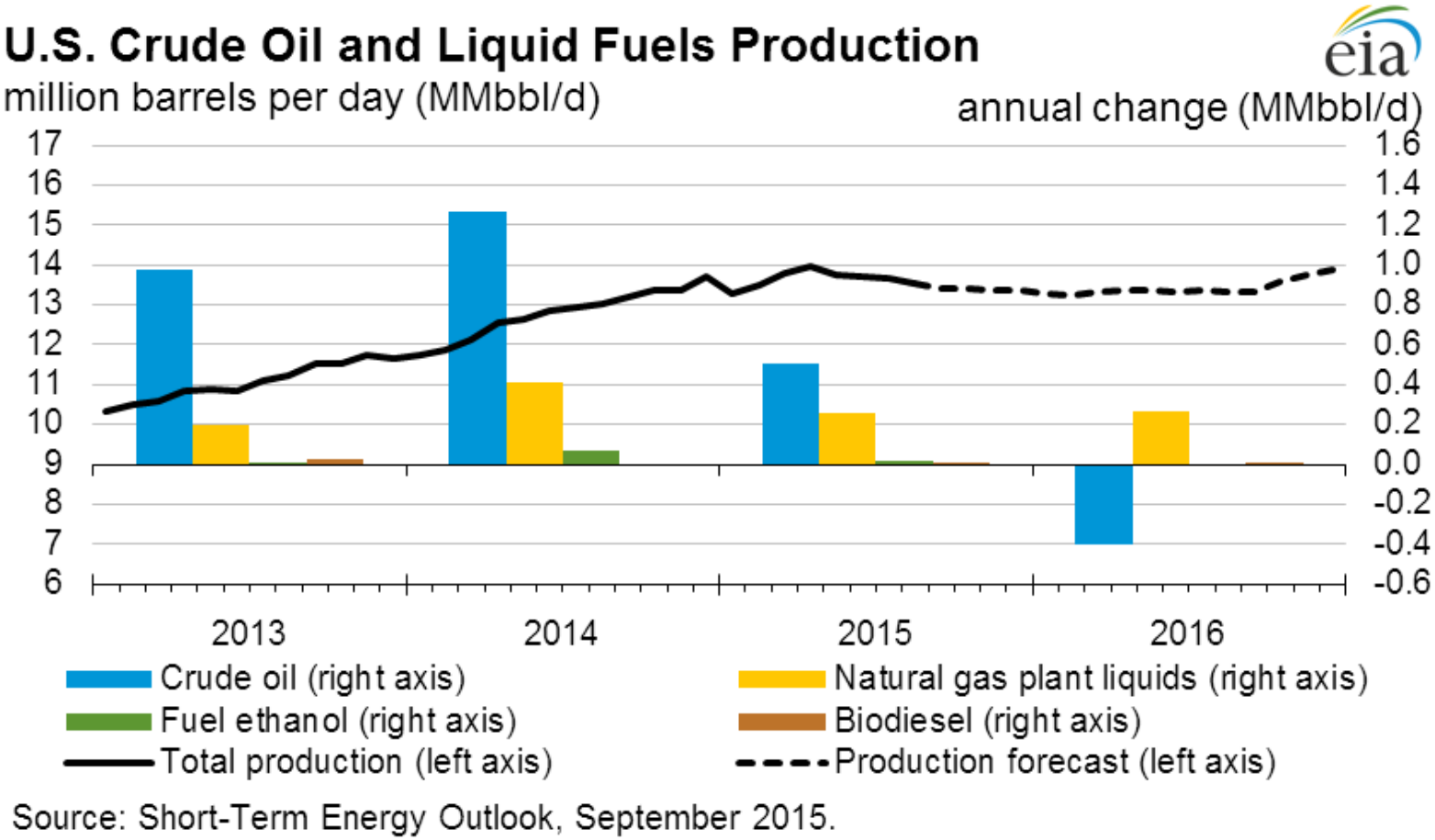
EIA: Sustained low oil prices could reduce exploration and production investment.



Source: http://www.eia.gov/petroleum/weekly/archive/2015/150923/includes/analysis_print.cfm

oil markets

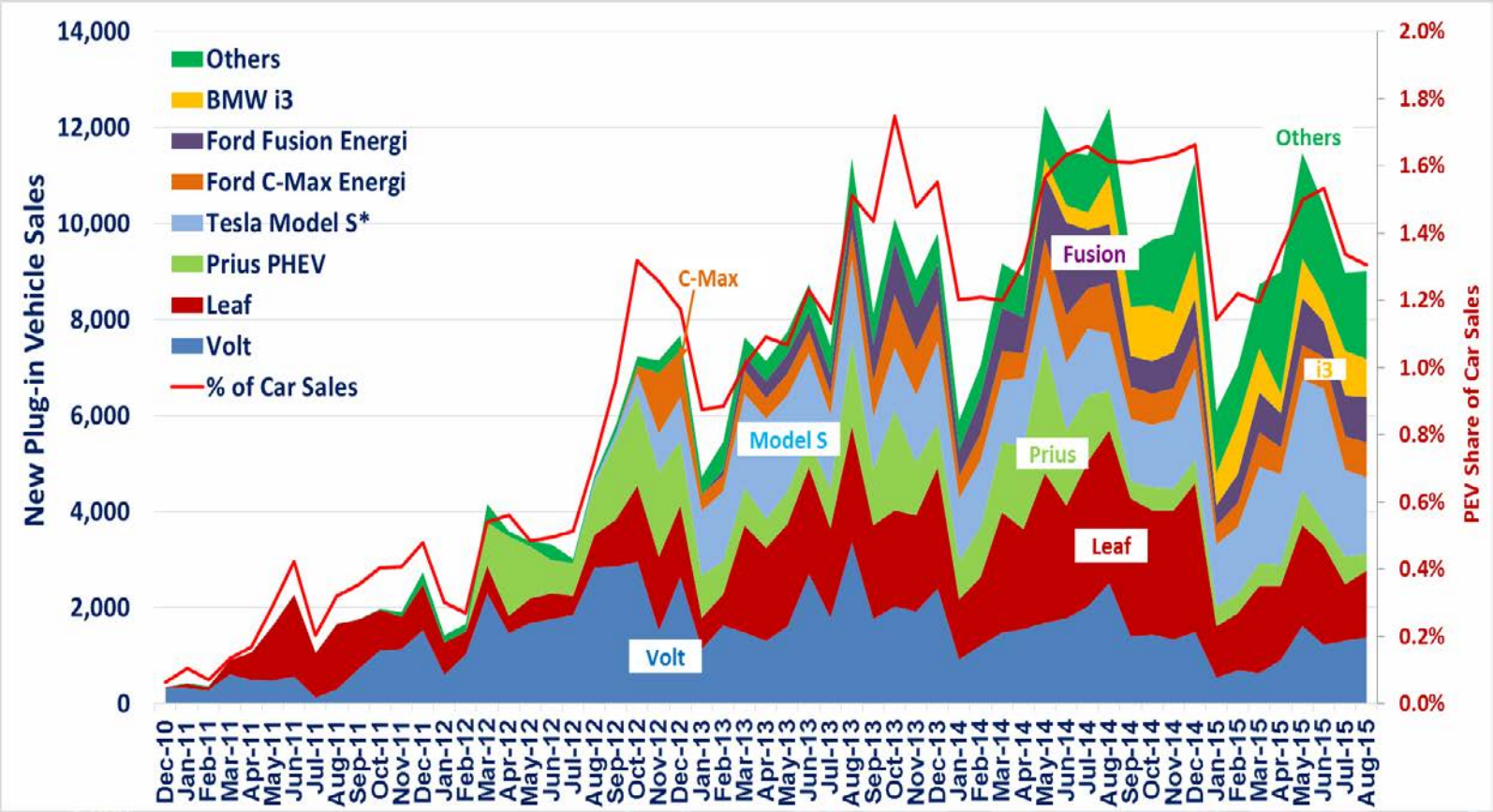
EIA: U.S. crude oil and liquid fuels production is projected to drop in 2016.



Source: http://oilpro.com/post/18349/us-oil-production-drops-to-1-year-low-seen-declining-through-2016

PEV market

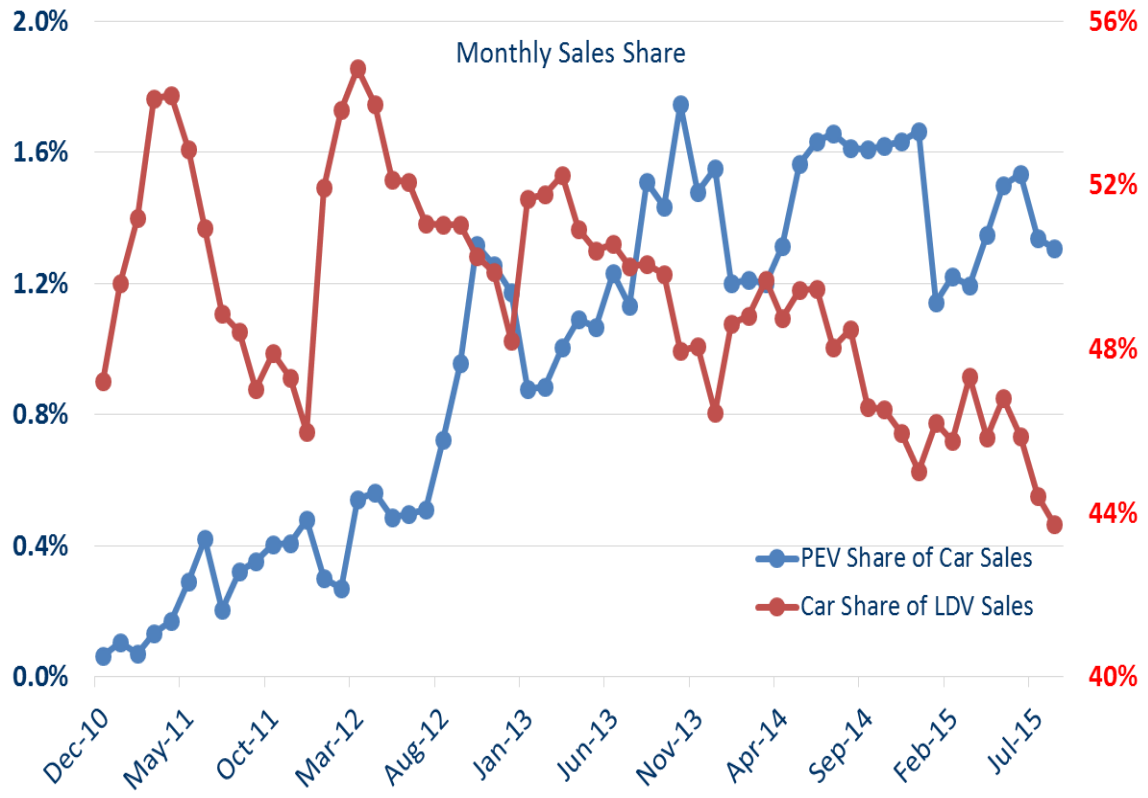
ANL: PEV monthly sales volumes have stagnated (though continue to change by make/model).



Source: Zhou, Y. ANL (2015).

PEV market

ANL: Overall PEV sales are pressured downward by shift away from cars (to light trucks).



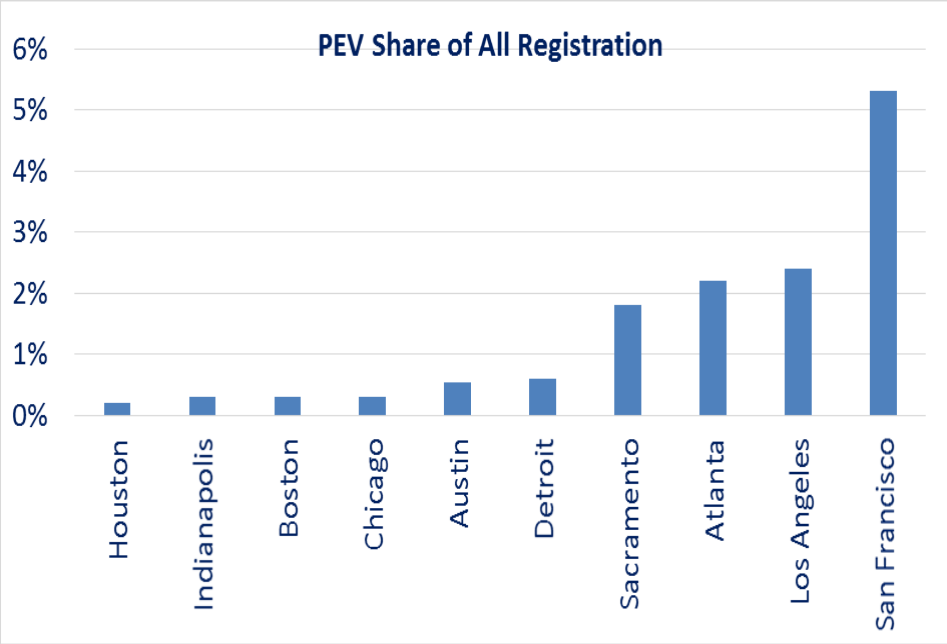
Overall PEV sales are mostly flat in 2015 largely because share of car sales is down. Within cars PEV shares have leveled, not fallen.

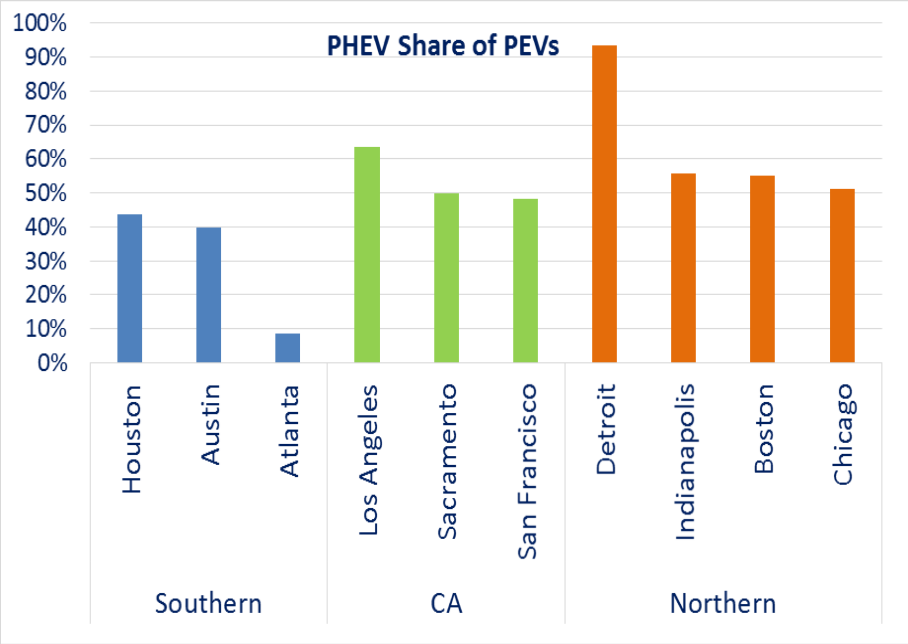
On average, the luxury/performance Tesla accounts for 40% of BEV sales

Source: Zhou, Y. ANL (2015).

PEV market

ANL: PEV market penetration—both overall, and PHEV-to-BEV ratio—differs by region.



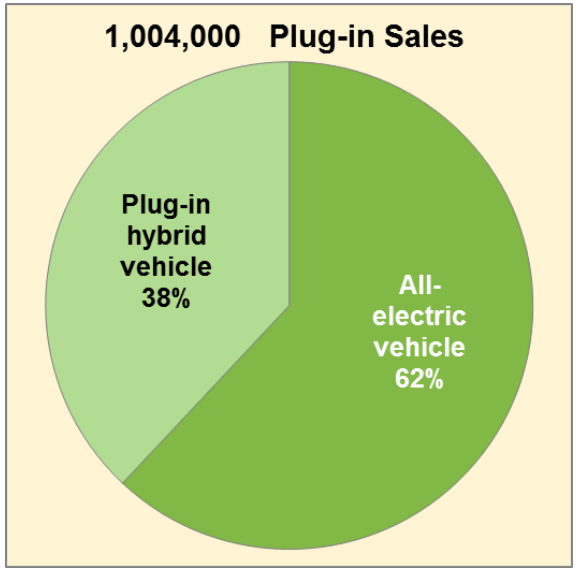


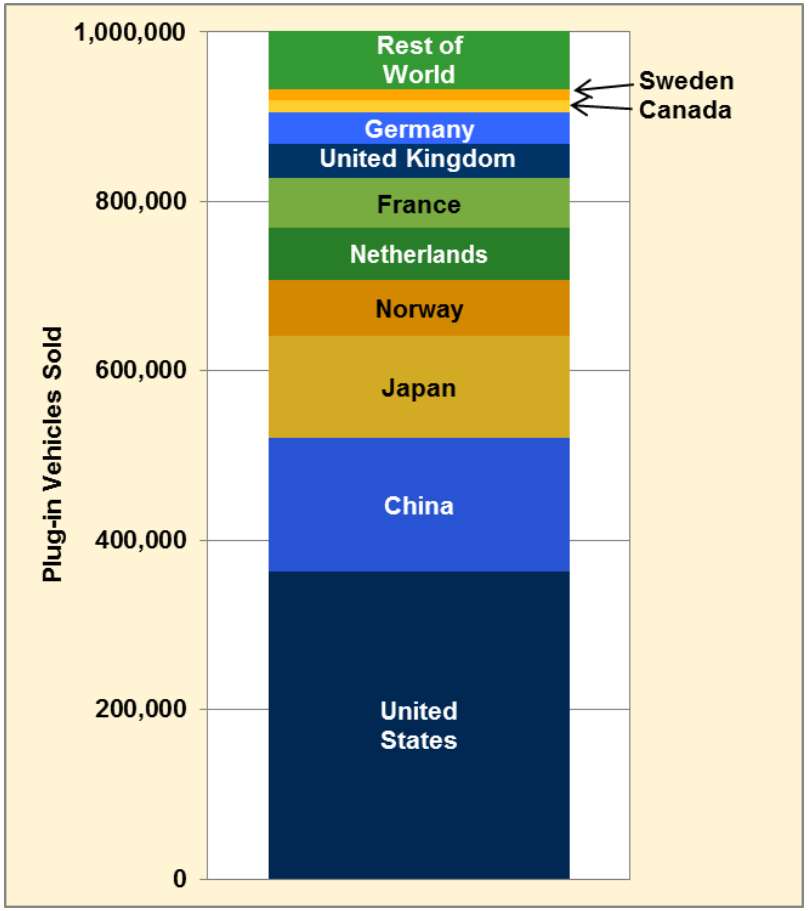
- The Pacific coast (particularly San Francisco) has the largest E-drive share
- California metros have the highest E-drive and PEV shares of total registrations.
- Atlanta has the lowest PHEV share by far (due to state incentive)
- Detroit the highest

Source: Zhou, Y. ANL (2015).

PEV market

FOTW: The one-millionth PEV globally was sold in September 2015 (500,000 mark was in July 2014).

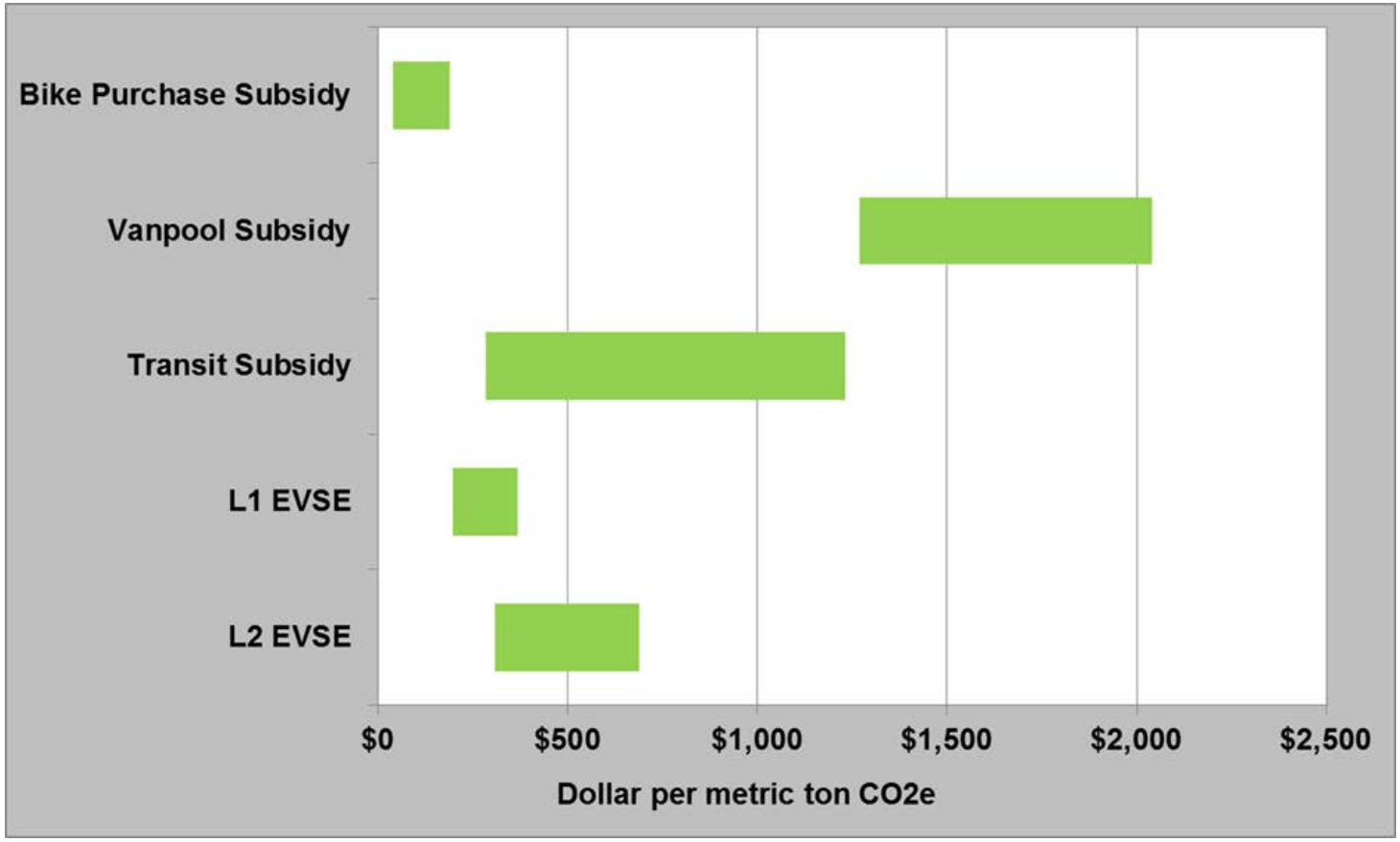




Source: http://energy.gov/eere/vehicles/fact-878-june-22-2015-plug-vehicle-penetration-selected-countries-2014

PEV emissions studies

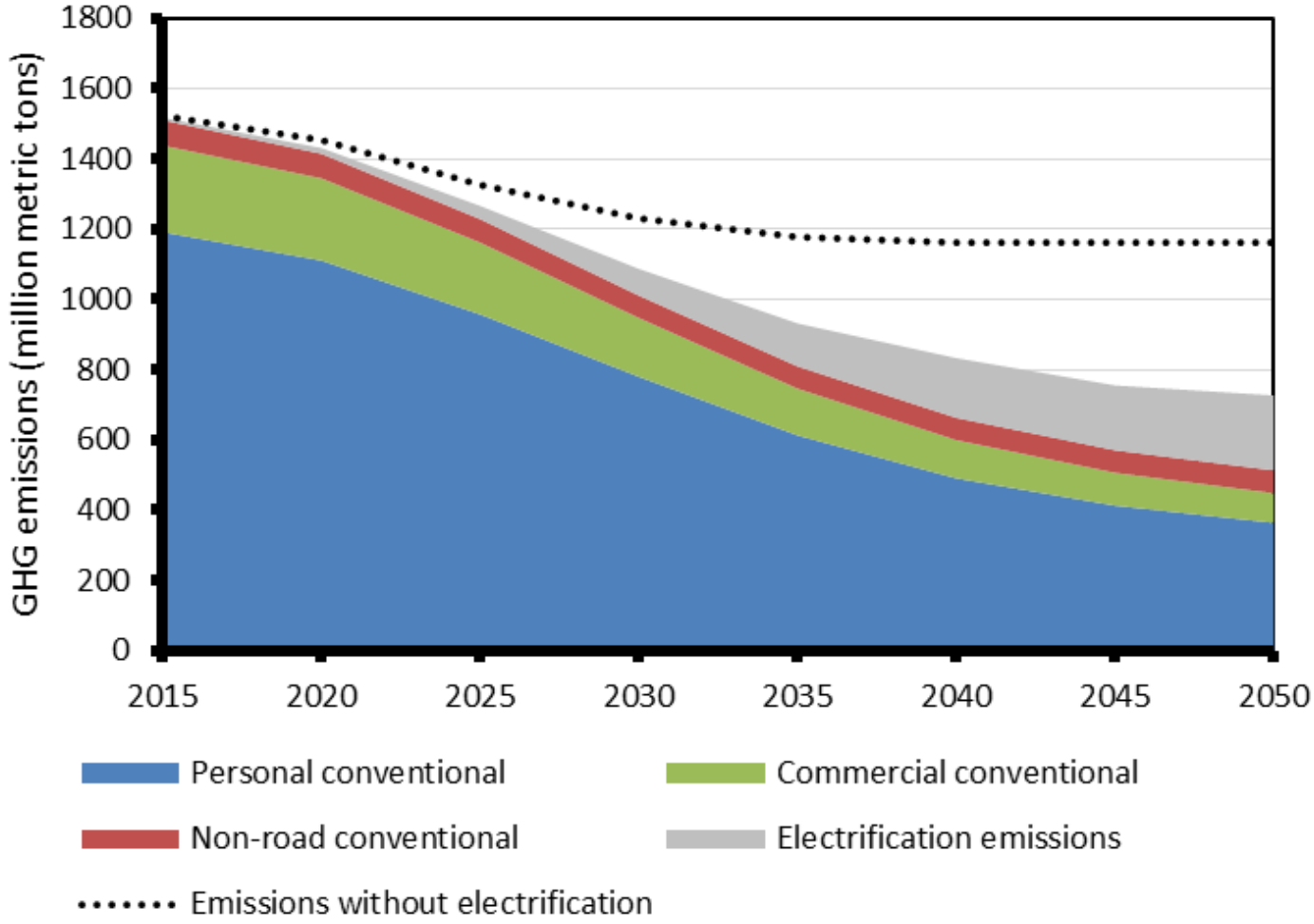
WPC/FOTW: Workplace charging GHG abatement cost (already) compares to other commuting alternatives.



Source: http://energy.gov/eere/vehicles/fact-879-june-29-2015-greenhouse-gas-abatement-costs-employer-subsidized-commuting

PEV emissions studies

EPRI/NRDC: Nationwide emissions drop further with electrification.

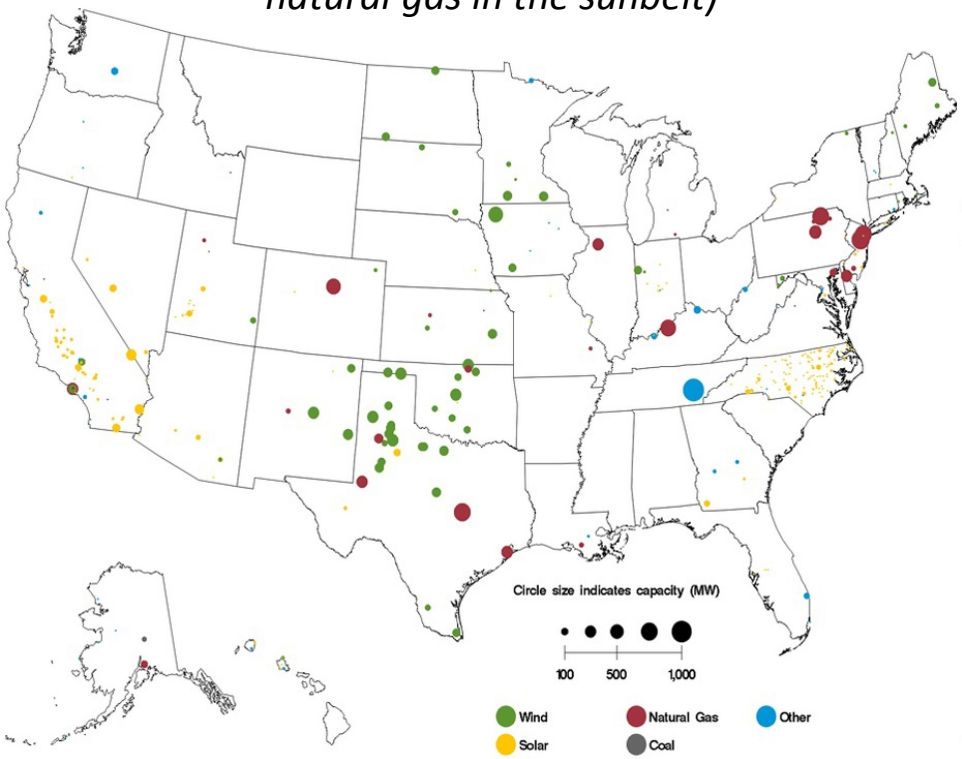


Source: http://www.epri.com/abstracts/Pages/ProductAbstract.aspx?ProductId=3002006881, Vol. 2, Figs. 7-12

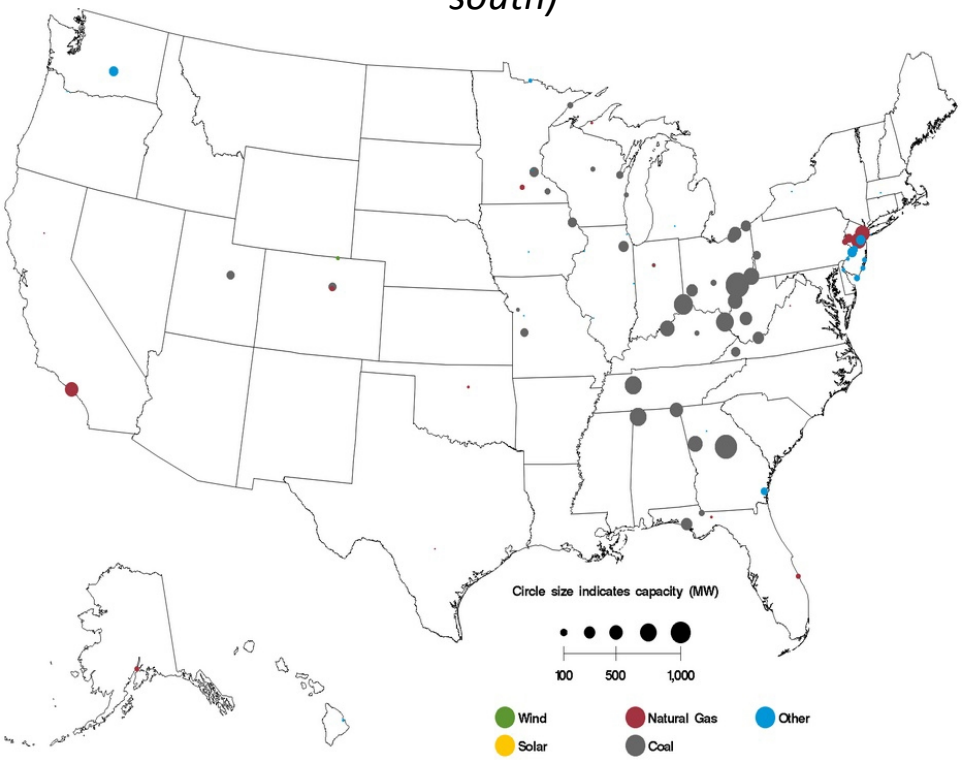
grid emissions studies

FOTW: New power generation facilities will differ by technology and geography than those retired.

Planned additions
(primarily wind, solar, and natural gas in the sunbelt)



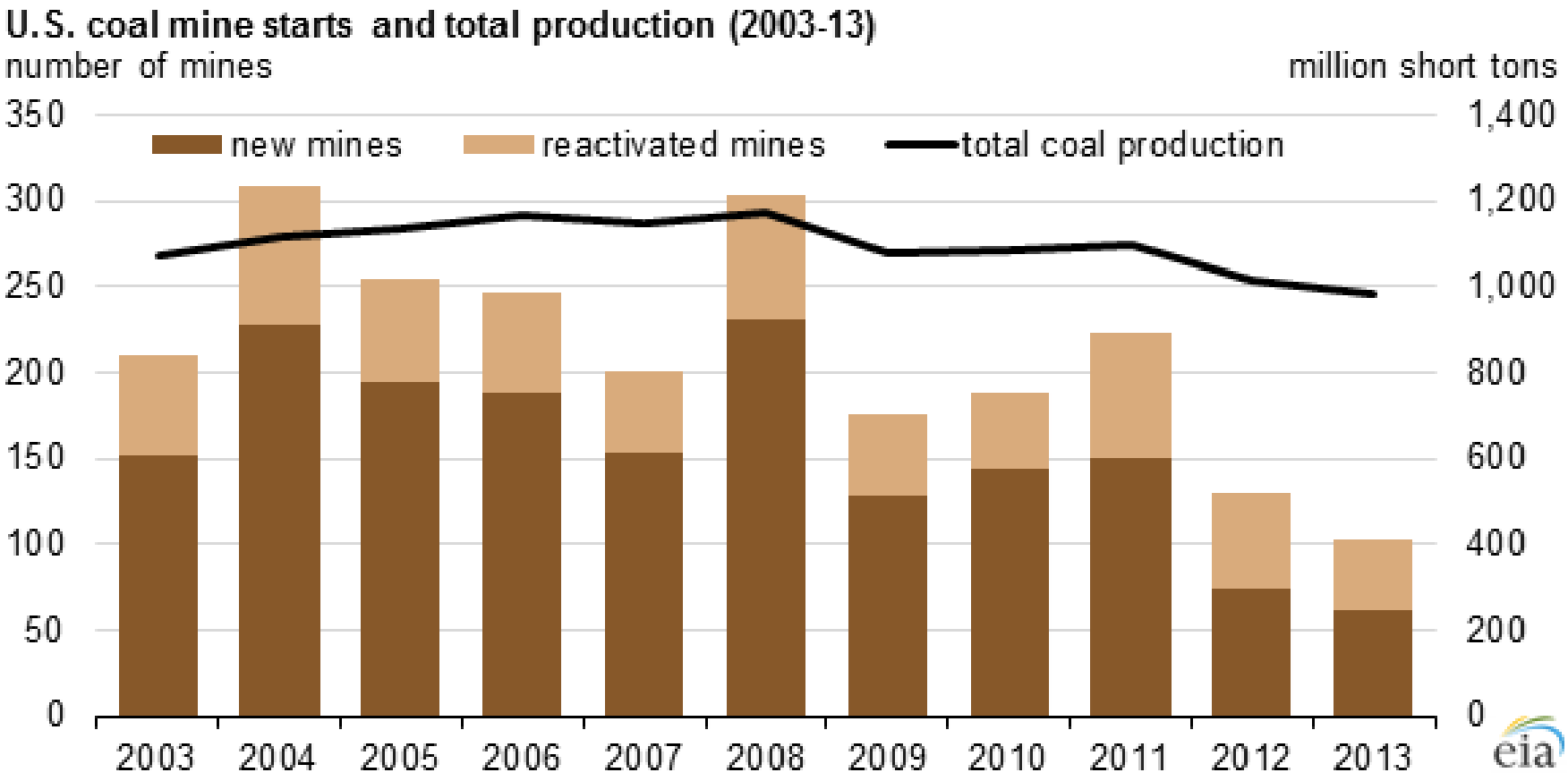
Planned retirements
(primarily coal in the mid-west, south)



Source: http://energy.gov/eere/vehicles/fact-885-august-10-2015-electricity-generation-planned-additions-and-retirements

grid emissions studies

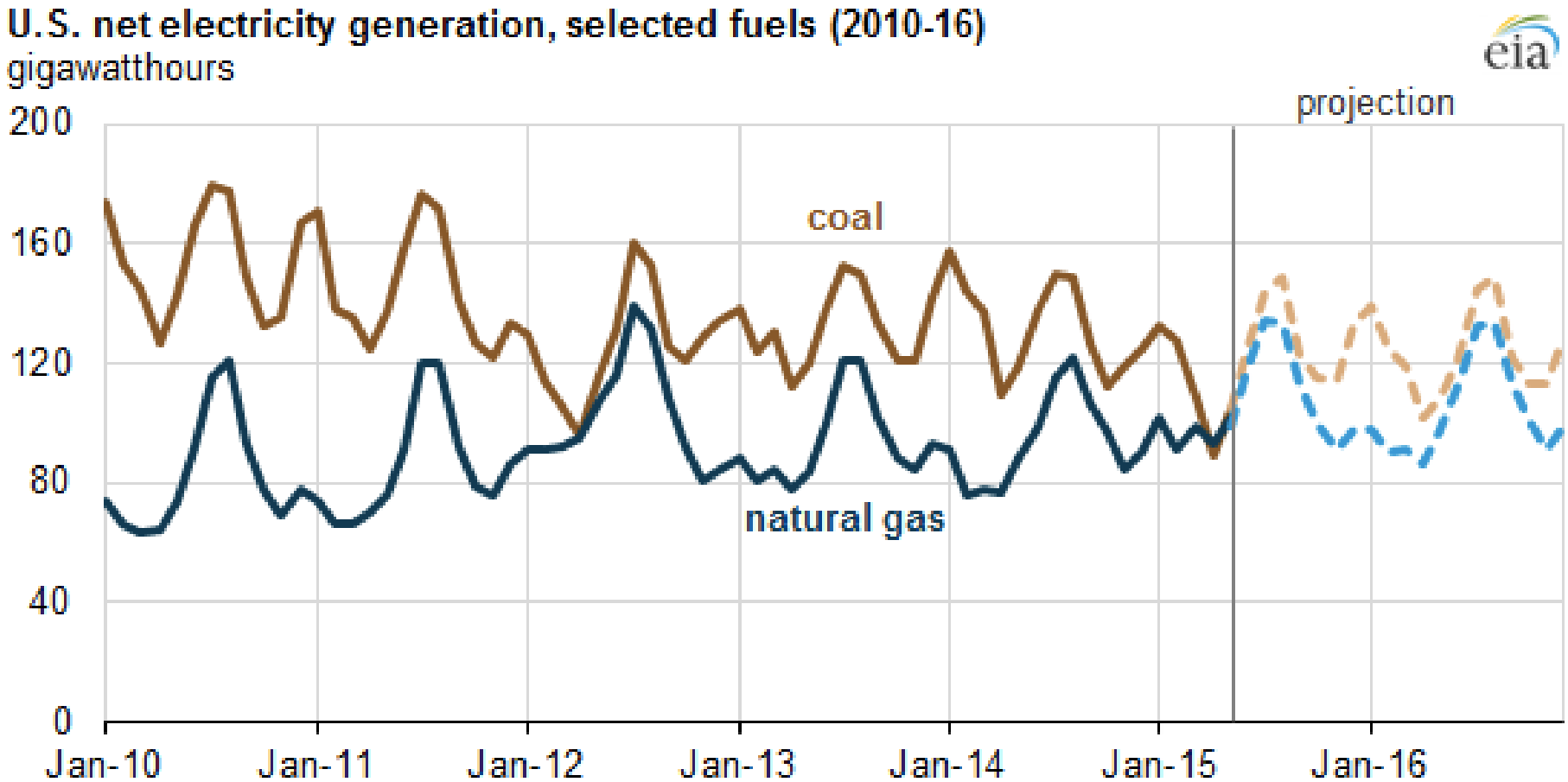
EIA: New coal mine starts continue to decline (>60% from their peak in the past 10 years).



Source: http://www.eia.gov/todayinenergy/detail.cfm?id=23052

grid emissions studies

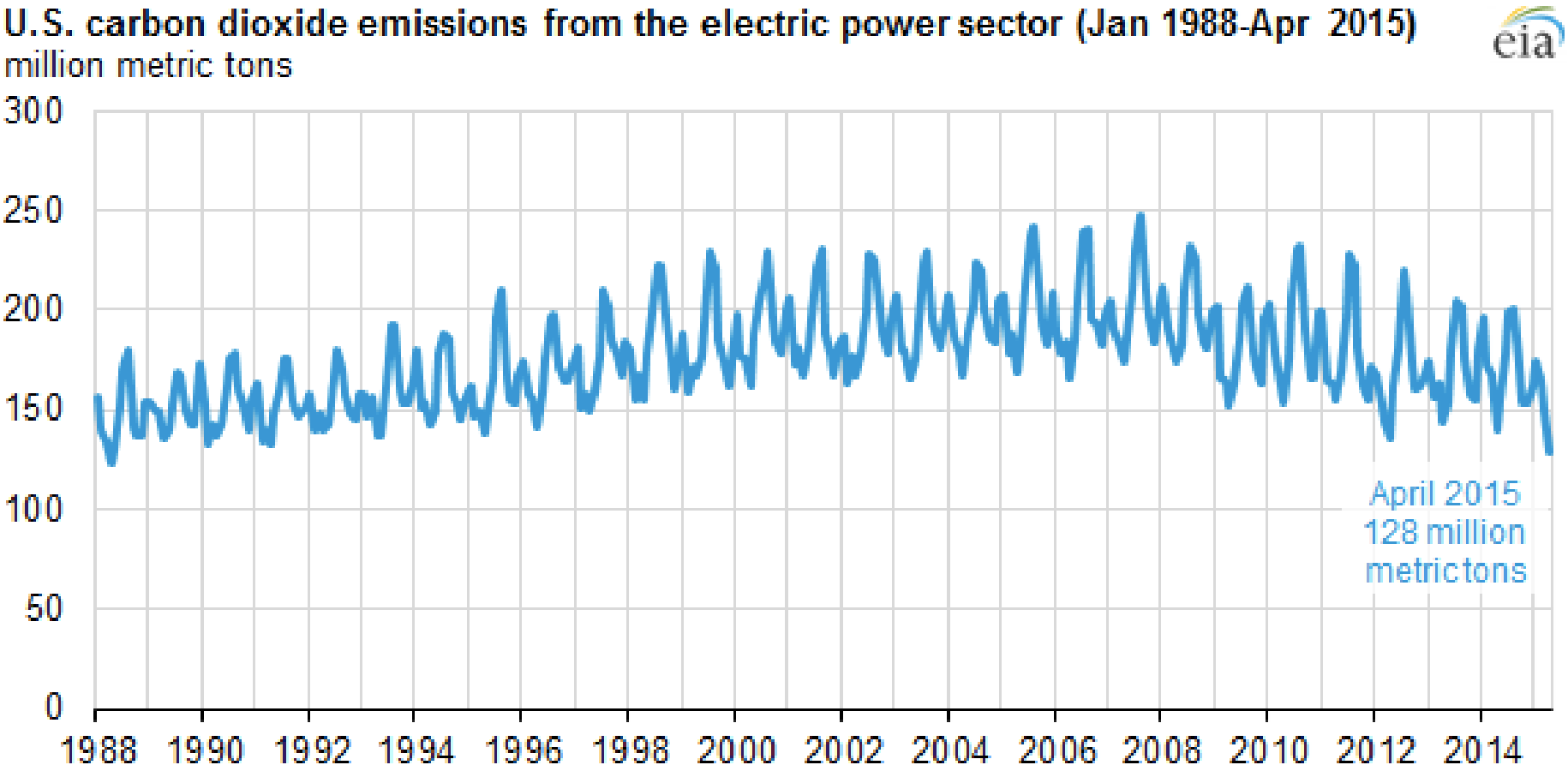
EIA: Electricity from natural gas surpasses coal for first time (but just for one month).



Source: http://www.eia.gov/todayinenergy/detail.cfm?id=22312

grid emissions studies

EIA: U.S. Power sector carbon dioxide emissions reach 27-year low in April.



Source: http://www.eia.gov/todayinenergy/detail.cfm?id=22372

consumer preferences

NREL: Attribute importance for vehicle choice changes (sometimes dramatically) over time.

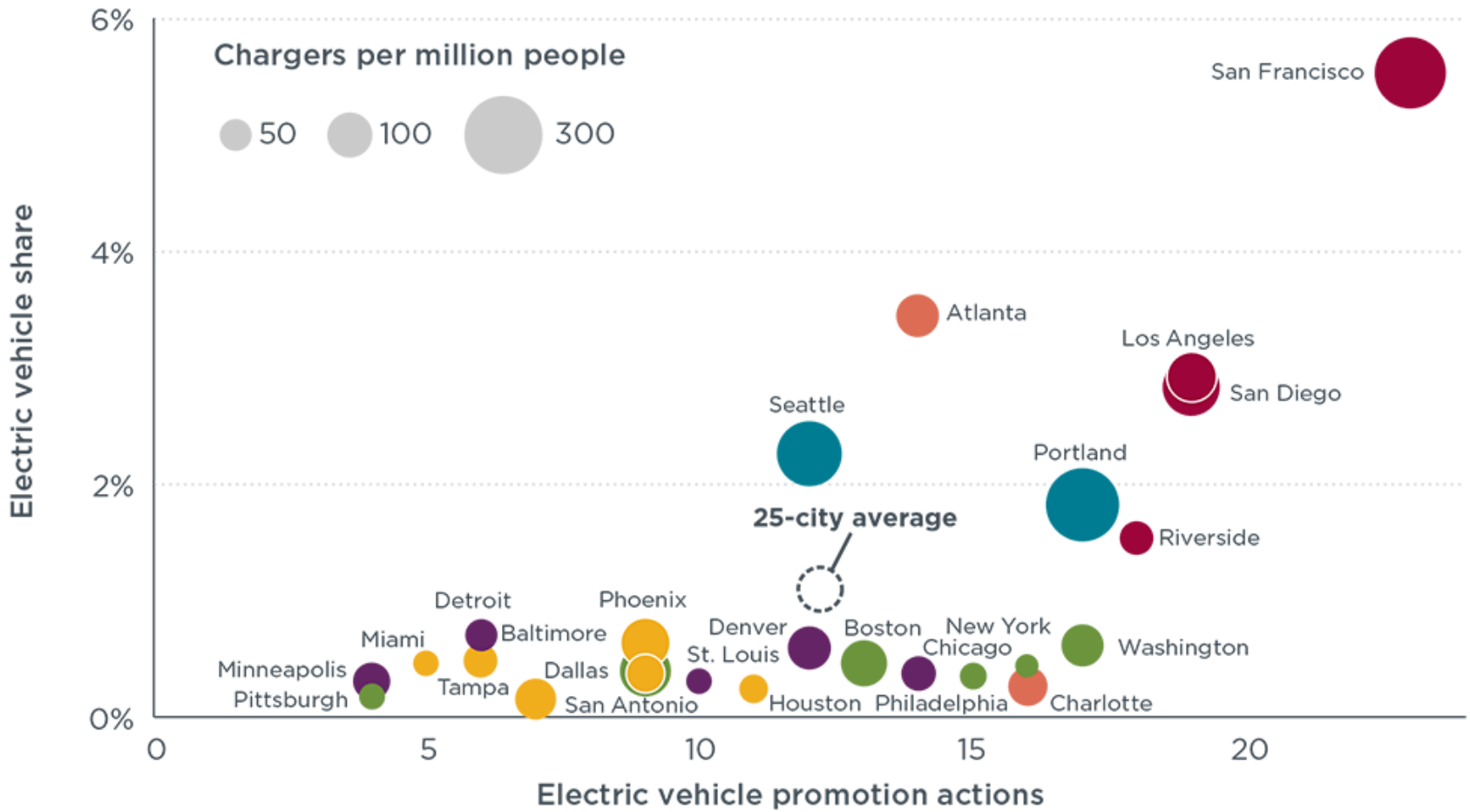
"Which one of the following attributes would be MOST IMPORTANT in your choice of your next vehicle?"

Date of Study	Fuel Economy	Depend-ability	Low price	Quality	Safety	Don't Know
1980	42%	31%	14%	4%	9%	
1981	20%	40%	21%	7%	12%	
1983	13%	38%	30%	11%	9%	
1985	8%	41%	29%	12%	10%	
1987	4%	44%	31%	8%	14%	
1996	7%	34%	11%	19%	29%	
1998	4%	36%	5%	20%	34%	1%
2000	10%	32%	11%	21%	24%	2%
2001	10%	29%	8%	22%	29%	1%
May 2004	22%	26%	10%	19%	23%	
May 2005	12%	33%	6%	20%	26%	3%
Jun 2006	19%	27%	6%	19%	25%	4%
Aug 2007	21%	30%	7%	17%	24%	3%
Aug 2008	26%	26%	8%	15%	22%	2%
Aug 2009	23%	28%	9%	19%	17%	5%
Jun 2011	29%	22%	7%	19%	21%	1%
Nov 2012	27%	23%	13%	15%	14%	7%
Jun 2014	20%	29%	11%	19%	19%	2%
Jun 2015	13%	31%	14%	18%	21%	3%

Source: Singer, M. NREL (2015), http://www.nrel.gov/docs/fy15osti/64840.pdf.

PEV incentives

ICCT: PEV sales are [generally] positively correlated with PEV promotion policies.



Source: http://www.theicct.org/blogs/staff/electric-vehicles-rising-select-us-cities

PEV incentives

ICCT: Total monetized consumer benefits for PHEV and BEV occur in largest cities.

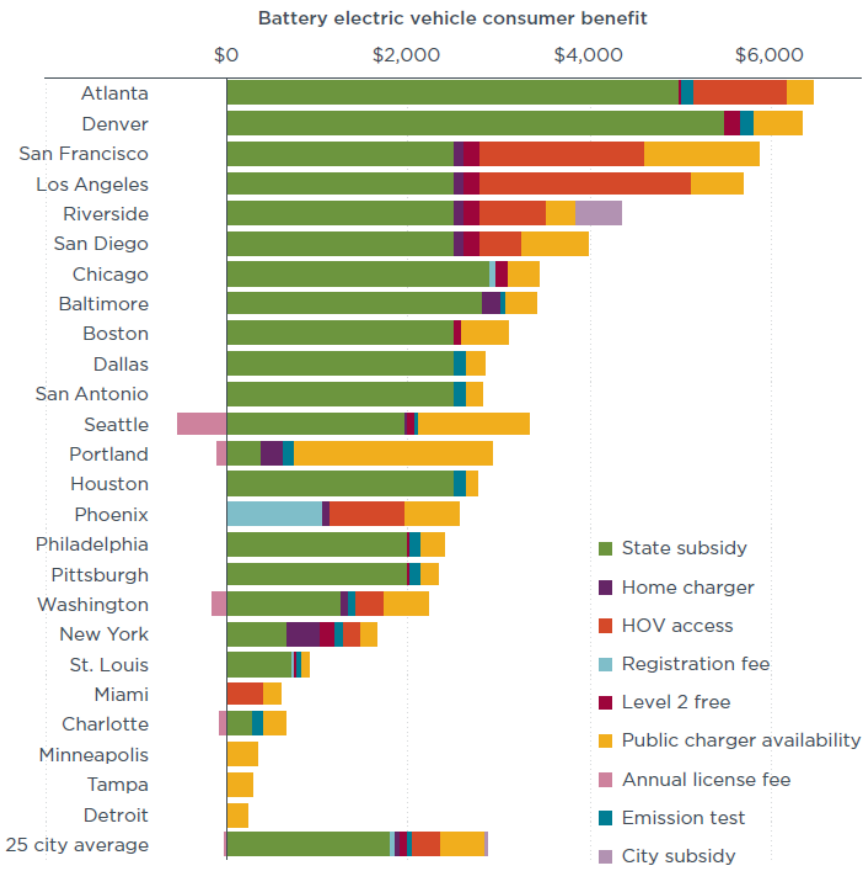


Figure 6. Summary of battery electric vehicle consumer benefits from electric vehicle policy actions across 25 most populous U.S. cities in 2014

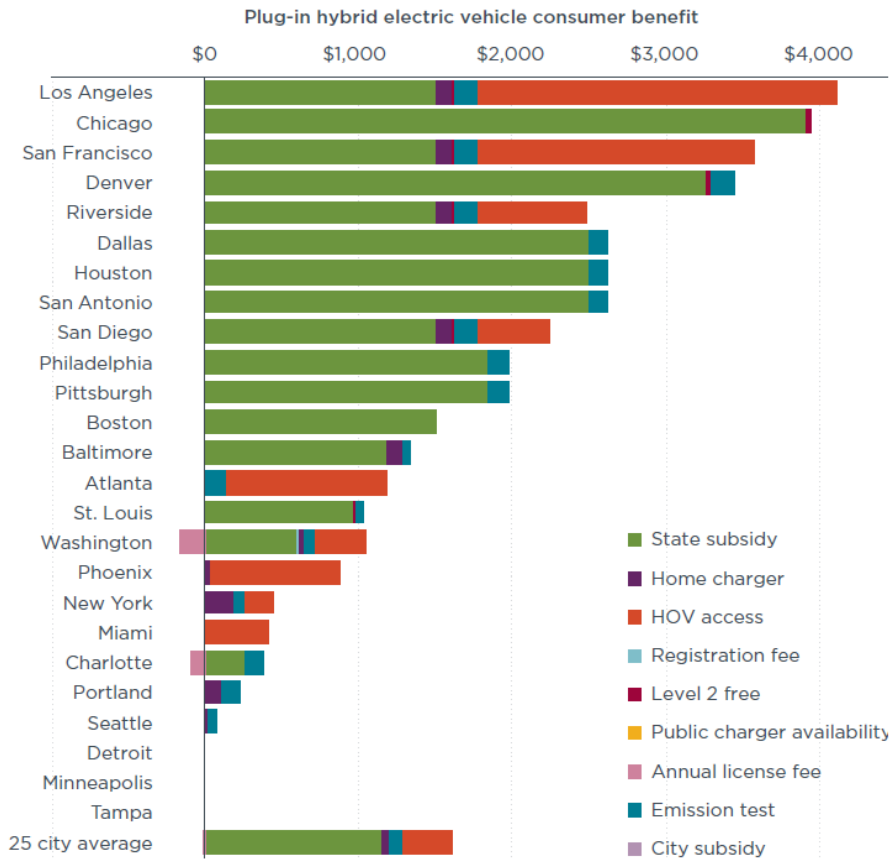
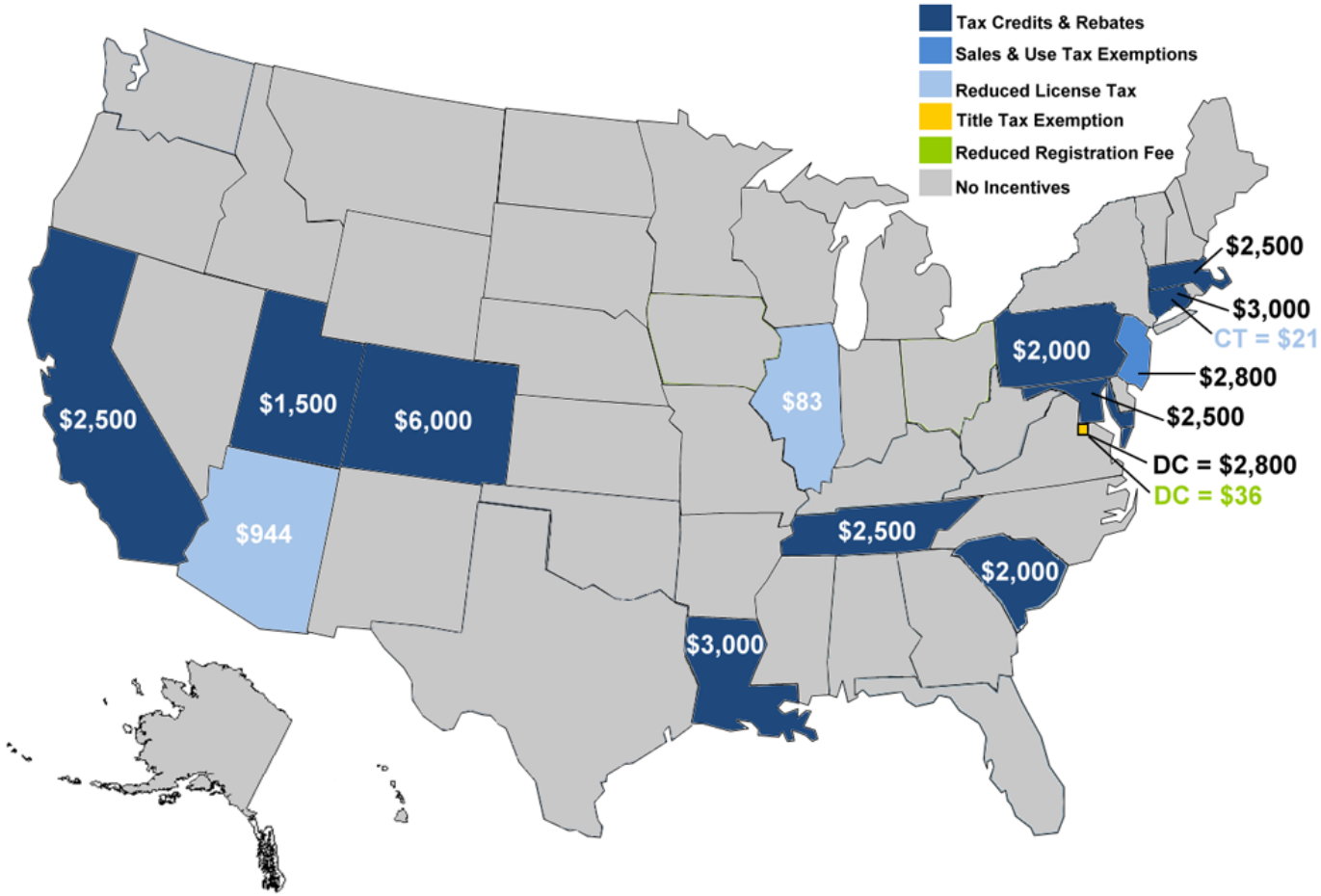


Figure 7. Summary of plug-in hybrid electric vehicle consumer benefits from electric vehicle policy actions across 25 most populous U.S. cities in 2014

Source: http://www.theicct.org/blogs/staff/electric-vehicles-rising-select-us-cities

PEV incentives

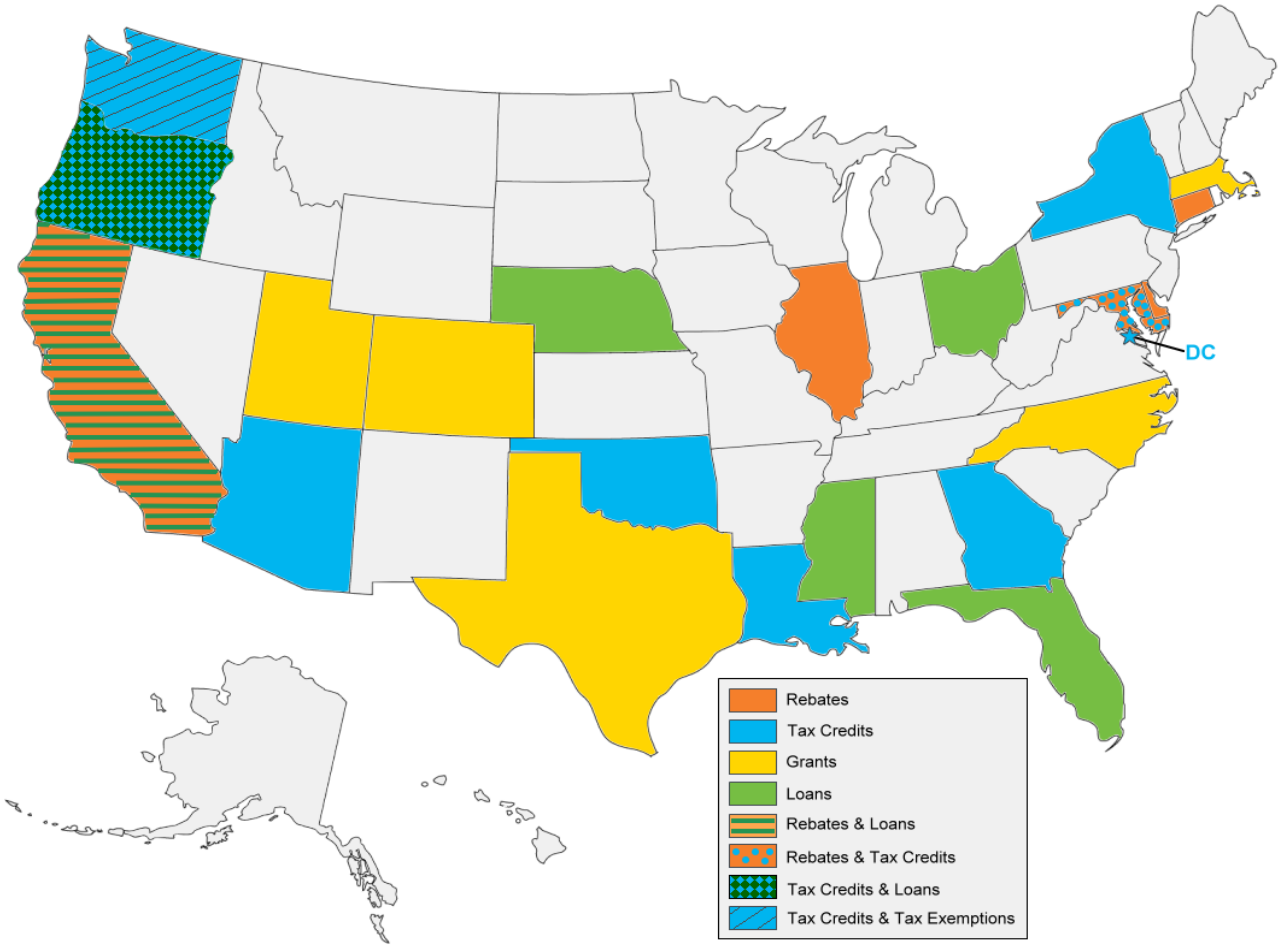
FOTW: State incentives for PEVs vary widely (from $0 to $6,000).



Source: http://energy.gov/eere/vehicles/fact-891-september-21-2015-comparison-state-incentives-plug-electric-vehicle-purchases

PEV incentives

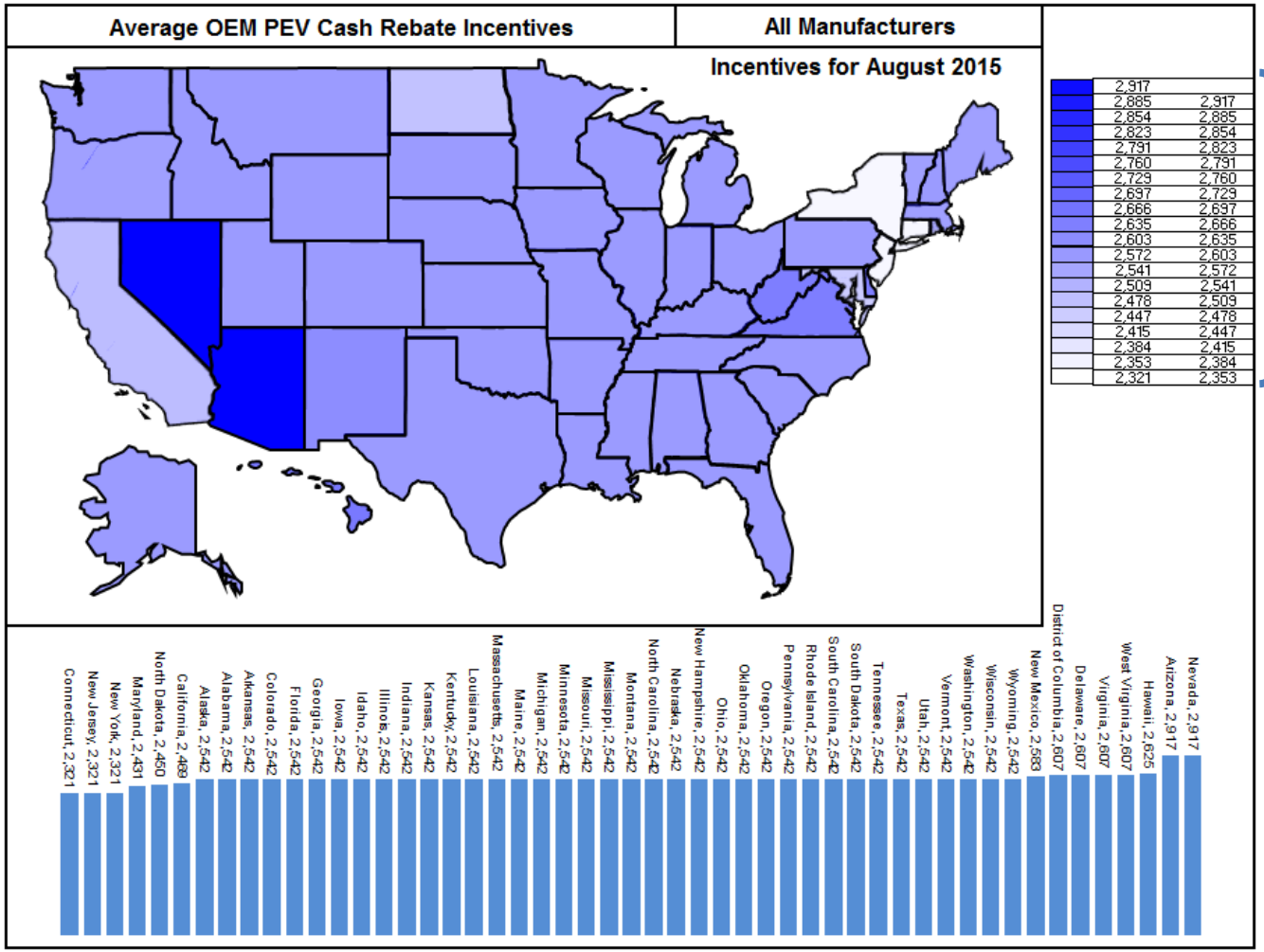
ORNL: State incentives for EVSE also vary widely (by amount and format).



Source: Davis, S. (FOTW)

PEV incentives

SRA: OEM incentives also reduce PEV incremental price in the current market.

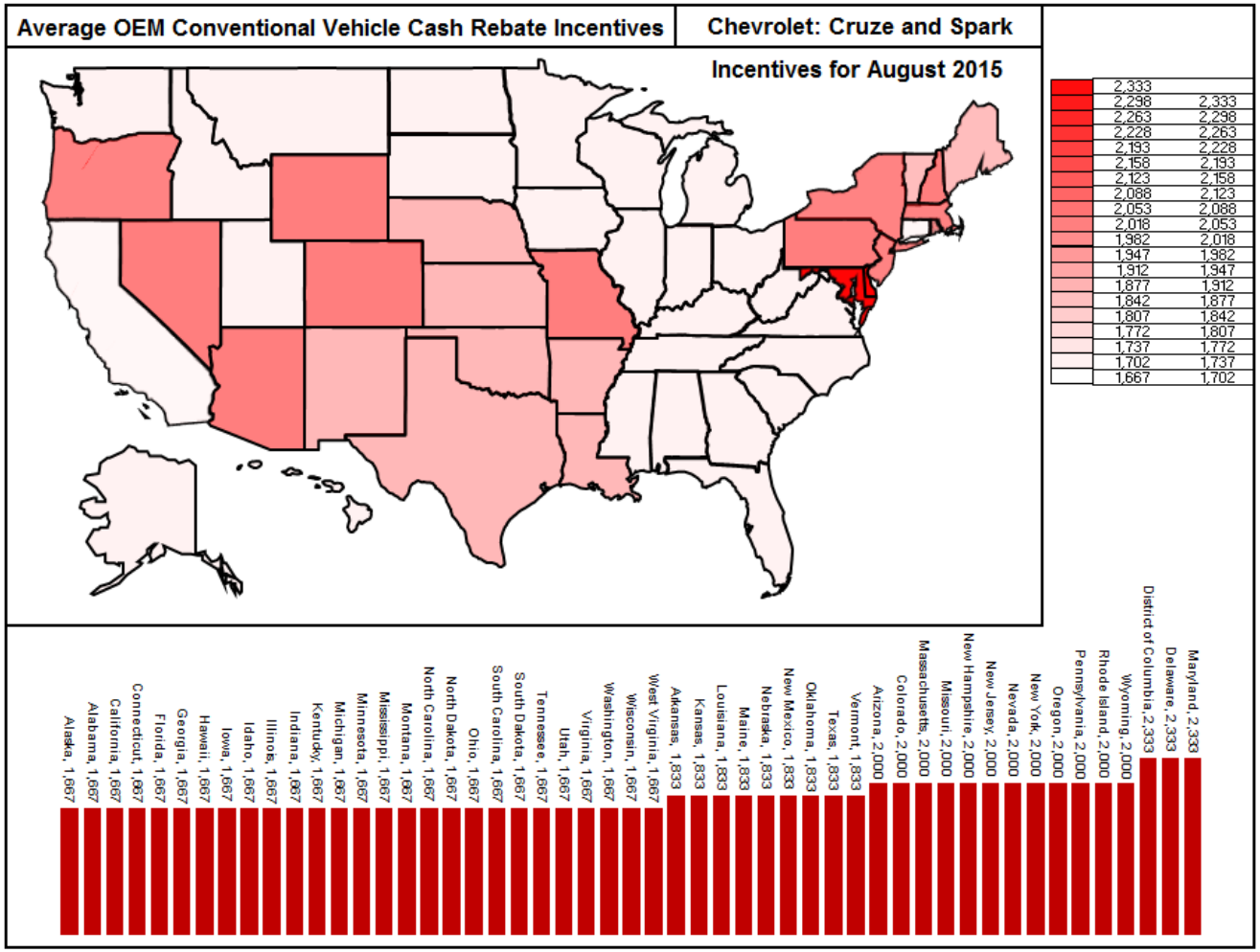


Incentives shown range from ~$2,300-$2,900.

Source: Campbell, R. (SRA, publication forthcoming)

PEV incentives

SRA: Some OEM incentives are more aligned with ZEV states than others.



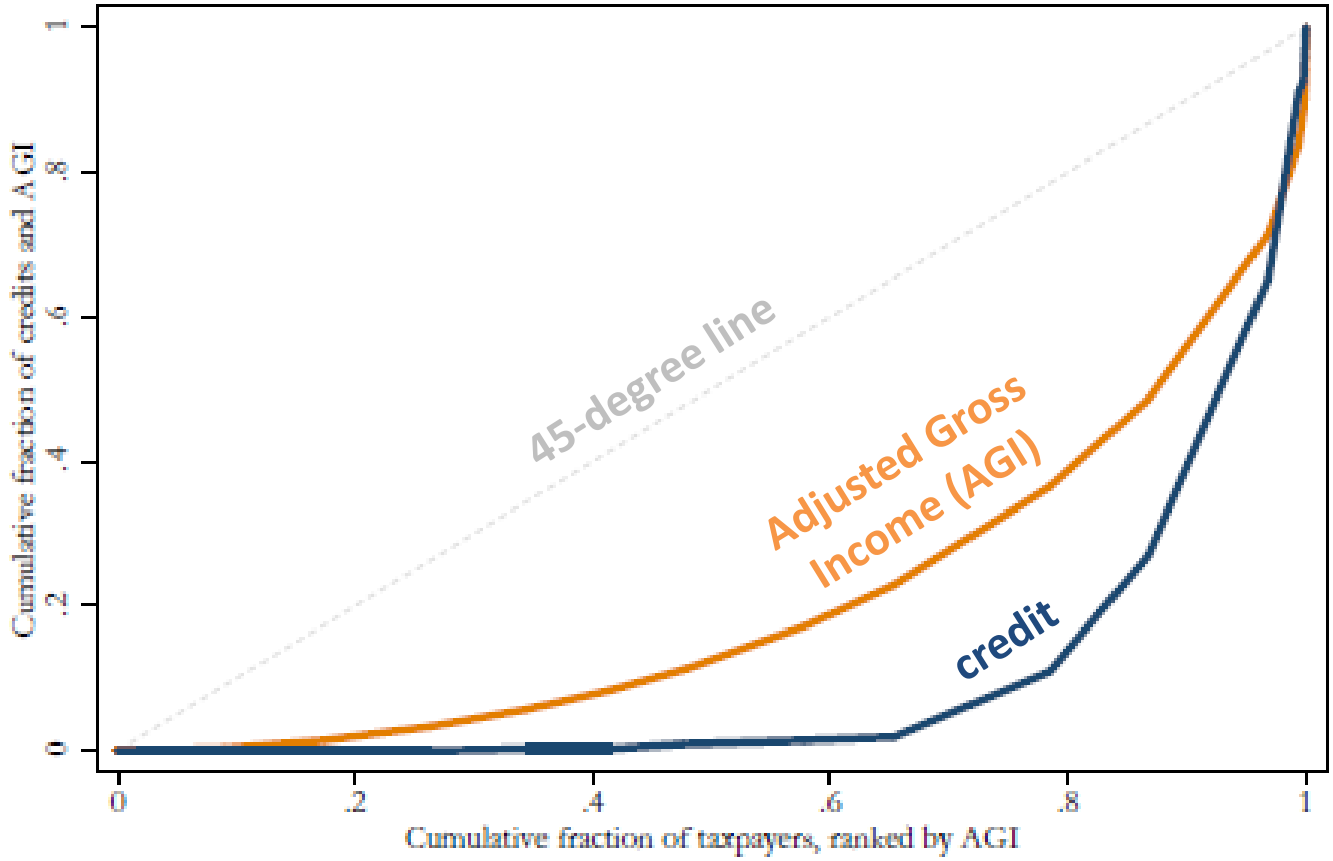
Incentives shown range from ~$1,600-$2,300.

Source: Campbell, R. (SRA, publication forthcoming)

PEV incentives

UC-Berkeley: Most PEV buyers claiming incentives are relatively wealthy.

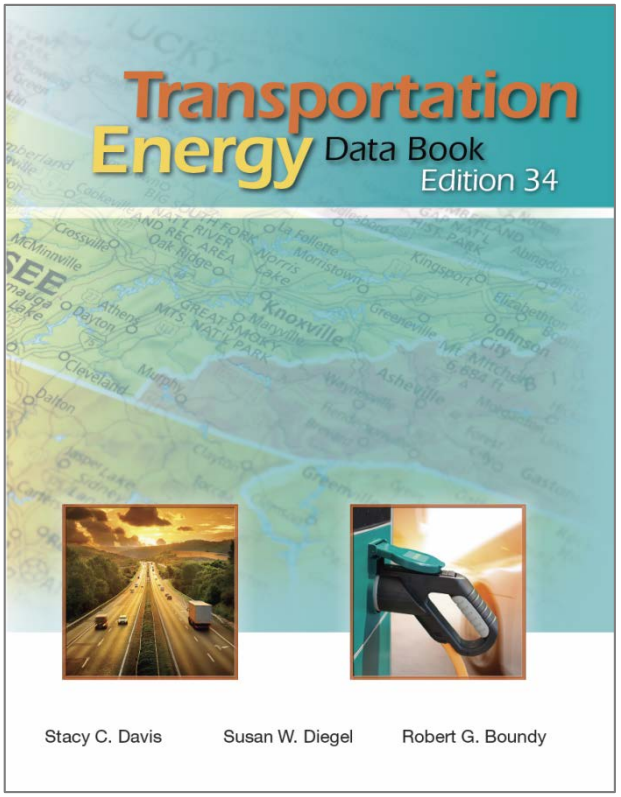
C: Qualified Plug-in Electric Drive Motor Vehicle Credit, 2009-2012



Source: http://ei.haas.berkeley.edu/research/papers/WP262.pdf

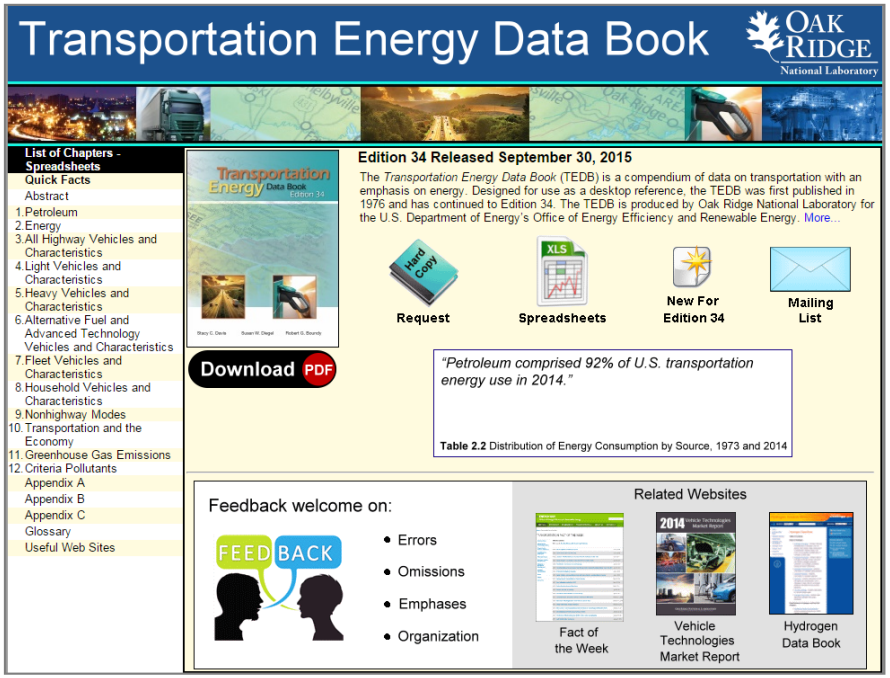
general awareness

ORNL: Transportation Energy Data Book, edition 34 is available online.



Printed copies are coming.

http://cta.ornl.gov/data



Excel and PDF formats available.

Source: Davis, S. (ORNL).