EV Charging Network Webinar

Nick Nigro and Jeff Hopkins

The first webinar for the Washington State Advisory Panel

C2ES CENTER FOR CLIMATE
AND ENERGY SOLUTIONS

C2ES.ORG

About Center for Climate and Energy Solutions

- **Independent, nonpartisan, nonprofit organization**

- **Working to advance strong policy and action to address the twin challenges of energy and climate change**

- **Founded in 1998 as the Pew Center on Global Climate Change**

- **Became C2ES in 2011**

C2ES's Relevant Experience

- **Plug-in Electric Vehicle Dialogue Initiative (2011-present)**

  - Goal: Bring together automakers, electric utilities, policymakers, and environmental groups to develop and implement consensus approaches to accelerate electric vehicle deployment nationwide

  - 2012: Published report *An Action Plan to Integrate Plug-in Electric Vehicles with the U.S. Electrical Grid*, provides a roadmap to enabling a national electric vehicle market

  - 2013: Created PEV Action Tool to help state transportation departments determine goals for electric vehicle deployment and chart out path for reaching goals

  - 2014: Published report, *A Guide to the Lessons Learned from the Clean Cities Community Electric Vehicle Readiness Projects*, summarizes lessons learned from 16 groups that received Energy Department grants to advance the deployment of electric vehicles

- **Alternative Fuel Vehicle Finance Initiative (2013-present)**

  - Goal: Develop pilot project strategies to demonstrate new business models for alternative fuel vehicles and fueling infrastructure

  - 2014: Published report, *Alternative Fuel Vehicle & Fueling Infrastructure Deployment Barriers & the Potential Role of Private Sector Financial Solutions*, a seminal report on role of private finance in accelerating electric vehicle deployment

- **Project Overview**

- **Vehicle and Charging Technology**

- **Project Approach**

  - Electric Vehicle Market State of Play: Task 1 Approach

  - Interactive Maps Preview

Project Overview

Electric Vehicle (EV) Business Models Study Overview

Directive from Washington State Legislature

C2ES

The Legislature directed the Joint Transportation Committee to "evaluate the current status of electric vehicle charging stations in Washington, and to make recommendations regarding potential business models for financially-sustainable electric vehicle charging networks and alternative roles for public and private sector participation in those business models. Public sector participation may include public financing, funding, facilitation, and other incentives to encourage installation of electric vehicle charging stations. In conducting the study, the committee must coordinate with the department of transportation and consult with local governments and stakeholders in the electric vehicle industry. The committee may also consult with users of electric vehicles and stakeholders representing manufacturers and operators of electric vehicle charging stations. The committee shall submit an interim report by December 31, 2014, and a final report by March 1, 2015." (ESSB 6001, Sec 204(6))

Project Timeline
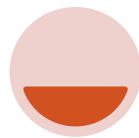
Task 1: Evaluate Current Status of EV Charging in Washington

Establish a stakeholder network

Construct Public Charging Network Database

Create interactive maps for charging suitability assessment

Provide insights into role of public charging networks in encouraging EVs

Summarize findings

May – August
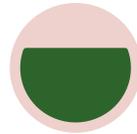
Task 2: Develop Business Models

Leverage C2ES's AFV Finance Initiative

Conduct Business Model Workshop

Create 2-3 Business Model Summaries

July – November
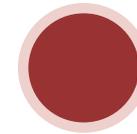
Task 3: Identify Public & Private Roles

Execute financial analysis on business model viability

Identify public sector role in addressing barriers to private investment

October – December

● Advisory Group Meeting

● JTC Presentation

May 2014 – March 2015

Janet Peace — Vice President

Jeff Hopkins — Vice President

Nick Nigro — Senior Manager

Matt Frades — Finance Fellow

Jason Ye — Fellow

Philip Quebe — Cadmus Group
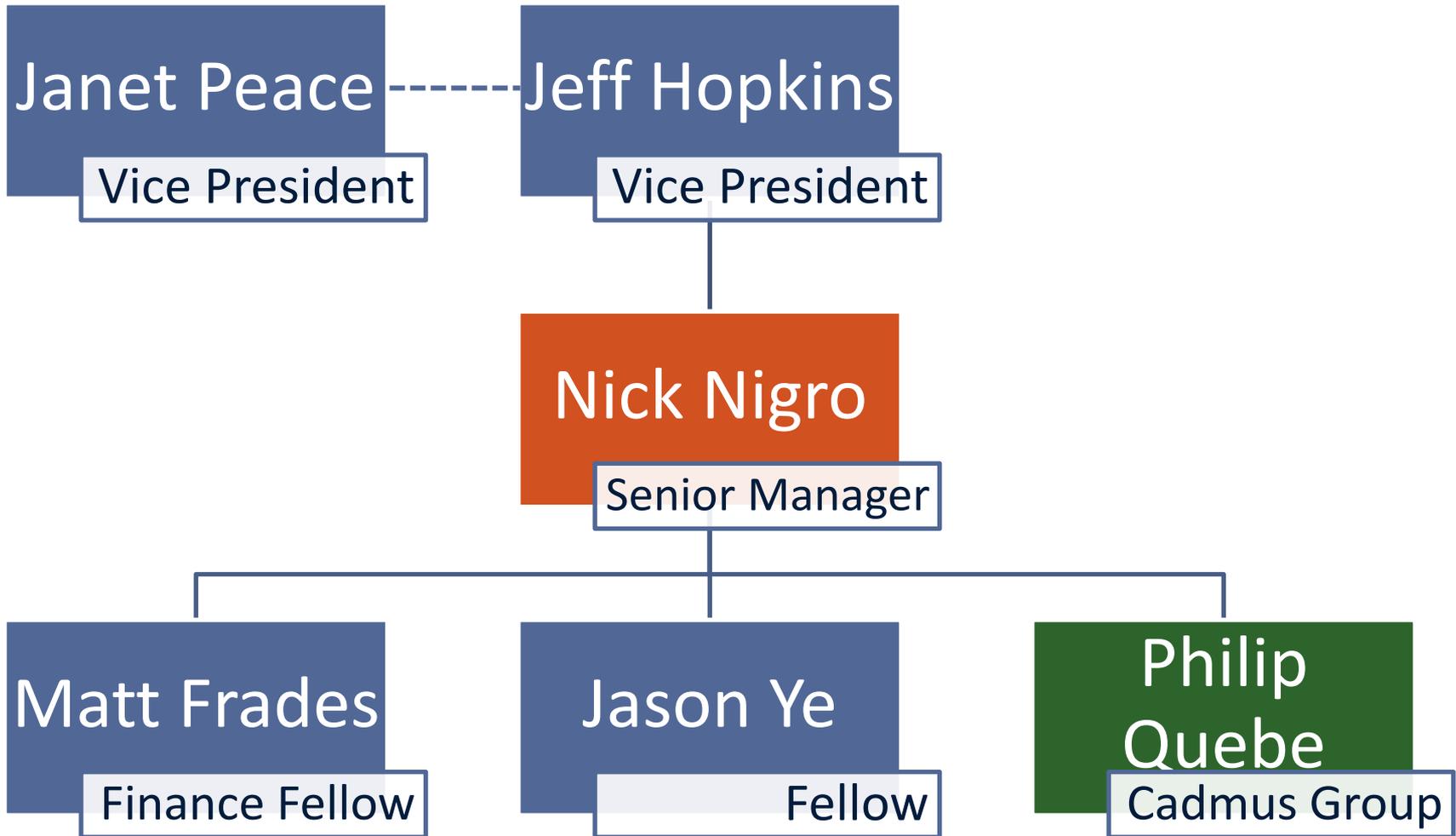
Washington State Advisory Panel

Name	Organization
Wayne Amondson	Cowlitz County Public Utility District
Rep. Judy Clibborn	Joint Transportation Committee Co-Chair
Scott DeWees	Western Washington Clean Cities
Jeff Doyle	Washington State Department of Transportation
Ben Farrow	Puget Sound Energy
Rep. Jake Fey	House Transportation Committee Member
Stephen Johnsen	Seattle Electric Vehicle Association (SEVA)
Ron Johnston-Rodriguez	North Central Washington Plug-In Center
Charles Knutson	Governor's Policy Office
Rep. Drew MacEwen	House Republican Caucus Member
Rep. Chad Magendanz	House Republican Caucus Member
Sen. Mark Mullet	Senate Transportation Committee Member
Dan O'Shea	ChargePoint
Rep. Ed Orcutt	Joint Transportation Committee Member
David Peterson	Nissan North America, EV Regional Manager, Marketing & Sales Strategy
Sandra Pinto de Bader	City of Seattle Office of Sustainability
Colleen Quinn	ChargePoint
Glen Stancil	NRG Energy EV Services eVgo

Washington State Staff Workgroup

Name	Organization
Nick Bowman	Senate Democratic Caucus
Tonia Buell	Washington State Department of Transportation
Alyson Cummings	Office of Financial Management
Jeff Doyle	Washington State Department of Transportation
Debbie Driver	House Democratic Caucus
Mary Fleckenstein	Joint Transportation Committee, Project Manager
Kim Johnson	Senate Transportation Committee
Jerry Long	House Transportation Committee
Jackson Maynard	Senate Majority Coalition Caucus
Peter Moulton	Washington State Energy Office
Dana Quam	House Republican Caucus
Beth Redfield	Joint Transportation Committee
Andrew Russell	House Transportation Committee

Vehicle and Charging Technology

Policy drivers for EVs; overview of vehicle and charging technology

Many Policymakers Want to Encourage EVs

- **Federal programs and incentives drive investments**

  - EPA/NHTSA vehicle standards

  - Federal vehicle tax credit for EVs: $7,500

- **10 U.S. states participate in Zero Emission Vehicle (ZEV) Program**

  - ZEV Program key driver for automaker investments

  - Requires 15% of new vehicles made for sale be ZEVs in 2025

Number of new state policies and incentives on EVs
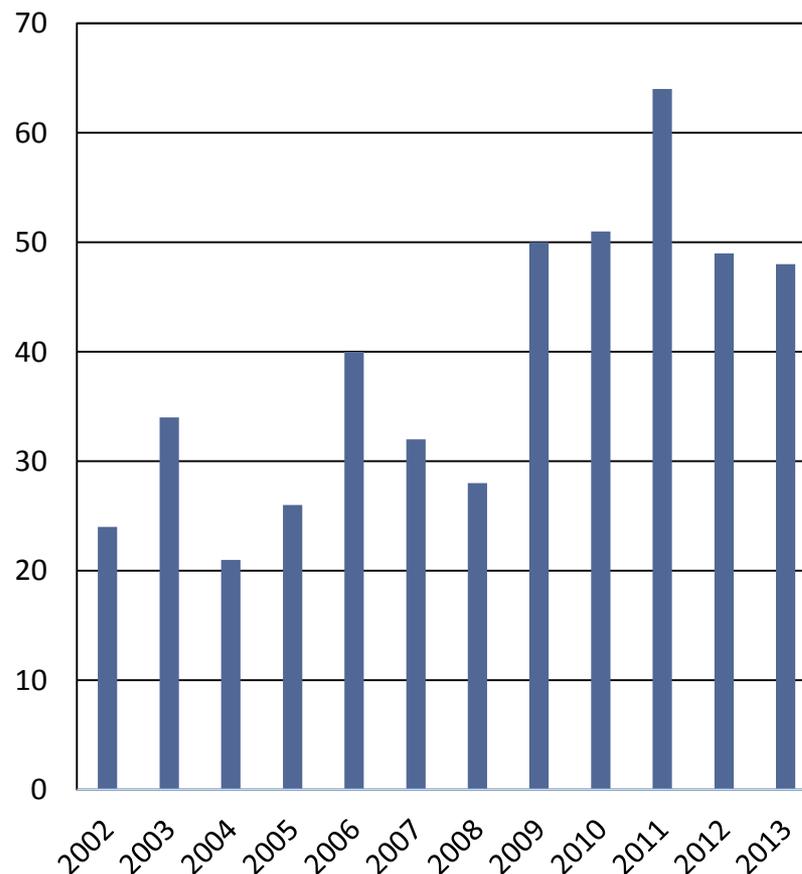
Plug-in Electric Vehicle (PEV)

A vehicle that can be powered by a rechargeable battery pack and connects to the electrical grid

Battery Electric Vehicle (BEV)

- Electric drive vehicle that can only be powered by a battery pack
- Example: Nissan LEAF, Tesla Model S

Extended Range Electric Vehicle (EREV)

- BEV with a backup internal combustion engine powered by gasoline, biofuel, etc. (a.k.a. range extender)
- Example: Chevy Volt

Plug-in Hybrid Vehicle (PHEV)

- Electric and conventional drivetrain in one
- Similar to a Prius with a larger battery pack that can be recharged
- Example: Toyota Prius Plug-in

Vehicle Range

- **Electric-only range varies widely**

  - E.g., Nissan LEAF range can vary from 60 miles to over 100 miles

- **Range is a function of driving conditions, driver behavior, vehicle system efficiency, battery size**

- **Factors that affect driving range:**

  - Mostly, the same things that affect conventional vehicle fuel economy

  - Climate control, hills, aggressive driving, regenerative braking, etc.

Toyota Prius Plug-in
Electric Range: 11 miles
Total Range: 540 miles

Chevy Volt
Electric Range: 38 miles
Total Range: 380 miles

Nissan LEAF
Electric Range: 84 miles
Total Range: 84 miles

Tesla Model S
Electric Range: 265 miles
Total Range: 265 miles

Understanding Charging Needs

| Low – AC 120V	Medium – AC 240V	High – DC Fast Charge
LEVEL 1	*"AC" LEVEL 2*	*"DC" LEVEL 2*
• Uses standard outlet • Power requirements are like a toaster • Adapter comes with the car • Accommodates average daily driving needs • Very low cost installation, often free • *Fully charge a Nissan LEAF: 17 hours*	• Requires high-voltage circuit • Power requirements are like a clothes dryer • Charging stations can cost about $500 • Installation costs vary widely (~$1,500) • *Fully charge a Nissan LEAF in 3.5-7 hours*	• Requires very high voltage circuit & 3-phase power • Power requirements are up to max power for 15 homes • No common standard for electric vehicles (CHAdeMO, SAE, Tesla) • Very high installation cost (~$100k) • Equipment costs vary widely • *80% charge a Nissan LEAF in 20 minutes*

- **Charging needs largely depend on daily VMT**
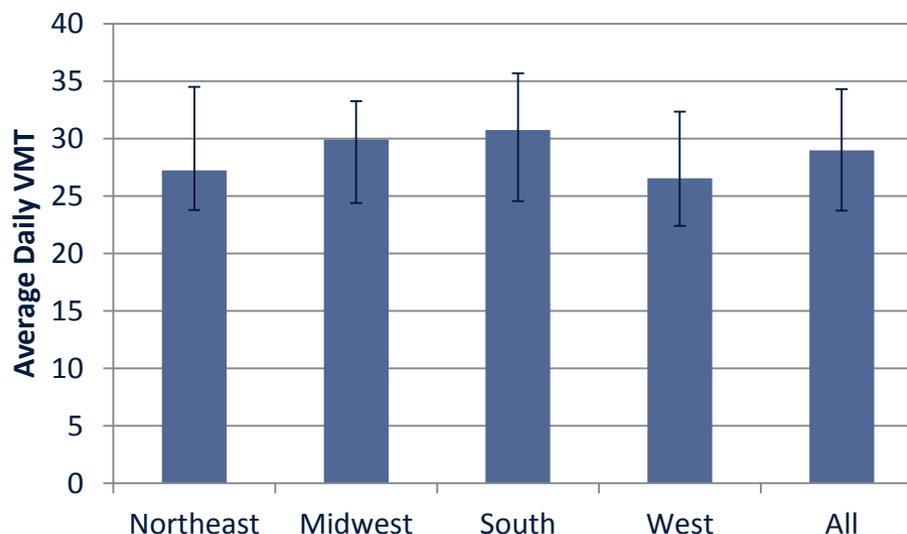
Source: National Household Travel Survey

- **E.g., Max miles per day with AC Level 1**

  - 40 miles/day ÷ 3 miles/kWh ÷ 10 hours/day = 1.33 kWh

Project Approach

Importance of Business Model Assessment; details of Task 1

Importance of Business Model Assessment

- **Deployment of clean transportation technology requires significant capital investments**

  - Governments actively seeking ways to multiply the impact of public dollars and unlock greater private investment

- **EV infrastructure gap (public, workplaces, and multi-unit dwellings) must be bridged for robust EV market**

- **Barriers to bridging infrastructure gap**

  - Residential electricity competition

  - A small market

  - Cost of charging stations

  - High cost of capital

- **Business models can capture value of EV charging networks**

  - Public-private finance programs, including public-private partnerships

  - New business arrangements

Advancing EV Deployment with Private Finance

- **Small public investments can leverage private finance and overcome market deficiencies**

- **Existing financial mechanisms have helped accelerate deployment of cleantech in other sectors**

  - Energy service providers have accelerated deployment of energy efficiency technologies in buildings

  - Public-private finance programs have leveraged public dollars to attract private investment

- ***Washington can be first to use innovative finance to advance EV charging networks***

Role of Public-Private Finance Programs Example

Market Barriers

Low near-term demand for EV charging infrastructure

- **Market Effects**: Limited private investment in charging projects, depresses demand for EVs, etc.
- **Solutions**: Longer loan terms, delayed loan repayment

(short to medium term)

Financial Barriers

Loans cannot be easily resold

- **Market Effects**: Projects appear too risky, thus increasing cost of capital
- **Solutions**: Standardized loan structures, public buying and holding of loans

(medium to long term)

Electric Vehicle Market Summary: Task 1 Approach

Evaluate Current Status of Electric Vehicle Charging in Washington

Task 1 Approach Summary

- Gather the latest and most comprehensive data on EV ownership and publically-accessible EV charging infrastructure in Washington.

- Use data to describe the current status of EV charging infrastructure, by combining the data on EVs and charging infrastructure at a geographically relevant level, for example at the 5-digit ZIP code level.

- Using comparable data on households, commuting patterns, and traffic intensity, evaluate the existing charging infrastructure against basic criteria of connectivity and service to major population and commuting corridors.

- Examine potential for existing infrastructure to meet growth in EV deployment.

- **EV sales are rising slowly**

  - Over 200,000 EVs sold in United States since late 2010

  - Lion's share of sales in California

  - Only 1% of new passenger vehicle sales

  - Seventeen models sold in May 2014

- **Charging stations**

  - 8,000+ public charging stations

  - 20,000+ public charging ports

Legend: Total Sales | Hybrid Historical Sales | Forecast

X-axis: Year (1–6)
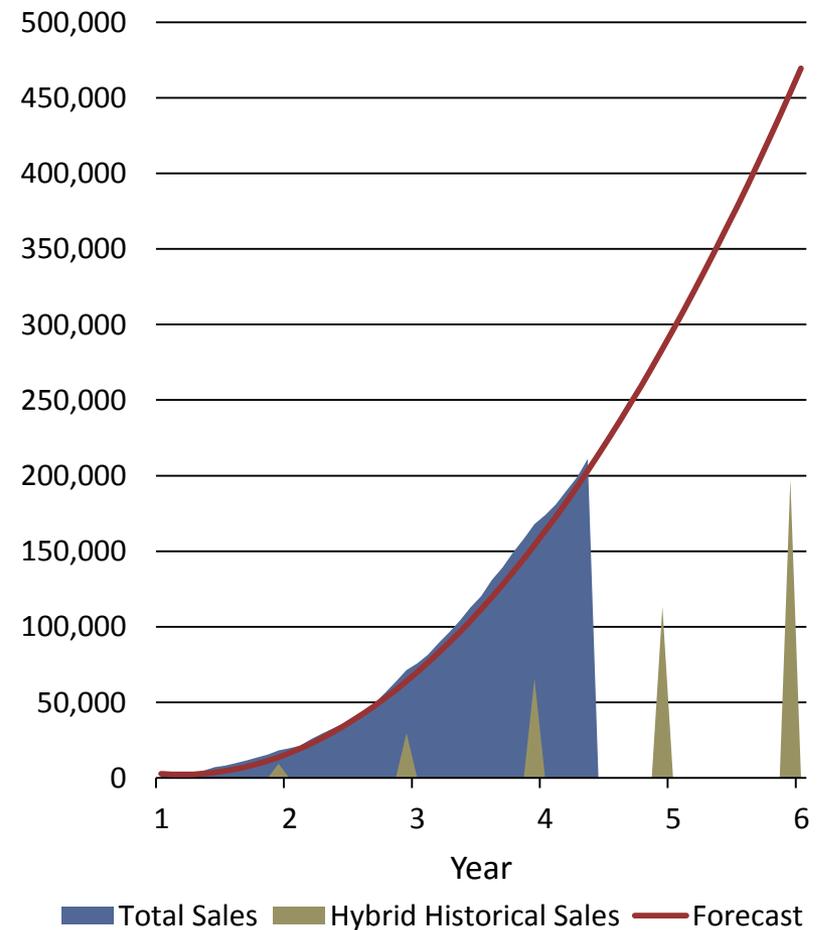
Washington State EV Market Summary

- **EV sales are rising slowly**

  - Nearly 7,500 EVs registered in Washington

  - More than half are registered in King County

  - Twelve models registered as of December 2013

- **Charging stations**

  - 400+ public charging stations

 - 950+ public charging ports (level 2 and DC fast charge)
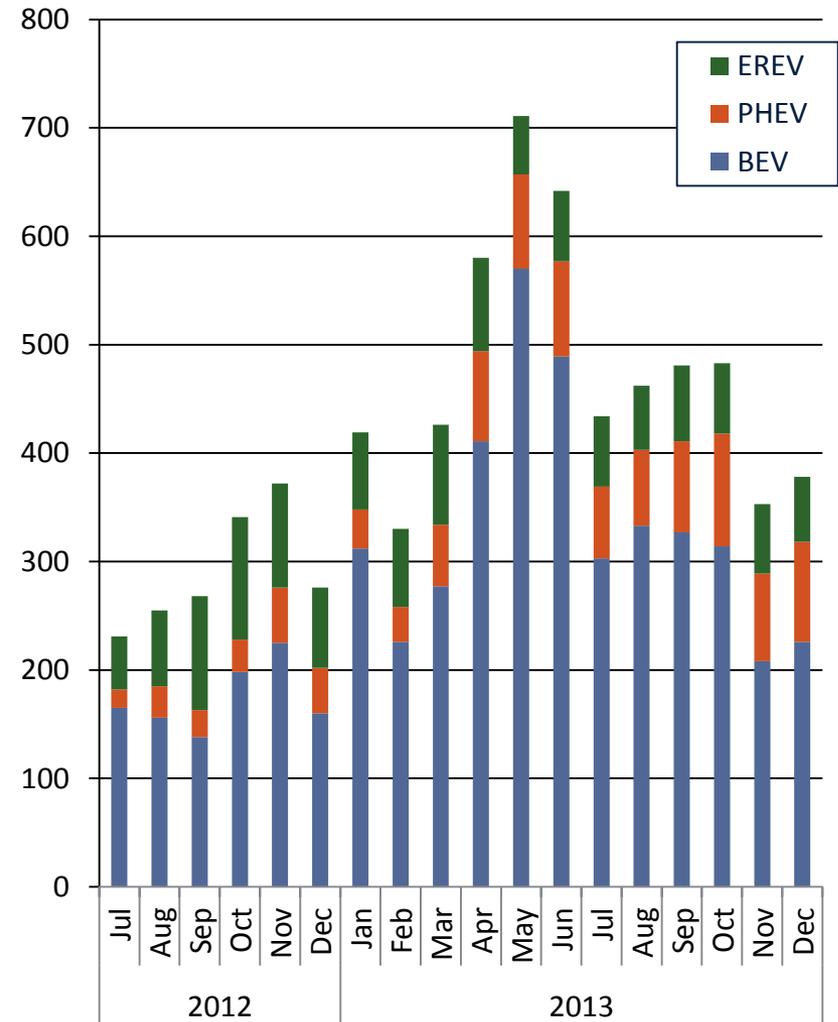
Interactive Maps Preview

Demonstrate how the Public Charging Network Database can be visualized

Washington State EV Charging Network
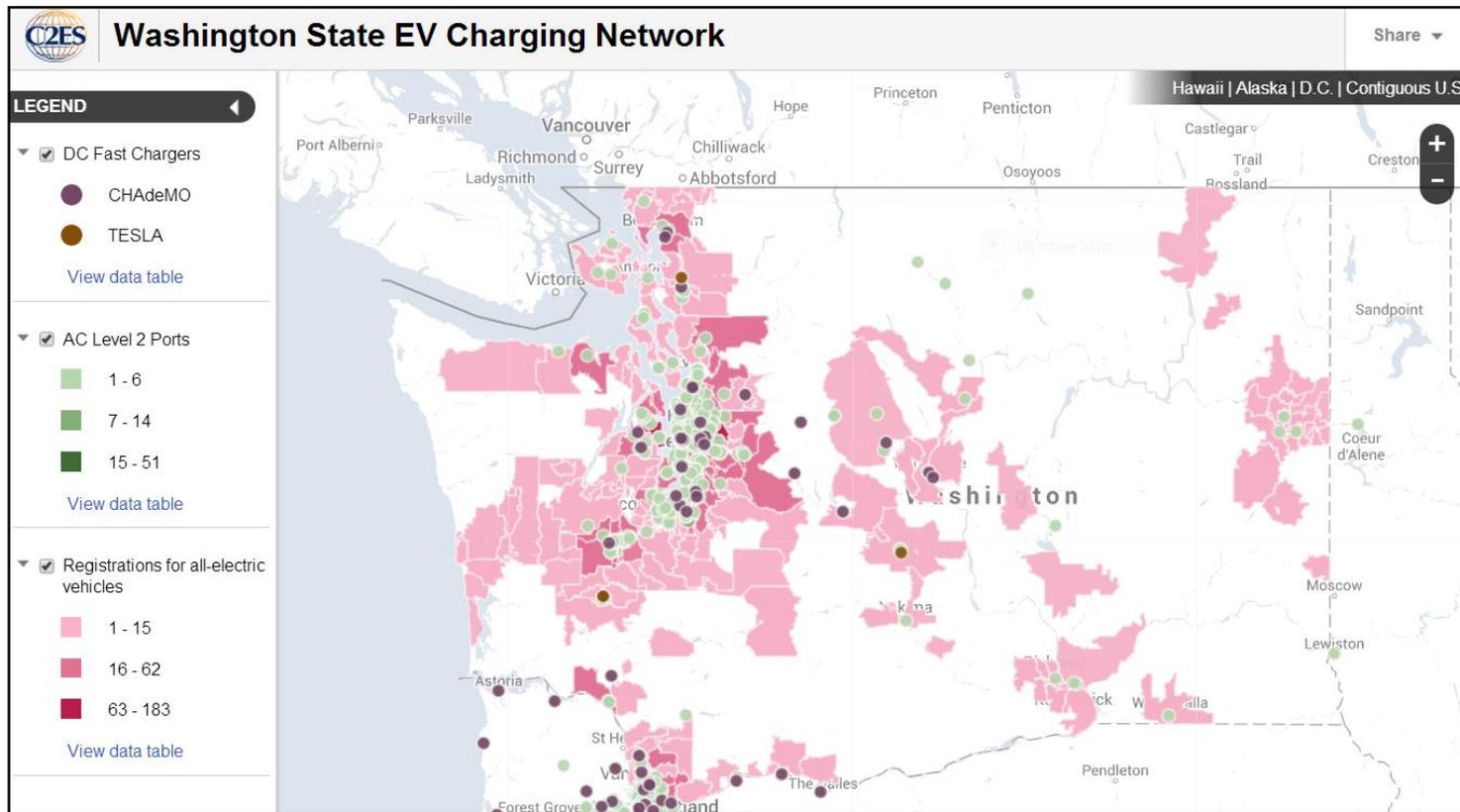
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FOR MORE INFORMATION

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