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POLICY INSTITUTE FOR ENERGY, ENVIRONMENT, AND THE ECONOMY

Leveraging university expertise to inform better policy

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Metrics & Methodologies to Evaluate Transportation Electrification Programs

CPUC Workshop

May 9th, 2019

Notes

- These principles and examples are based on my personal time at the Department of Energy and the National Renewable Energy Lab, as well as published materials
- Great guides at: https://www.energy.gov/eere/analysis/program-evaluation
- These are my personal takes and NOT the official views of DOE or anyone else

Why Evaluation?

- Show what was accomplished
- Foster research opportunities
- Improve future programs
- Inform big picture policy

Key Principles

- Program staff: look under the rock
- Managers: fight the 'gotcha' culture
- Start with the logic model
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- Understand your counterfactual
- Use deployment as an experiment where possible
- Start with a broad definition of impacts
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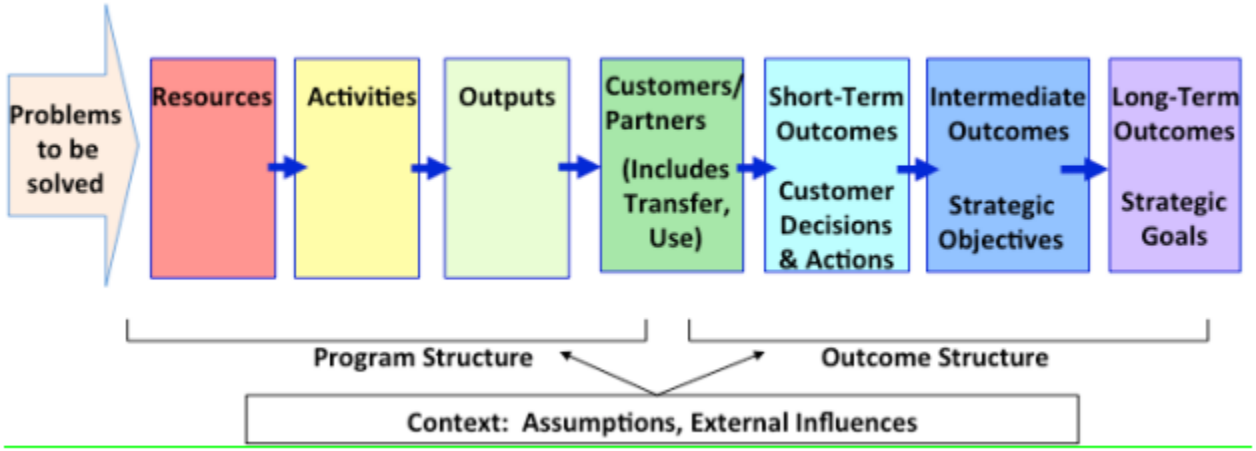
- Make sure data can be aggregated

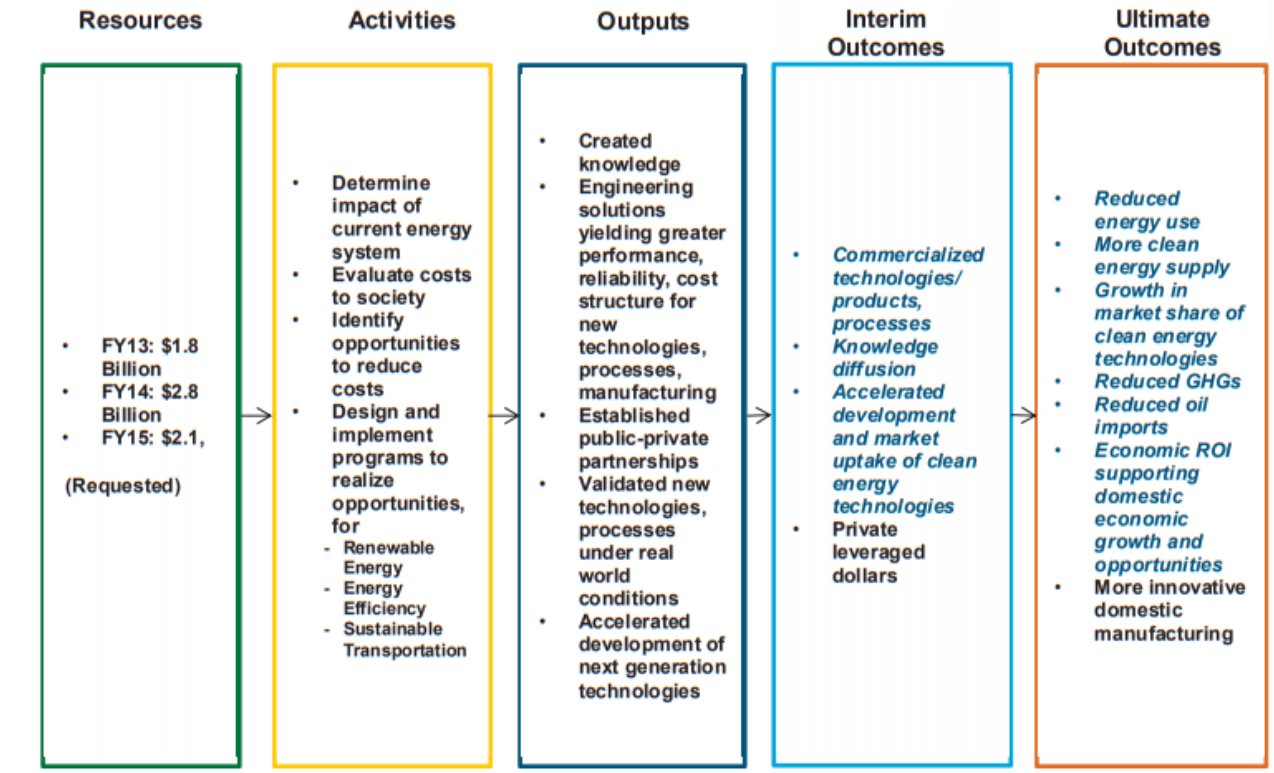
Logic Model

Figure 2-1. The Basic Elements of a Logic Model



Source: Gretchen Jordan, EERE Program Evaluation Training, 2014

Logic Model



Note: The outcomes in blue lettering in italics can be calculated using the standard method outlined in this Guide.

Figure I.1 High Level Diagram of EERE Logic

https://www.energy.gov/sites/prod/files/2015/05/f22/evaluating_realized_rd_mpacts_9-22-14.pdf

Impact Evaluation for Deployment Programs

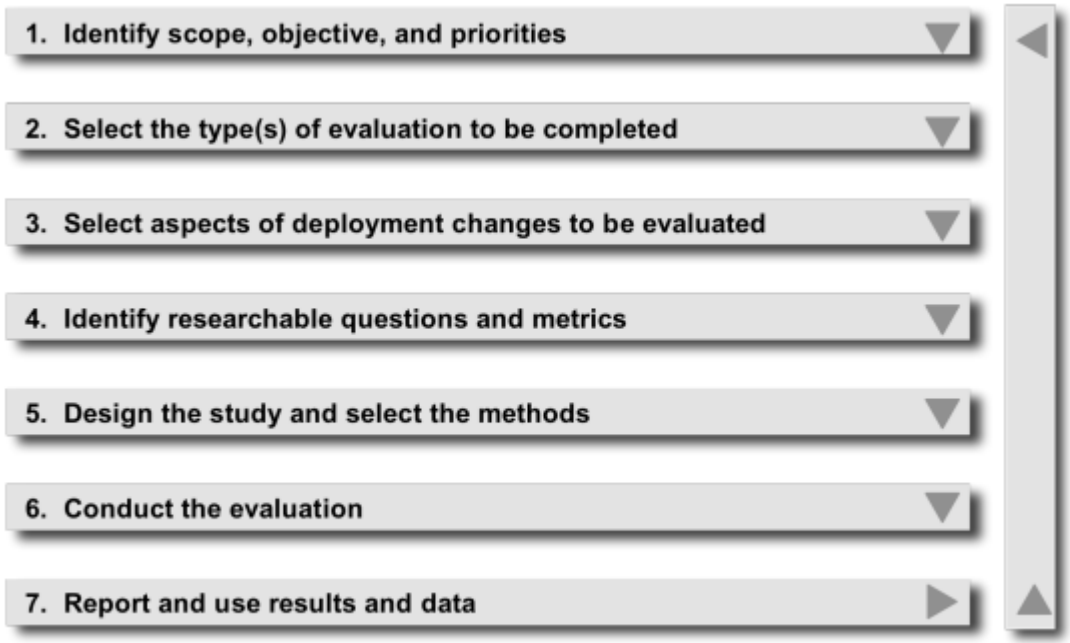
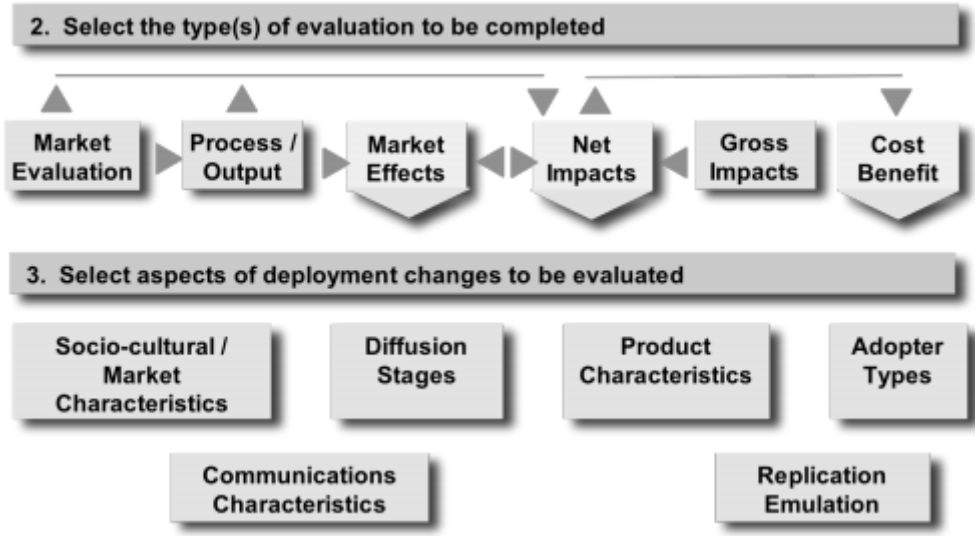


Figure 1. Overview of the Impact Evaluation Framework

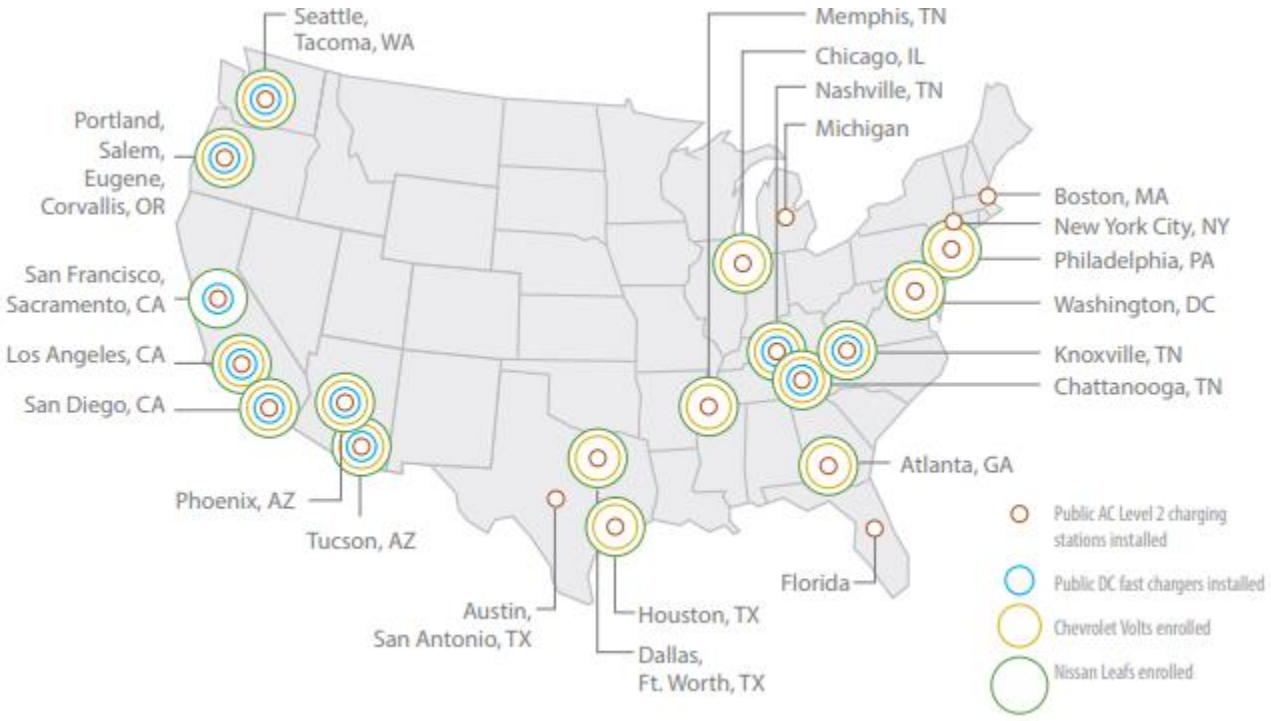
https://www.energy.gov/sites/prod/files/2015/05/f22/impact_framework_tech_deploy_2007_main.pdf

Impact Evaluation for Deployment Programs – Detail for Steps 2 & 3



https://www.energy.gov/sites/prod/files/2015/05/f22/impact_framework_tech_deploy_2007_main.pdf

Recovery Act Example



https://avt.inl.gov/sites/default/files/pdf/arra/PluggedInSummaryReport.pdf

Recovery Act Example

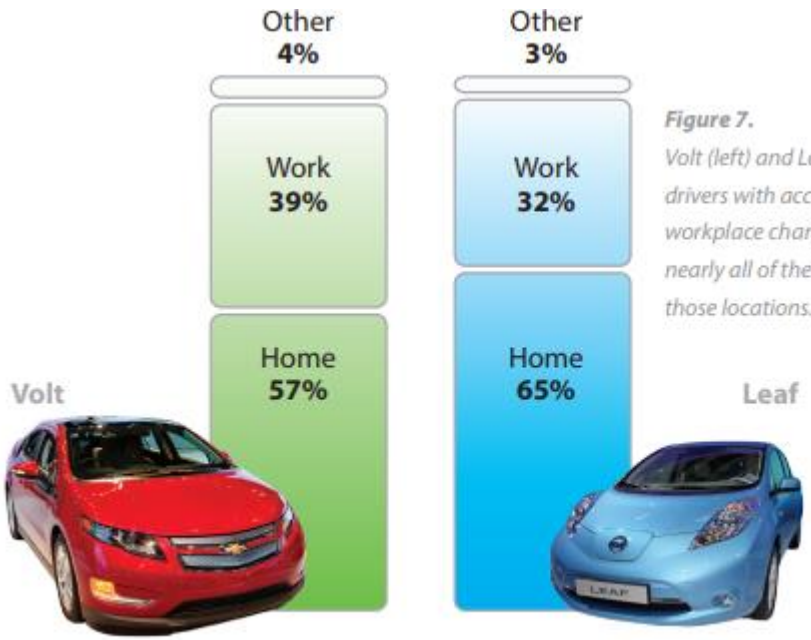


Figure 7.
Volt (left) and Leaf (right) drivers with access to home and workplace charging performed nearly all of their charging at those locations.

RESIDENTIAL LEVEL 2 AVERAGE INSTALLATION
$1,354

WORKPLACE LEVEL 2 AVERAGE INSTALLATION
$2,223

PUBLIC LEVEL 2 AVERAGE INSTALLATION
$3,108

BLINK DC FAST CHARGER AVERAGE INSTALLATION
$22,626

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https://avt.inl.gov/sites/default/files/pdf/arra/PluggedInSummaryReport.pdf

Smart Grid Investment Grant Example

- "Under the U.S. Department of Energy's (DOE) Smart Grid Investment Grant (SGIG) program, six utilities evaluated operations and customer charging behaviors for in-home and public electric vehicle charging stations:
  - Burbank Water and Power (BWP)
  - Duke Energy (Duke)
  - Indianapolis Power & Light Company (IPL)
  - Madison Gas and Electric (MGE)
  - Progress Energy (now part of Duke Energy as a result of a merger in 2012)
  - Sacramento Municipal Utility District (SMUD)"
- My note: findings mostly qualitative, not combinable between projects

https://www.energy.gov/sites/prod/files/2014/12/f19/SGIG-EvaluatingEVcharging-Dec2014.pdf

SGIG Example Data

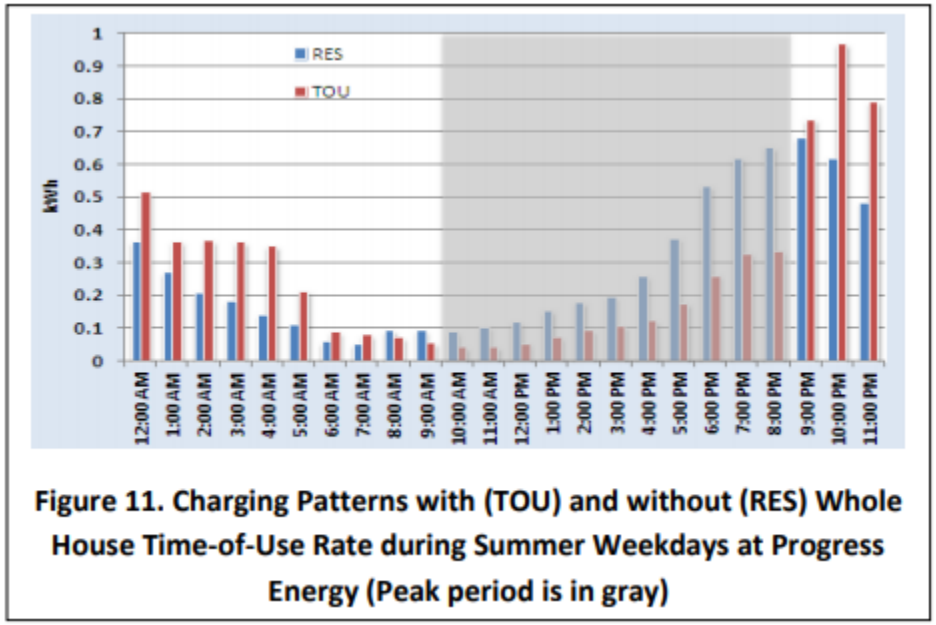


Figure 11. Charging Patterns with (TOU) and without (RES) Whole House Time-of-Use Rate during Summer Weekdays at Progress Energy (Peak period is in gray)

https://www.energy.gov/sites/prod/files/2014/12/f19/SGIG-EvaluatingEVcharging-Dec2014.pdf

SGIG Example Data

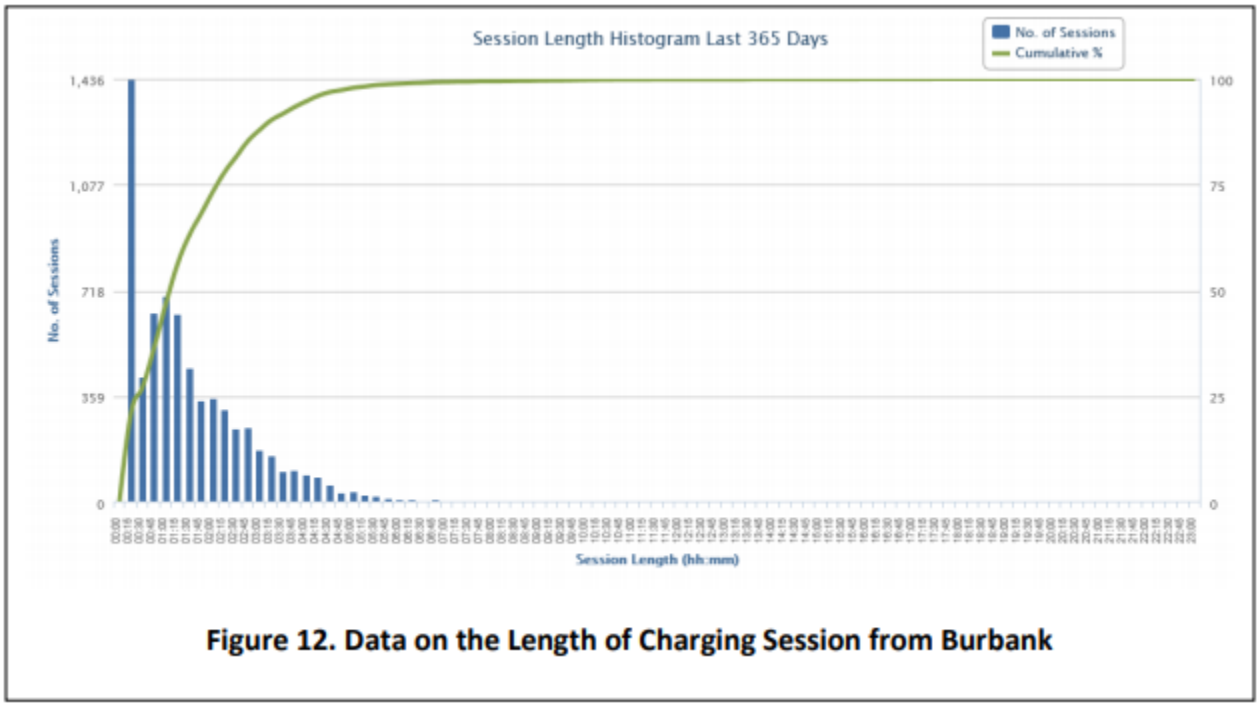


Figure 12. Data on the Length of Charging Session from Burbank

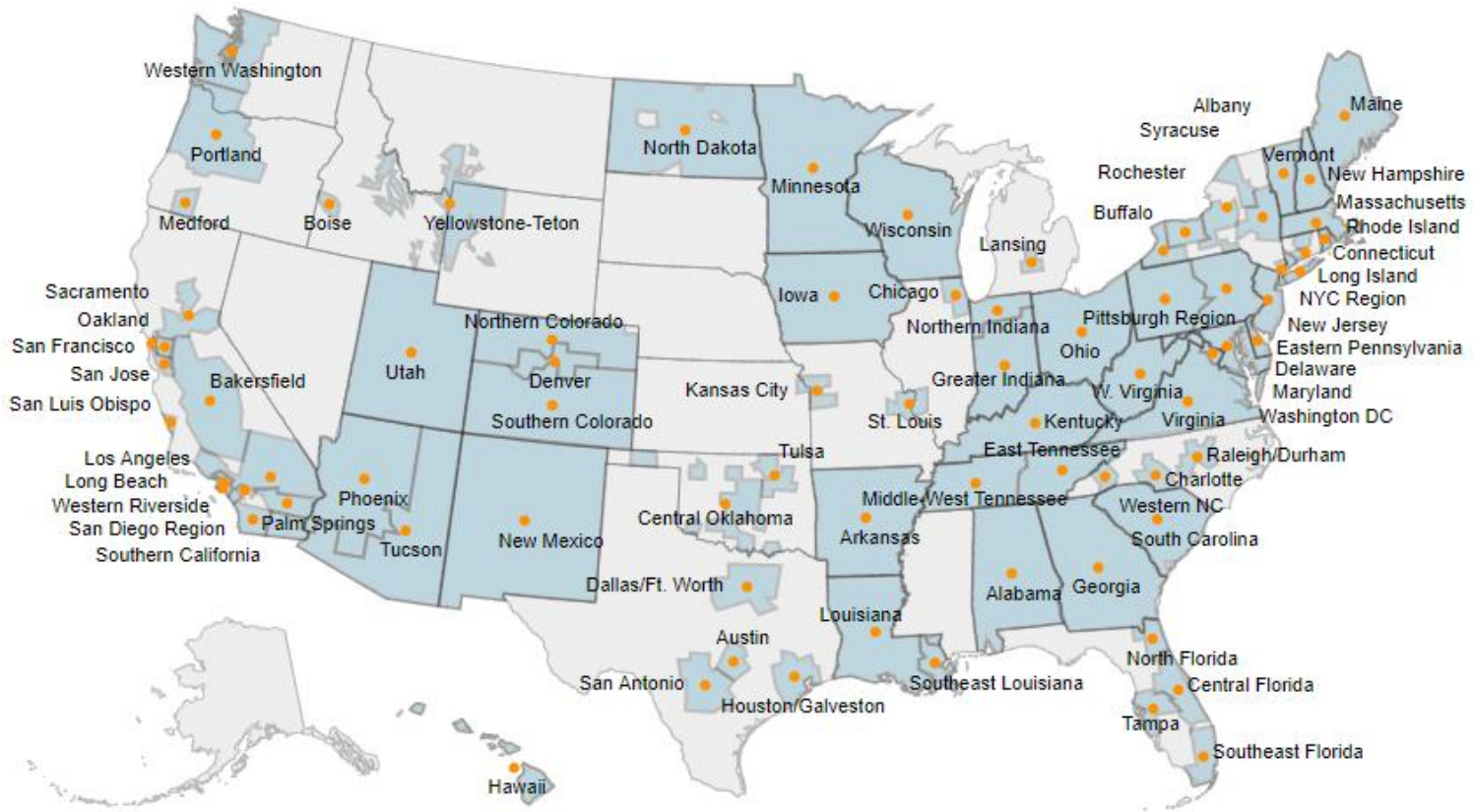
https://www.energy.gov/sites/prod/files/2/12/f19/SGIG-EvaluatingEVcharging-Dec2014.pdf

Lessons Learned

Table 5. Summary of Lessons Learned	
Category	**Lesson Learned**
Planning and Management	• Initially install a small number of chargers as demonstrations, and evaluate their use to justify larger deployments. • Plan for sufficient resources to support customer issues throughout the project. A high level of customer support to address technical issues was typically required. • Conduct smaller, in-house process and field tests prior to full field implementation, perhaps using employees. • Develop detailed process maps to streamline operating procedures; guide vendors, installers, and service technicians; and provide higher quality customer services and issues resolution.
Market Development	• Consider the needs of the different target markets, such as single families, multi-family housing units, fleets, employers, dealerships, and public access. Evaluate use cases for each that examines the charging patterns of the users in those segments.
Implementation	• Site and installation scheduling requires hands-on attention which vendors can provide to help ensure customer satisfaction. • Locate chargers where it is convenient for the consumers, not necessarily for utilities. This will optimize utilization and shorten capital cost recovery.

https://www.energy.gov/sites/prod/files/2/12/f19/SGIG-EvaluatingEVcharging-Dec2014.pdf

Clean Cities



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Clean Cities Example

Table 2. Emissions Reduced by Clean Cities Coalitions in 2016

Project Type	Tons of GHG Emissions Averted	Equivalent of Conventional Cars Removed [a]	Percent of Coalition Total
Alternative Fuels and Vehicles	2,012,531	457,894	45%
HEVs	734,310	167,072	16%
Fuel Economy Improvements	530,818	120,773	12%
Idle Reduction	476,464	108,406	11%
VMT Reduction	351,077	79,878	8%
EVs and PHEVs	188,812	42,959	4%
Off-Road Vehicles	111,111	25,280	2%
Outreach Events Estimate	89,064	20,264	2%
Coalition Total	4,494,185	1,022,526	100%

[a] Calculated as total passenger car GHG emissions (Table 2–13 in the U.S. Environmental Protection Agency's (EPA's) *Inventory of GHG Emissions and Sinks: 1990-2015*) divided by total short wheelbase light-duty vehicles (Table VM-1 in the Federal Highway Administration's *Highway Statistics*, 2015).

https://afdc.energy.gov/files/u/publication/2016-coalition-activity-report.pdf

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More (Federal) Resources

- Federal Workplace Charging: https://afdc.energy.gov/files/u/publication/federal_wpc_case_study.pdf
- Recovery Act Plug-in Vehicle Infrastructure Analysis: https://inldigitallibrary.inl.gov/sites/sti/sti/6799570.pdf
- Evaluating EV Charging: https://www.energy.gov/sites/prod/files/2014/12/f19/SGIG-EvaluatingEVcharging-Dec2014.pdf
- Evaluation Guide For Project Managers: https://www.energy.gov/sites/prod/files/2015/09/f26/project_manager_guide_managing_impact_process_evaluation_studies.pdf