



Driving Change:

Defining Success for Electric Vehicle Deployment in Oregon

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Abstract

The December 2010 release of the first mass-produced electric vehicles by major automotive manufacturers (the Nissan LEAF and the Chevrolet Volt) marks the beginning of a new era in transportation. Electric vehicles, or EVs, bring multitudes of benefits to drivers, cities and our national transportation infrastructure as a whole. However, there are significant barriers to adoption – particularly in the areas of electric grid interface, charging infrastructure and education. Hence, the success of electric vehicles depends heavily on the extent to which governments and stakeholder groups can work together to overcome these barriers.

This master’s project examines the EV deployment planning processes for four cities that are widely recognized as being leaders in the EV space – Houston, Indianapolis, Orlando and Raleigh – and compares them to the process in the client city of Portland, OR. Relying on a review of benchmarking and performance measurement processes in the available business literature, cities were evaluated on stakeholder engagement, areas of focus and process integration. Data was collected via stakeholder group websites and phone interviews with key contacts in each city, and was bolstered by planning documents and other available reports from the nationwide community of EV planners and leaders.

The results show that cities have been successful in engaging the right stakeholders, and some cities have also been ambitious in selecting areas of focus for these stakeholder groups, while other cities have a more limited scope of operation. Most cities, however, could strengthen their efforts in the area of process integration – determining a mission for the stakeholder group, setting goals, establishing metrics by which those goals will be evaluated, and assigning ongoing responsibility. Recommendations are made for Portland to adopt best-in-class practices from other cities in order to enhance the city’s planning process.

As electric vehicles begin to hit the road in larger numbers over the next couple of years, these efforts will be ever more important to transforming the face of personal transportation. By taking cues from other EV-forward cities and addressing current areas of weaknesses, Portland can continue its EV leadership and provide a national model of safe, clean, sustainable urban development.

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Introduction and Objective

The December 2010 release of the first mass-produced electric vehicles by major automotive manufacturers (the Nissan LEAF and the Chevrolet Volt) marks the beginning of a new era in transportation. While electric vehicles were popular in the early part of the 20th century,¹ they quickly fell out of favor as consumers increasingly relied upon the convenience and economy of an on-board fuel tank. An aborted foray into the “EV” market was made by General Motors in the early 2000s, but the failure of that venture only seemed to seal the fate of EVs once and for all. For nearly a century, EVs have been relegated to a niche product status within the automotive market.



FIGURE 1: WORLD'S FIRST ELECTRIC CAR, 1884

Despite this unflattering history, electric vehicles bring multitudes of benefits to drivers, cities and our national transportation infrastructure as a whole. EVs are considerably more efficient than traditional vehicles, due entirely to the extreme efficiency of the electric motor (~90% efficient) versus the internal combustion engine (~30% efficient). EVs produce no tailpipe emissions of greenhouse gases and other air pollutants. Obviously, the upstream emissions from electricity generation must be considered, but even EVs that operate on electricity generated by the dirtiest coal plants are less polluting, on a lifetime basis, than internal combustion engine vehicles.² Mile for mile, electricity is much less expensive than gasoline, meaning that a strong economic argument can be made for the use of “dry fuel” in vehicles. Lastly, from an infrastructure perspective, meshing the two existing energy networks in the United States (the electric grid and the transportation sector) means that gains in efficiency and emissions reductions impact both systems, without need for policy differentiation between point sources versus non-point sources.

The success of the electric motor in a market that has been dominated for a century by internal combustion technology depends on a number of factors, including public awareness, customer

¹ “World’s first electric car built by Victorian inventor in 1884,” [The Daily Telegraph](http://www.telegraph.co.uk/news/newstopping/howaboutthat/5212278/Worlds-first-electric-car-built-by-Victorian-inventor-in-1884.html), April 24, 2009, retrieved 04/24/11 at <http://www.telegraph.co.uk/news/newstopping/howaboutthat/5212278/Worlds-first-electric-car-built-by-Victorian-inventor-in-1884.html>

² Electric Power Research Institute and Natural Resources Defense Council, [Environmental Assessment of Plug-In Hybrid Electric Vehicles](http://mydocs.epri.com/docs/CorporateDocuments/SectorPages/Portfolio/PDM/PHEV-ExecSum-vol1.pdf), 2007, retrieved 02/13/11 at <http://mydocs.epri.com/docs/CorporateDocuments/SectorPages/Portfolio/PDM/PHEV-ExecSum-vol1.pdf>

acceptance, availability and ease of charging infrastructure, product positioning and price point. While automotive manufacturers necessarily carry much of the burden of proving the value of their product, state and municipal governments also play a role, as do electric utilities. To date, much of this activity has been disjointed, with various players not communicating regularly about goals and successes.

The state of Oregon, and the city of Portland in particular, have been very forward-thinking about electric vehicles. Assets such as an environmentally-conscious population, mild weather, strong government-NGO-utility partnerships, and good leadership have led Portland to be a natural forerunner in terms of gaining attention from the federal government (in the form of grants for infrastructure development) as well as from automobile manufacturers (in the form of model launches). Additionally, an economic “cluster” of electric vehicle manufacturers and suppliers has cropped up in Oregon, providing an opportunity to create jobs and grow the economy. However, Oregon has been largely coasting on natural strengths thus far, and other cities that do not have these natural assets – such as Houston and New York City – are implementing policies that are allowing them to gain ground in this area. If Oregon can pair strong planning efforts with its own intrinsic assets, the state can become the leading authority on electric vehicles, resulting in an enhanced reputation, broader access to federal funding, and economic development.

The objective of this project was to identify and benchmark other cities with advanced EV planning processes, and make recommendations to the client, which is the Oregon Transportation Electrification Executive Council. The project began with a review of business literature in the areas of benchmarking and performance measurement, and applied this literature to the process of selecting benchmarking cities and evaluating their performance measurement and planning practices.

As a point of clarification, it is important to note that the word “city,” as widely used in this project, refers to a metropolitan area, its residents and its institutions – not the formal city government. Where city governments are referenced, they are properly named (ex: City of Houston).

Background

Glossary

First, a glossary of important terms, technologies and acronyms is in order.

Internal Combustion Engine (ICE) – the traditional propulsion device of vehicles, the internal combustion engine has a combustion chamber where liquid fuel (gasoline) combusts in the presence of an oxidizer (usually air). The high-pressure gases expand, applying direct force to other engine components, generating mechanical energy. The vast majority of on-road vehicles contain internal combustion engines.

Hybrid Electric Vehicle (HEV) – a hybrid electric vehicle combines a conventional internal combustion engine propulsion system with an electric propulsion system. The presence of the electric powertrain, which is powered by energy-efficient technologies such as regenerative braking, is usually intended to achieve better fuel economy than an ICE. Examples include the Toyota Prius.

Plug-In Hybrid Electric Vehicle (PHEV) – a plug-in hybrid electric vehicle is a hybrid vehicle which utilizes rechargeable batteries, or another energy storage device, that can be restored to full charge by connecting a plug to an external electric power source, such as a wall socket. A PHEV runs on electric power at first, and then switches to hybrid mode when the battery is depleted. Examples include the Toyota Plug-In Prius, which has a 14-mile electric range and will be on the market in 2012.

Extended-Range Electric Vehicle (EREV) – extended-range electric vehicles contain an electric motor, which is charged from a plug, as well as a generator that burns gasoline to generate electricity once the battery is depleted. As with PHEVs, EREVs run on battery electric miles first, and then switch to the generator. Examples include the Chevy Volt, which has a 40-mile electric range.

Battery Electric Vehicle (BEV) – this refers to a pure electric vehicle, with no internal combustion engine, hybrid engine or generator. These vehicles charge from the electrical socket and are unable to continue when their batteries are depleted. Examples include the Nissan LEAF, which has a 100-mile electric range.

Neighborhood Electric Vehicle (NEV) – neighborhood electric vehicles are smaller, 2-, 3- or 4-wheel vehicles that are not suitable for highway driving. They are, however, useful for shorter in-town trips, and many of the manufacturers in local electric vehicle clusters are making NEVs.

Electric Vehicle Supply Equipment (EVSE) – this refers to charging stations, whether in-home or publicly installed. There are three levels of EV charging: Level I, Level II and Level III. Level I charging occurs on a standard 120-volt wall socket, and can take a considerable amount of time (8-12 hours to fully charge a Nissan LEAF). Level II charging occurs on a 240-volt wall socket, such as ones used for clothes dryers. Level II charging is likely possible in most residences, given the proper permitting and installation. Level II charging takes a relatively short amount of time (4-6 hours to fully charge a Nissan LEAF – easily completed overnight), and these charging stations cost about \$2500 to install at home or in public. Level III charging, or DC fast charging, uses a direct current, and is not appropriate for in-home use. However, the charging time is quite short – 20-30 minutes to fully charge a Nissan LEAF – and many municipalities are installing these charging stations along highways. Level III fast-charging stations cost about \$50,000 to install.

Oregon’s History of EV Activity

Oregon’s progress on electric vehicles had, until the creation of the Oregon Transportation Electrification Executive Council (the TEEC), been an organic and somewhat disorganized process. However, despite the disparate nature of the state’s development in this area, the natural assets of the state – an environmentally-minded citizenry, a history of alternative transportation options, and enthusiastic participation from players such as Portland General Electric and Portland State University – have continually kept the state in forward motion and at the forefront of EV leadership. A few examples of this forward motion are outlined below.



Meeting of the Minds

In July of 2008, the Oregon Transportation Commission and the Oregon Business Council

hosted the Meeting of the Minds, an invitation-only conference of nearly 300 thought leaders, which was designed “to bring together leaders from multiple sectors and geographies to share ideas, learn from each other, and shape the agenda for creating more sustainable cities, with a particular focus on transportation and mobility.”³ The conference did not focus on electric vehicles in particular, but rather on sustainable transportation in general. However, it laid the ground work for many of the conversations and connections that would help define the electric vehicle conversation in Oregon going forward.

³ Meeting of the Minds website, retrieved 04/02/11 at <http://www.meetingoftheminds.org>

Smart Garage Charrette

Portland was selected as the location for Rocky Mountain Institute's October 2008 Smart Garage Charrette, which brought together experts from around the country to discuss the intersections of transportation, the electric grid and the built environment.

Representatives from nearly 50 companies and organizations attended, and the selection of location firmly established Portland and Oregon as leaders in the EV field. The final Smart Garage report, which was published by RMI after the charrette, established RMI's plans to launch Project Get Ready, a portal for EV-forward cities to come together, share successes and challenges, and stay abreast of the latest updates. Unsurprisingly, Portland was an inaugural urban partner in Project Get Ready.



EVRoadmap.com

In early 2010, with support from a local foundation and under the auspices of Portland State University's Office of Research and Sponsored Projects, as well as the Oregon Transportation Research and Education Consortium,⁴ EVRoadmap.com was launched. The website is intended to be an information portal for all of the electric vehicle activity in Oregon, as well as a gathering place for the consortium of stakeholders.

Product Launches

Portland was also selected as a pilot or launch market for several models of electric vehicles. Navistar, an OEM that produces trucks and diesel engines, launched its all-electric eStar truck in Portland in May 2010, citing the city as "one of the nation's most environmentally sustainable cities and a leading advocate for energy-efficient transportation."⁵ Toyota selected Portland State



iTAR

University as a formal partner for end-consumer research and demonstration on its prototype 2012 Plug-In Hybrid Prius line – based partially on the fact that "Oregonians have already shown great commitment to being early adopters of sustainable transportation options," according to Portland

⁴ EVRoadmap.com website, retrieved 04/03/11 at <http://www.evroadmap.com>

⁵ Navistar Press Release, "Navistar Launches eStar All-Electric Truck in 'Sustainable City' of Portland, Oregon," May 25, 2010

General Electric CEO Jim Piro.⁶ In August 2010, Portland was the inaugural location of Ford Motor Company's 14-city tour with an all-electric Ford Focus,⁷ and the city will also be an early market for the Chevy Volt, later in 2011.⁸ Most notably, however, Portland was chosen as a launch market for the all-electric Nissan LEAF, which was available to early adopters in December 2010.

Drive Oregon

Drive Oregon is the industry group for companies in the electric vehicle "cluster" in Oregon. A business cluster, as defined by Michael Porter in 1990's The Competitive Advantage of



Nations, is a "geographic concentration of interconnected companies, specialized suppliers, service providers, firms in related industries, and associated institutions (e.g., universities, standards agencies, trade associations) in a particular field that compete but also cooperate."⁹ Drive Oregon members include vehicle manufacturers (makers of 2- or 3-wheel neighborhood EVs), manufacturers of motors and power electronics, charging station manufacturers, battery and battery component companies, and battery recycling businesses.¹⁰ Drive Oregon members collaborate with one another, track industry news, attend conferences together, and work to promote the electric vehicle industry as a green jobs opportunity for the state of Oregon. This important group is a powerful voice in the Oregon EV landscape, since it has the power to directly impact the Oregon economy through increased revenues and job creation.



The EV Project

Through a grant from the American Recovery and Reinvestment Act of 2009 (stimulus bill), in a program called The EV Project, Nissan and charging station provider ECOtality are able to provide their products at subsidized rates to qualified Oregon residents. Early adopters can qualify for priority listing for a Nissan LEAF, and a free home charging system installed by ECOtality. In return, these residents allow Nissan and ECOtality to collect information about their driving and charging habits. The EV Project is available in several Oregon cities, as well as other EV-forward cities around the country. ECOtality is also

⁶ Sustainable Business Oregon, "PSU Selected as Site for Testing Toyota Prius Hybrid," April 25, 2010

⁷ The Oregonian, "Ford Picks Portland to Launch 14-City Electric-Vehicle Tour," August 24, 2010

⁸ Chevrolet Voltage, "Accelerating the National Rollout of the Chevrolet Volt," January 27, 2011

⁹ Porter, Michael. "Location, Competition and Economic Development: Local Clusters in a Global Economy." Economic Development Quarterly, vol 14, no. 1, pp 15-34, 2000

¹⁰ Drive Oregon website, retrieved 04/02/11 at <http://driveoregon.org>

installing a number of Level II and III charging stations around these cities and up and down the I-5 corridor in Oregon.¹¹

Alternative Fuels Infrastructure Working Group

Pursuant to Executive Order Number 08-24, an Alternative Fuel Vehicle Infrastructure Working Group was convened and met throughout 2009. This group consisted of Oregon municipal, state and regional leaders, industry experts and non-profit representatives. In January 2010, the Working Group's report was issued. The top recommendations of that report are as follows:

- "Create an Electric Vehicle Executive Council by Governor's Executive Order;
- "Engage utility regulators and governing boards in identifying barriers to and solutions for EV commercialization;
- "Set purchase standards for state-funded fleets to increase the percentage of alternative fueled vehicles in the fleets;
- "Create a program that results in free home audits prior to installing charging equipment;
- "Incorporate electric vehicle manufacturing into the Business Energy Tax Credit (BETC) program;
- "Create a new Transportation Electrification Tax Credit (TETC) for electric vehicles and infrastructure; and
- "Create a world-class, multi-disciplinary, transportation electrification and 'smart mobility' Center of Excellence."¹²

Portland City Plan

In July 2010, the City of Portland developed and adopted its own electric vehicle plan, with the following goals:

- "Adopt and update policies to streamline the transition to, and responsible use of, electric vehicles (EVs) in Portland:
 - *Streamline electrical permitting.*
 - *Provide limited use of the right-of-way for EV charging.*
 - *Adopt consistent signage and parking enforcement standards.*



¹¹ The EV Project website, retrieved 04/02/11 at <http://www.theevproject.com/>

¹² Report of the Alternative Fuel Vehicle Infrastructure Working Group, January 2010

- *Reduce vehicle miles traveled by continued education about using transit, walking or biking for trips of 3 miles or less.*
- *Continue to research best practices and consider equitable EV friendly development regulations and policies.*
- “Educate the public about the benefits of EVs and promote State and Federal tax incentives for Portland residents and businesses.
- “Demonstrate leadership in accelerating the adoption of EVs by creating a new program to serve garage-free homes.
- “Foster strategic relationships and pursuing economic development initiatives to support job growth in the region within the clean-tech cluster.
- “Strive to create the most sustainable municipal fleet in the country by integrating EVs in to the daily use of City employees.
- “Foster partnerships in the freight community to facilitate adoption of EVs and plug-in-hybrid technology in the trucking industry.
- “Partner with carshare companies and transit agencies to ensure affordable access to EV technology.
- “Foster existing public and private relationships and look for new partnerships and other collaborative opportunities that support EV infrastructure deployment, promote EV adoption and explore progressive technologies.”¹³

Transportation Electrification Executive Council (TEEC)

The Oregon Transportation Electrification Executive Council was created in September of 2010 by Executive Order 10-09. The TEEC is tasked with the following directives:

- “Develop a work plan on how Oregon can be the leader in the new emerging electric vehicle technologies, including both introduction of vehicle and associated technology and manufacturing vehicles and components. This work plan shall also include strategies for future deployment of electric vehicles statewide;
- “Provide a initial point of contact for companies that are looking to invest in Oregon jobs in the electric transportation industry, including vehicle assembly and manufacturing, charging infrastructure, information technology, and related services;

¹³ Electric Vehicles: The Portland Way, July 2010

- “Collaborate on existing efforts to ensure Oregon's leadership in electric vehicles and related technologies and avoid duplication of efforts;
- “Enhance state, regional and local strategic efforts to deploy electric vehicle infrastructure in Oregon;
- “Facilitate development of public education and acceptance outreach campaigns to accelerate the transition to electric transportation, including education and training of Oregon's workforce to prepare for electric vehicle infrastructure; and
- “Identify opportunities and barriers to adoption and recommend policy and administrative initiatives to the Governor.”¹⁴

This account brings us from the Meeting of the Minds in mid-2008 to Oregon’s current state in mid-2011, and documents the major milestones and projects that have been germane to the deployment of electric vehicles in the state.

Literature Review

The process of benchmarking is frequently used in the business world as a way of comparing one’s progress to that of one’s competitors, identifying strengths and weaknesses, and defining competitive advantage. According to Michael Spendolini, benchmarking can be defined as “a continuous, systematic process for evaluating the products, services, and work processes of organizations that are recognized as representing best practices for the purpose of organizational improvement.”¹⁵ Benchmarking is undertaken by businesses for any number of reasons, which might include strategic planning, forecasting, generating new ideas, comparing products and processes, and goal setting.¹⁶ However, the process is a relatively recent development in the business world: benchmarking was first used in the United States by Xerox Rand in the late 1970s, when the company began to experience significant profit and market share loss to Japanese competitors.¹⁷

There are a number of different methodologies in practice for benchmarking, but the Xerox model remains one of the stronger options. The Xerox method is explained best by Robert Camp in his seminal

¹⁴ Office of the Governor, State of Oregon. *Executive Order 10-09*, September 2010

¹⁵ Spendolini, Michael J. *The Benchmarking Book*. New York: Amacom Books, 1992.

¹⁶ Ibid.

¹⁷ Zairi, Mohamed and Paul Leonard. *Practical Benchmarking: A Complete Guide*. New York: Springer, 1994.

1989 book, *Benchmarking: The Search for Industry Best Practices that Lead to Superior Performance*.

According to Camp, there are ten primary steps of a benchmarking process:¹⁸

Planning

1. Identify what is to be benchmarked
2. Identify comparative companies
3. Determine data collection method

Analysis

4. Determine current performance gap
5. Project future performance levels

Integration

6. Communicate benchmarking findings and gain acceptance
7. Establish functional goals

Action

8. Develop action plans
9. Implement specific actions and monitor progress
10. Recalibrate benchmarks

This project will utilize the first four of these steps and communicate findings to the TEEC, which will then establish goals and action plans.

Performance measurement has its own place in the available business literature, as well. According to Dean Spitzer, the context of measurement (creating buy-in, engaging stakeholders, ensuring that efforts are sustainable and dynamic) is more important than measurement itself.¹⁹ Spitzer cites Paul Rogers and Marcia Blenko of Bain & Company in saying that, “the hallmark of any highly effective organization is making good decisions and making them better, faster and more consistently than their competitors.”²⁰ The application of this statement to this project is that the creation of the TEEC represents an ongoing apparatus for updating EV goals, and nimbly reacting to changing circumstances (such as new funding opportunities). The dynamism that the TEEC creates is an asset, in other words.

¹⁸ Camp, Robert. *Benchmarking: The Search for Industry Best Practices that Lead to Superior Performance*. New York: Quality Resources, 1989.

¹⁹ Spitzer, Dean R. *Transforming Performance Measurement: Rethinking the Way We Measure and Drive Organizational Success*. New York: Amacom, 2007.

²⁰ Ibid.

Spitzer goes on to discuss what he calls the four keys of performance measurement: Context (stakeholder buy-in and leadership), Focus (the measures that are used), Integration (how the measures are linked to one another and aligned with established strategy) and Interactivity (the ongoing sustainability and dynamism of the process).²¹ For this project, these concepts will be adapted in order to evaluate the benchmarking cities.

In terms of metric development, Douglas Hubbard recommends that those embarking on performance measurement processes first ask themselves five questions:

- What is the decision this is supposed to support?
- What really is the thing being measured?
- Why does this thing matter to the decision being asked?
- What do you know about it now?
- What is the value of measuring it further?²²

In this project, these questions will help guide some of the recommendations to the TEEC on the development of goals and metrics.

The link between benchmarking and performance measurement is slightly nuanced – according to Mohamed Zairi and Paul Leonard, “benchmarking ‘sets the bar’ at new heights knowing what levels of competition are, and performance measurement is a process of ‘fitness’ – preparation, rehearsal, continuous training to ensure that the heights set are cleared.”²³ Therefore, this project will benchmark cities on their performance measurement processes, thereby utilizing both concepts and also providing context to the TEEC’s process of setting performance measures for EV activity in the state of Oregon.

Materials and Methods

As was established in the literature review, a benchmarking process first raises three main questions:

1. What measures should I benchmark?

²¹ Ibid.

²² Hubbard, Douglas W. *How to Measure Anything: Finding the Value of Intangibles in Business*. New York: Wiley, 2010.

²³ Zairi, Mohamed and Paul Leonard. *Practical Benchmarking: A Complete Guide*. New York: Springer, 1994.

2. Who should I benchmark myself against?
3. How should I collect data on those measures?

Selecting Measures

As established by Spitzer, there are four key areas that are important to performance measurement (context, focus, integration and interactivity). As the goal was to benchmark not just the measures that cities were using, but also the *process* by which they were measuring their progress and setting their goals, each of these areas was important to the evaluation. However, concepts were clarified by renaming the first two (Context became “Stakeholder Engagement” and Focus became “Focus Areas”) and combining the final two (Integration and Interactivity became “Process Integration”).

1. Stakeholder Engagement (who makes the decisions?)
2. Focus Areas (what is being addressed?)
3. Process Integration (how are the focus areas linked to mission, goals and metrics; how sustainable and dynamic is the process?)

Stakeholder Engagement

To evaluate stakeholder engagement, a master list was created of types of stakeholders (utilities, municipal governments, industry groups, etc.) that were engaged in the measurement process in *any* benchmarking city, and then each city was evaluated on which stakeholders were engaged in that city.

Focus Areas

In order to determine the appropriate focus areas, a conceptual framework was developed that evaluated barriers to adoption (Roadblocks) and legitimate public interests in electric vehicle deployment (Merges), and established six focus areas (Detours) that would allow cities to achieve their goals. Cities were evaluated based on their effort expended in these areas, as well as their progress in them. The conceptual framework is outlined in detail below.

Roadblocks: Barriers to Adoption

Despite their numerous benefits, electric vehicles face an uphill road to widespread and unobstructed use by the public. In particular, there are four major barriers to adoption that must be overcome in order for electric vehicles to make significant inroads – in this conceptual framework, these barriers are referred to as Roadblocks.



❖ **Roadblock #1: Batteries and Technology**

There are numerous technologies for electric vehicles, but the common denominator among them is the battery – one of the most expensive parts of the vehicle. Current lithium-ion batteries cost around \$600/kWh,²⁴ meaning that the battery in a Nissan LEAF, for example, is estimated at \$18,000.²⁵ This comprises over half of the cost of the vehicle, meaning that reducing battery cost will be essential to promoting sales once existing purchase incentives expire. Scaling production and overall expansion of the value chain around battery and vehicle production may help drive some of this cost reduction. There are also likely other ways in which electric vehicle technology will improve in the next decade, much like hybrid technology has done.

❖ **Roadblock #2: Consumer Acceptance**

Electric vehicles are radically different from internal combustion vehicles, and consumers will have to change the way they think about transportation and fueling. Range anxiety – the fear of running out of charge and not having a location to refuel – is very real for many consumers. Additionally, the longer refueling times will mean that consumers will have to adjust their fueling habits and schedules. Lastly, concerns about battery life and warranty will give pause to some consumers. Even hybrid gasoline-electric vehicles, which face none of these challenges, have had a slow market acceptance – despite providing a clear value proposition in terms of lifetime cost and emissions, hybrids accounted for only 3% of automobile sales in 2008.²⁶

❖ **Roadblock #3: Charging Infrastructure**

Since most vehicles sit idly at home for long periods of time – particularly overnight – home charging is anticipated to be the most frequent form of refueling. However, this requires that EV owners install charging stations in their garages, and does not easily accommodate EV owners who live in multi-family dwellings or do not have garages. In addition, the permitting and installation processes may be long or laborious in some states, leading to consumer reluctance to purchase a vehicle.

²⁴ Electrification Coalition, *Electrification Roadmap*, 2009

²⁵ Autoblog Green, [Nissan Leaf profitable by year three; battery cost closer to \\$18,000](#), 5/15/2010

²⁶ Electrification Coalition, *Electrification Roadmap*, 2009

Public charging, while anticipated to have lower usage rates, will also be necessary in order to reduce range anxiety for consumers. The location and number of public charging stations must be carefully calculated – the stations are expensive, so installing too many will be costly; however, installing too few may perpetuate range anxiety. Public charging infrastructure will have to be a mixture of slow-charging and fast-charging stations, in order to accommodate consumers who wish to charge slowly (while shopping at the mall, for example) as well as quickly (while on a road trip, for example).

🔥 **Roadblock #4: Grid Limitations**

Depending on how and when electric vehicles are charged, there may be little need for additional grid capacity. For example, if electric vehicles are charged overnight when the grid has excess capacity, much of the demand could be met with existing grid capacity – while flattening load curves and allowing utilities to spread fixed costs over a greater volume of power while minimizing marginal costs. Additionally, once vehicle-to-grid communication is established, electric vehicle batteries could act as short-term energy storage, powering up overnight when demand is low and then reselling some of that electricity back to the grid during the day when demand is high. However, in order to achieve these benefits, upgrades to grid hardware (neighborhood transformers, for example) and software (smart metering, for example) will be necessary.

Merges: Public Interests

There are several compelling reasons for any community to promote and prepare for electric vehicle deployment in a focused, strategic way. The following four areas, which will be referred to as Merges, are reasons that many cities and states have cited as motivation for their EV deployment strategies.



📍 **Merge #1: Economic Development**

To the extent that electric vehicle promotion can enhance economic development and job creation within a location, cities and states have a legitimate interest in electric vehicle readiness. Frequently, this means supporting industry players such as vehicle manufacturers, battery and battery component manufacturers, and charging station manufacturers. Economic development has been – and can be – a selling point for electric vehicle readiness, even in locations that are not otherwise predisposed to electric vehicles for environmental reasons.

◆ **Merge #2: Environmental Goals**

Transportation is comprises a large portion of most states’ greenhouse gas emissions profiles, meaning that moving to electrified transportation may be a central to any state’s emission reduction plan. Figure 3 demonstrates that transportation comprises 23% of the overall CO₂ emissions in the United States as a whole;²⁷ therefore, many states have developed transportation planning mechanisms as part of their greenhouse gas emission reduction plans.

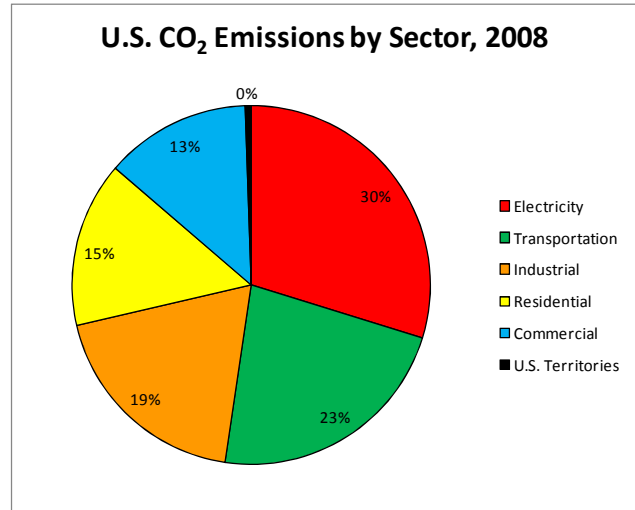


FIGURE 3: U.S. CO₂ EMISSIONS BY SECTOR

◆ **Merge #3: Federal and OEM Support**

Two programs supported by the American Recovery and Reinvestment Act of 2009 (ARRA, or the stimulus bill) – The EV Project (managed by ECOtality) and ChargePoint America (managed by Coulomb Technologies) – are already in motion, helping states defray the costs of installing a robust public charging infrastructure. Additional federal support may be available in the future, as well, and may be targeted toward communities that have already made a great deal of progress in terms of EVs. In addition, OEMs (original equipment manufacturers; i.e., automobile manufacturers) are selecting pilot and launch communities based on the level of readiness – consumer awareness, charging infrastructure and grid readiness – that these communities display. States that are enacting strong plans, then, are in good standing to capture federal funding and OEM attention to support their EV programming.

◆ **Merge #4: Grid Security and Reliability**

As electric utilities companies already know, electric vehicles pose both a significant revenue opportunity and a difficult challenge in terms of managing demand for electricity. Time-of-day pricing will be crucial to managing widespread electricity demand without compromising grid

²⁷ U.S. EPA, 2010 U.S. Greenhouse Gas Inventory Report, April 2010

reliability. As regulated entities, these utilities need the support of public utilities commissions in order to approve rate structures and help launch pilot programs that enable utilities to test their EV readiness. In addition, reliability at the neighborhood transformer level will require that utilities are closely monitoring the location of EV owners, in cooperation with the state motor vehicle department.

Detours: Solutions

When a driver encounters a block in the road, frequently a detour is recommended. In order to overcome the Roadblocks (the “push” reasons for EV deployment) and achieve the benefits of Merges (the “pull” reasons for EV deployment) outlined above, six key areas (“Detours”) were identified for cities’ electric vehicle planning efforts. These were the areas of focus upon which benchmarking cities were evaluated. The specifics of each Detour are explained below, and Figure 4 demonstrates how Detours are conceptually tied to Roadblocks and Merges.

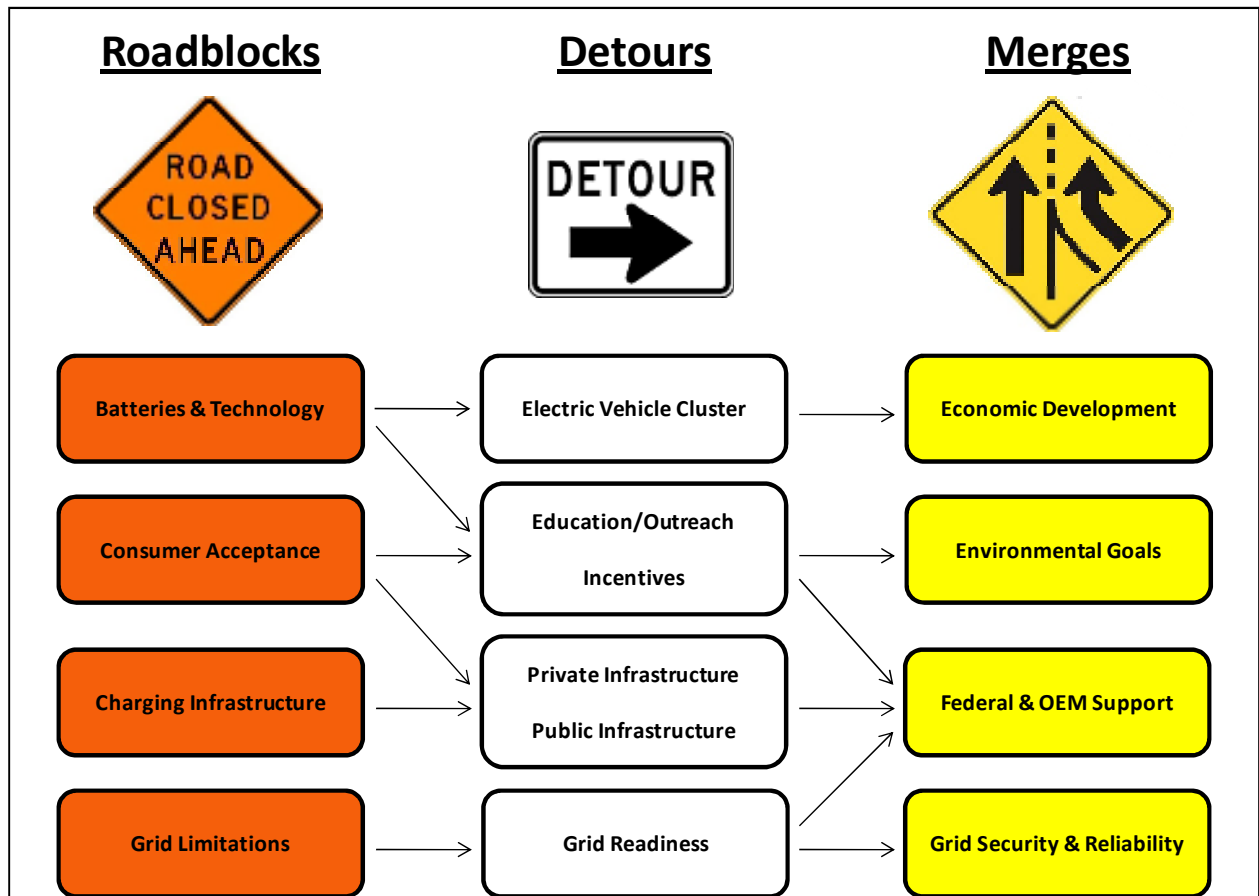


FIGURE 4: ROADBLOCKS, DETOURS AND MERGES

 **Detour #1: Electric Vehicle Cluster**

Many states are home to an economic cluster of businesses in the electric vehicle, battery or charging station value chains, even if they aren't manufacturing mass market vehicles. Many locations view supportive EV policies as a way to encourage economic development and job creation within the area, through these clusters. Cities were evaluated on their level of awareness of, consideration for, and coordination with the electric vehicle cluster in their location.

 **Detour #2: Education/Outreach**

Education and outreach is important to create consumer awareness and acceptance, and to help states promote electric vehicles – which will drive production, lower battery costs, and help states achieve their environmental goals. Levels of consumer education may also be helpful to states in proving their readiness to federal program managers and OEM marketers. Obviously, municipal governments should not be in the business of promoting one particular brand of vehicle versus another, so education and outreach must be done objectively. Each city was evaluated on its level of education and outreach, through awareness campaigns, web presence, public events and other forms of promotion.

 **Detour #3: Incentives**

Consumer incentives are another key to achieving consumer acceptance, scaling production and advancing environmental goals. There is a \$7,500 federal tax incentive in place for purchasers of electric vehicles,²⁸ but many states have additional tax incentives to encourage consumers to buy electric vehicles and install home charging stations. Other incentives that some states have implemented include carpool lane access or reduced excise taxes or vehicle registration fees for electric vehicles. Cities were evaluated on their current incentives, as well as whether or not readiness efforts included discussions about increased incentives (or new incentives, for states that do not yet offer them).

²⁸ U.S. Department of Energy, Alternative Fuels & Advanced Vehicles Data Center, retrieved 03/14/11 at <http://www.afdc.energy.gov/afdc/laws/matrix/tech>

 **Detour #4: Public Infrastructure**

The installation of public charging infrastructure will help to overcome concerns about charging availability, which will drive consumer acceptance. Public charging is also a measure that is of interest to federal and OEM decision-makers, since it is essential to overcoming range anxiety and promoting electric vehicle usage. The visibility of public charging infrastructure, therefore, is equally as important as its presence. Cities were evaluated on their planning, promotion and signage around public charging infrastructure, which can be a piecemeal process if not carefully managed.

 **Detour #5: Private Infrastructure**

The promotion of private home charging infrastructure relies primarily on the permitting and standards that are in place in a location to help smooth the installation process. In some locations, for example, there is a three-day lag time to obtain a permit to install a home charging station. This type of lag poses a significant hindrance for a consumer who might otherwise walk onto a car lot and purchase an electric vehicle, and it might deter federal and OEM decision-makers as well. Cities were evaluated on their awareness of, and willingness to address, permitting and standards in order to promote home charging infrastructure installation.

 **Detour #6: Grid Readiness**

Since grid readiness is so important to reliability, it is critical that utilities be involved in the decision-making process around electric vehicle deployment strategies. Each city was evaluated on the extent to which its local utilities were involved, and those utilities were also evaluated on their level of readiness and engagement.

After each city was given a numerical score (out of five) for each of the six Detours, scores were aggregated to determine which cities were doing best in their efforts in these areas.

Process Integration

Similarly, Process Integration was broken into multiple areas for evaluation. The five areas are:

Mission

Cities were evaluated on the mission of their stakeholder planning groups – whether there was a mission, and how encompassing that mission was.

Goals

Cities were evaluated on the established goals of their stakeholder planning groups. The most important piece was that a city had established goals for their work, and shared these goals with the public and with other coordinating bodies.

Metrics

Metrics are the quantitative measures by which cities evaluated their progress toward their goals. The literature on performance measurement indicates that proper metrics, which actually measure the thing that one is trying to measure, are key.

Integration

Cities were evaluated on the extent to which their mission, goals and metrics were integrated – that is, whether all parts of the mission were borne out in the goals and metrics, and whether goals and metrics were strategically connected to the established mission.

Sustainability

Lastly, cities were evaluated on the sustainability of their efforts. The business literature suggests that having a team in place to continually evaluate and update goals and metrics is important to the ongoing performance measurement process. If goals need to be changed due to changing circumstances or new opportunities, cities with strong teams already in place will be more nimble and better positioned to take advantage of openings.

Selecting Cities

In order to determine which cities were most appropriate for benchmarking, a cross-reference was conducted between cities that are involved in Rocky Mountain Institute's Project Get Ready and cities that ranked highly in a report recently issued by consulting firm Roland Berger. The Project Get Ready cities each have a central point of contact for their electric vehicle activities, enabling phone interviews as a data point. The Roland Berger report, which was authored in conjunction with Rocky Mountain Institute, examined the 50 largest cities in the United States and divided them into Leaders (14 cities, including Portland), Aggressive Followers (3 cities), Fast Followers (11 cities) and Followers (22 cities).²⁹ Figure 5 shows a cross-reference of these cities, with Project Get Ready cities in bold.

²⁹ Roland Berger Strategy Consultants and Rocky Mountain Institute, Electric Vehicles in America: PEV Readiness Study, 2010

Leaders	Aggressive Followers	Fast Followers	Followers
<ul style="list-style-type: none"> • Austin • Denver • Los Angeles • New York • Orlando • Phoenix • Portland • Raleigh • Riverside • Sacramento • San Diego • San Francisco • San Jose • Seattle 	<ul style="list-style-type: none"> • Detroit • Houston • Indianapolis 	<ul style="list-style-type: none"> • Atlanta • Baltimore • Chicago • Dallas • Kansas City • Las Vegas • Minneapolis • Providence • San Antonio • St. Louis • Tampa 	<ul style="list-style-type: none"> • Birmingham • Boston • Buffalo • Charlotte • Cincinnati • Cleveland • Columbus • Hartford • Jacksonville • Louisville • Memphis • Miami • Milwaukee • Nashville • New Orleans • Oklahoma City • Norfolk • Pittsburgh • Philadelphia • Richmond • Salt Lake City • Washington, D.C.

FIGURE 5: ROLAND BERGER REPORT RESULTS (PROJECT GET READY CITIES IN BOLD)

Since it makes the most sense to benchmark Oregon against cities that are near to Portland’s own classification under this report’s rubric, the following cities were selected for benchmarking: Houston, Indianapolis, Orlando and Raleigh. Handily, the cities selected also ended up being relatively geographically distinct, which suggests that the results are not subject to regional strengths and weaknesses, attitudes about environmentalism, or other biases.

Collecting Data

Data was collected from three locations. First, each city’s profile information was culled from the Project Get Ready website, which is frequently updated following monthly webinars where points of contact from each city report on their progress. Second, each city’s web presence for EV activities was explored, if applicable – some cities have created independent websites that centralize their EV planning, or have published reports that give information on the city’s planning. Third, 30-minute phone interviews were held with points of contact from each city, filling in gaps in the analysis and ensuring that information collected elsewhere was up-to-date.

Results

A brief synopsis of each city's electric vehicle programs are below, and a full description and evaluation of each of the cities' programs can be found in the Appendix.

Houston

Houston's stakeholder group is informal, and is spearheaded by the City of Houston and the Houston Advanced Research Center, assisted by ECOtality. Much of the focus of the group is on public charging infrastructure, with a nod to the environmental benefits of charging electric vehicles overnight and utilizing the abundant West Texas wind power for a zero-emission refueling. The City of Houston is developing a long-term plan for infrastructure installation, and NRG Energy, a private-sector company, is installing charging stations that utilize a unique business model. Much of the work has been coordinated through ECOtality, as Houston is an EV Project city.

Indianapolis

Indianapolis' stakeholder group, called Project Plug-IN, is managed by Energy Systems Network, a non-profit cleantech industry group that started in 2009 at the urging of the governor. Project Plug-IN launched in the fall of 2009, and focuses on proof-of-concept for business models and feasibility of fleet and commute management. The project has highly specific goals and milestones, most of which center around numbers of charging stations and number of vehicles on the road. The organizers believe that Indianapolis' size lends itself well to an electrified commute, and efforts are centered on infrastructure development with the belief that economic development will result naturally from EV deployment.

Orlando

Orlando's stakeholder group, called Get Ready Central Florida, is managed by the Government of Orange County. Get Ready Central Florida recently launched a website that aggregates information about the group itself, as well as a robust set of resources for those interested in EVs. The group seeks to capitalize on the heavy tourist traffic through Orlando, and is focusing on public charging and rental car fleets more than private charging and individual resident purchases of EVs. The placement of public charging infrastructure is a current focus of the project, as Orlando is a ChargePoint America city.

Raleigh

Raleigh's stakeholder group, called NC Get Ready, is managed by Advanced Energy, a non-profit energy-focused organization. NC Get Ready has a strong committee structure, with many stakeholders engaged in the efforts. The group is trying to leverage the proximity of Raleigh, Durham and Chapel Hill, and is

relying on support from the local universities as well as the local utilities such as Duke Energy. That being said, the group is more focused on home charging stations than on public infrastructure – they are wary of developing public infrastructure before demand for vehicles is established. The group is more of a coordinating body than an agenda-setting one, but has developed some innovative ways to share knowledge and keep everyone current. The group sees itself as supporting existing interest in EVs, rather than promoting them outright.

Portland

Portland’s stakeholder group is the Oregon Transportation Electrification Executive Council, which exists by directive of the governor. The group has a weak, but present, committee structure, and has widespread representation from across sectors. The TEEC is the agenda-setting body in the state, but also works to coordinate existing activities. The TEEC is the only benchmarked group that has true authority from the state level to make recommendations and set policy directions. The group is in the process of determining goals and metrics by which they will evaluate EV activity within the state. In addition, the group has been working with ECOtality, since Portland is an EV Project city.

As described above, each city was evaluated on three different measures: Stakeholder Engagement, Focus Areas and Process Integration (synthesis between mission, goals, milestones, etc.).

Stakeholder Engagement

Table 1 demonstrates how each city stacks up in terms of stakeholder engagement. As the table shows, most cities have most of the important stakeholders at the table in decision-making (or at least have worked with them on an as-needed basis). The top location in this respect is Portland, but no single city trails too far behind the others.

	Houston	Indianapolis	Orlando	Raleigh	Portland
Automotive Manufacturers	√	√	√		√
County Government			√	√	√
Dealerships	√		√		
Industry Groups		√			√
Local Businesses	√	√		√	√
Local Business Associations		√			√
Metropolitan Planning Orgs	√	√	√	√	√
Municipal Governments	√	√	√	√	√
Non-Profits	√	√	√	√	√
Public Utilities Commissions	√		√	√	√
State Government	√	√		√	√
Utilities	√	√	√	√	√
Universities	√	√	√	√	√
Total	10	10	9	9	12

TABLE 1: STAKEHOLDER ENGAGEMENT

Focus Areas

Details for each of the focus areas in each of the cities, and their resulting scores, can be found in the city descriptions in the Appendix. Scores for most of the focus areas were largely qualitative.

Scores for Grid Readiness were based to some degree on the local utilities' readiness, as measured by an August 2009 study conducted by the Edison Electric Institute, an industry group which represents shareholder-owned utilities. That study was a qualitative assessment of many utilities' electric vehicle readiness. For the purposes of this project, a quantitative framework was developed based on the qualitative information given in the EEI study, and each of the utilities was evaluated against a list of 18 "readiness" actions they could be taking.³⁰ Figure 6 displays the results of this assessment:

³⁰ Edison Electric Institute, Industry-Wide Plug-In Vehicle Market Readiness Initiatives, 2009

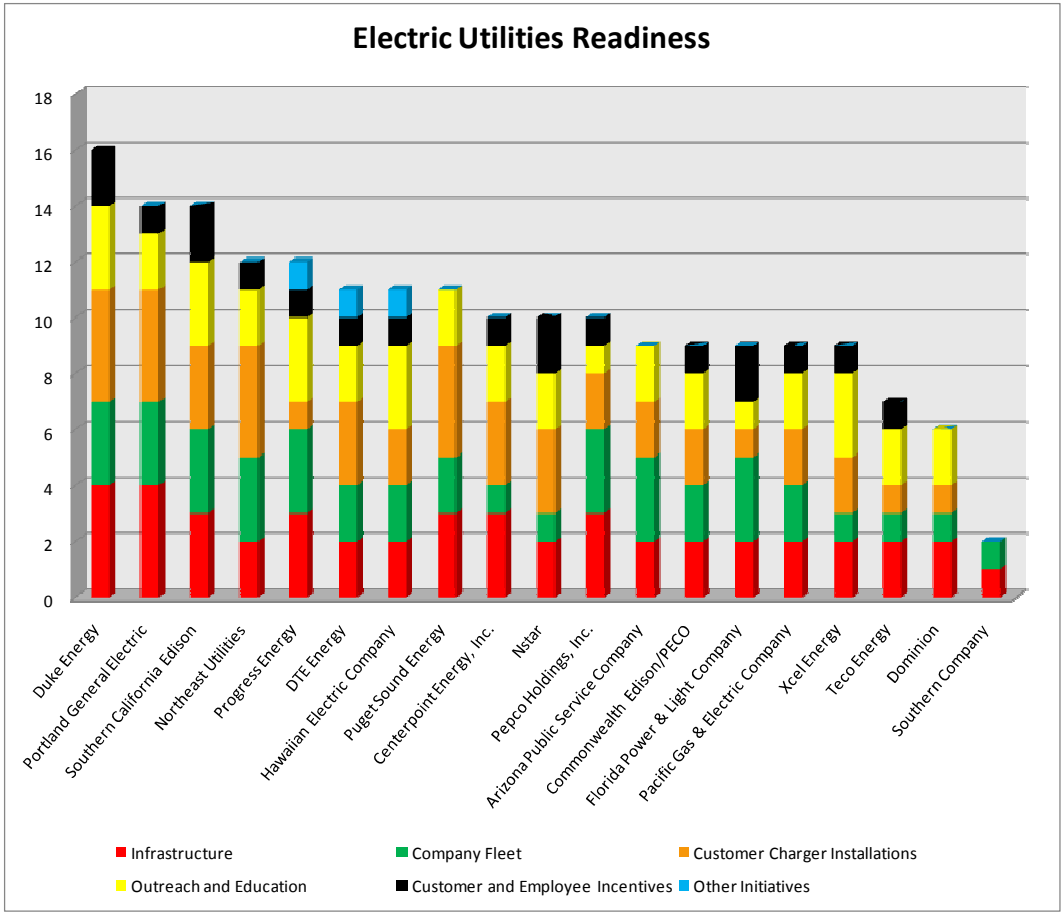


FIGURE 6: ELECTRIC UTILITIES READINESS

The relevant utilities for this analysis are Duke Energy/Progress Energy (16 points and 12 points, respectively; now merged, serving Indianapolis, Orlando and Raleigh) and Portland General Electric (14 points; serving Portland). Houston’s local utility is Reliant Energy, owned by NRG, and is not ranked in the EEI study.

Based on the information about each Focus Area detailed in the Appendices, each city was given points (out of five) for each of the six focus areas, and an aggregate score (out of 30) for Focus Areas. Table 2 and Figure 7 demonstrate how each city stacks up.

	Houston	Indianapolis	Orlando	Raleigh	Portland
Electric Vehicle Cluster	2	4	2	2	4
Education & Outreach	1	2	4	3	3
Incentives	1	1	1	2	3
Public Infrastructure	5	5	5	3	5
Private Infrastructure	5	5	1	5	5
Grid Readiness	4	5	5	5	5
Total	18	22	18	20	25

TABLE 2: FOCUS AREA SCORES

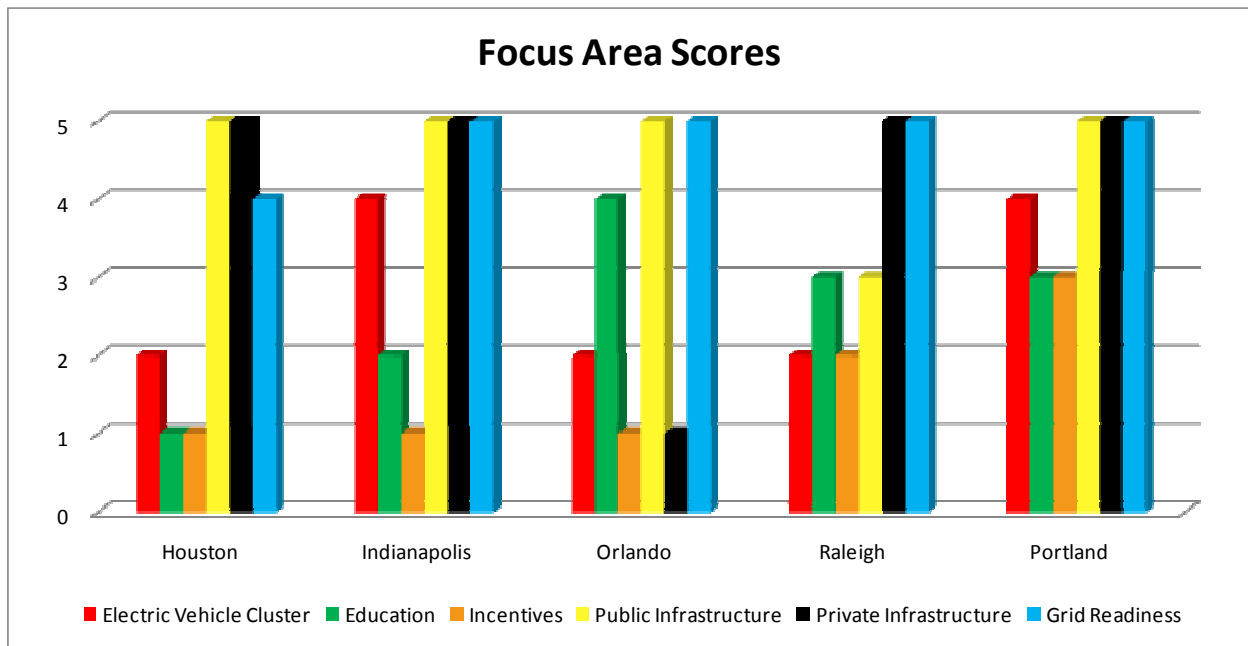


FIGURE 7: FOCUS AREA SCORES

Process Integration

Each city was evaluated on its mission, goals, metrics (measures by which they would evaluate their progress toward those goals), integration (the extent to which mission and goals were linked to one another) and sustainability (the extent to which an ongoing, dynamic process for self-evaluation was established, and accountability was assigned). Each city could receive a maximum score of three for

each of these points of evaluation. More detail on the assessment behind the scores can be found in the Appendices, and Table 3 and Figure 8 show how each of the cities stacks up in terms of Process Integration.

	Houston	Indianapolis	Orlando	Raleigh	Portland
Mission	0	3	3	3	3
Goals	1	2	1	1	2
Metrics	0	2	0	0	2
Integration	0	1	1	2	2
Sustainability	1	3	1	3	2
Total	2	11	6	9	11

TABLE 3: PROCESS INTEGRATION SCORES

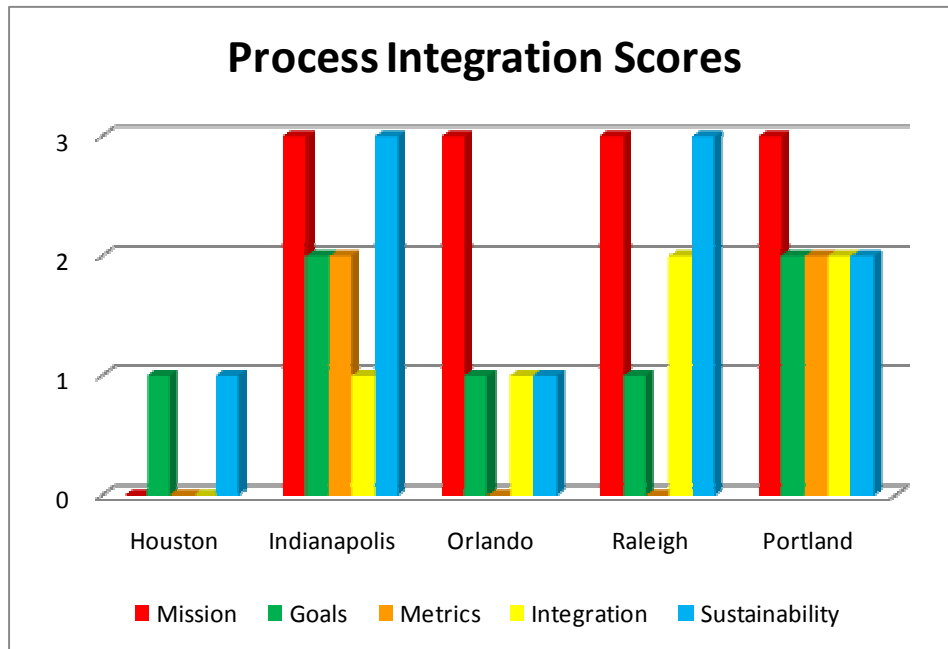


FIGURE 8: PROCESS INTEGRATION SCORES

Clearly, Portland and Indianapolis are the leaders here, with Orlando and Raleigh lagging slightly behind them. Houston ranked lowest in terms of Process Integration – the city has no established mission for its EV activities, no published goals, and no metrics by which to measure progress.

Overall Assessment

While the majority of this project centered on developing and analyzing Focus Areas, the literature review reiterates the importance of each step of the performance measurement process. Therefore, each step of the process – Stakeholder Engagement, Focus Areas and Process Integration – was weighted equally. Based on the quantitative and qualitative assessments above, “traffic signals” were assigned for each step to each city, with the following key:

- Green: Relatively strong in this area
- Yellow: Growing in this area
- Red: Relatively weak in this area, in comparison to other cities benchmarked here

Table 4 shows the overall evaluation for each of the benchmarking cities.
















	Houston	Indianapolis	Orlando	Raleigh	Portland
Stakeholder Involvement					
Focus Areas					
Process Integration					

TABLE 4: OVERALL CITY ASSESSMENT

Based on this evaluation, then, the benchmarking cities can be ranked in the following order, from most organized EV planning process to least:

- Indianapolis and Portland;
- Raleigh;
- Houston; and
- Orlando.

Discussion

The first thing to note in discussion of these results is that this benchmarking was a relative process. These five cities are among the most forward-thinking cities in the entire country in terms of electric vehicles, and a low ranking here does not mean that these cities are not still true leaders in this area.

Further, it is interesting to see that these results were somewhat different from those of the Roland Berger report, which ranked Portland, Orlando and Raleigh in the group of top cities, with Houston and Indianapolis not far behind. The likely reason for this difference is that the Roland Berger report was descriptive of where EVs would be successful first, based on some factors that were within a city's control (infrastructure placement, for example) and others of which were not (environmental consciousness of residents, for example). This project's analysis, on the other hand, focuses on the quality of the planning and goal-setting process, resulting in a different ranking.

Lastly, as will be shown in subsequent discussion sections, each benchmarking city, no matter where it ranked in comparison to the others, has a handful of best-in-class practices that are worth identifying and replicating. Every city has something to teach, and every city has something to learn.

Stakeholder Engagement

Most cities had most stakeholders at the table, which was encouraging – in fact, no cities significantly trailed the pack in Stakeholder Engagement. While some stakeholders – county governments, local business associations, etc. – are engaged in only a couple of cities, others are engaged in all cities. The stakeholders that were engaged in every single benchmarking city were:

- Metropolitan planning organizations;
- Municipal governments;
- Non-profits (notably, these were non-profits *other than* Rocky Mountain Institute, which was obviously engaged in all cities as all cities were Project Get Ready partners);
- Utilities; and
- Universities.

These results are unsurprising – obviously metropolitan planning organizations and municipal governments have an interest in EV activities, as established in the Materials and Methods. Utilities also have a strong interest, as they will be providing the fuel for these vehicles. Non-profits and universities are brought to the table due to their unique expertise in technology research, city and regional planning,

or even relationship-building. In Portland, for example, Portland State University is aggressively involved in the EV planning process due to its strong Office of Research and Strategic Partnerships, in addition to its downtown location and thought leadership in sustainable urban design.

With all due caution toward conflating correlation and causation, it is interesting to explore the possibility that a strong EV planning process results in having these five stakeholders at the table, or that having these five stakeholders at the table spurs a strong EV planning process. For example, Duke Energy’s EV involvement is very aggressive, and it may be no coincidence that three of the top EV cities in the U.S. (Raleigh, Indianapolis and Orlando) are served by Duke Energy. On the other hand, it is clear that EV-forward cities have all reached deep into their communities to find numerous stakeholders and bring their expertise to the table, and this robust stakeholder set may be an indication of the strength of the planning process.

Either way, what these results do clearly indicate is that these five stakeholders are among the most important ones to have engaged in the planning process, and cities that are not as advanced in their EV planning could look to this list as a launching point for their own stakeholder groups.

Focus Areas

The six Detours, or focus areas, divided somewhat neatly into two categories: one in which most cities were performing quite well, and one in which many cities were falling behind. Table 5 and Figure 9 show the focus area scores again, with the average score for each focus area displayed.

	Houston	Indianapolis	Orlando	Raleigh	Portland	Average
Electric Vehicle Cluster	2	4	2	2	4	2.8
Education & Outreach	1	2	4	3	3	2.6
Incentives	1	1	1	2	3	1.6
Public Infrastructure	5	5	5	3	5	4.6
Private Infrastructure	5	5	1	5	5	4.2
Grid Readiness	4	5	5	5	5	4.8

TABLE 5: FOCUS AREA SCORES, WITH AVERAGES

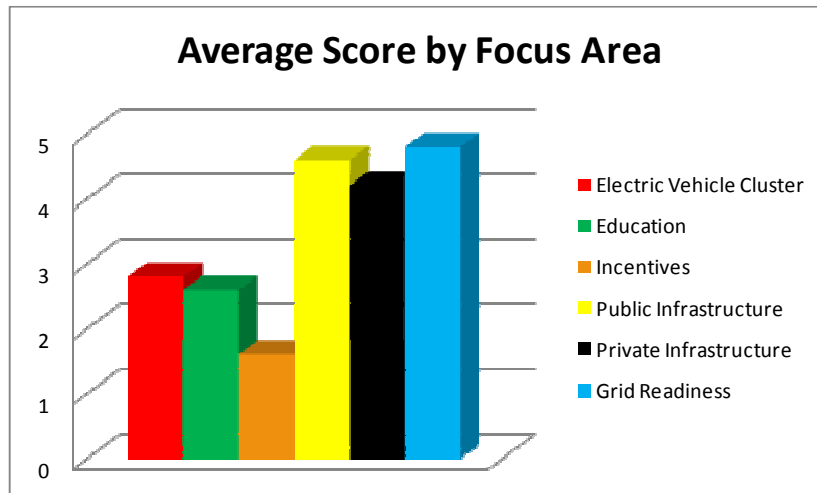


FIGURE 9: AVERAGE SCORE, BY FOCUS AREA

Clearly, many cities are doing well in developing public and private infrastructure, and in grid readiness (which is unsurprising, given that the stakeholder groups all include local utilities). However, cities are lagging behind in reaching out to their electric vehicle clusters, promoting education and outreach, and pursuing incentives for EV owners and drivers.

There could be any number of reasons for this divide. Some cities may not have much of an electric vehicle cluster, or may not view in-state manufacturing as a goal for their EV activities. To be certain, for most states the in-house manufacturing is unlikely to reach the type of scale that is hoped for in order for cities to reach their environmental goals, and the vehicles manufactured in-state may be NEVs that are not the main focus of EV deployment efforts. However, it is noteworthy that most locations cited economic development as one of their goals, and many had contact with local dealerships or retail operations for infrastructure purposes, but few cities were working directly with the manufacturing bases in their states.

In terms of incentives, political philosophy or ability to affect change may be preventing cities from pursuing incentives more heavily. Some city organizers were quite clear that they had no interest in the government subsidizing electric vehicle sales, and they preferred to find ways for EV deployment to be market-driven. Additionally, many of the incentive decisions are made at the state level (refund on state income taxes, for example, or HOV lane access), meaning that those decisions are not as easily influenced as policy decisions that can be made on the municipal or county level.

Low scores for education and public outreach campaigns, on the other hand, were more surprising. This type of work is relatively low-hanging fruit for most cities, and is a focus area that many cities mentioned in their mission and goals. Further, it is clearly within the purview of stakeholder groups that are working to overcome barriers to EV adoption (as opposed to tax incentives, which one could argue are not necessarily the responsibility of such a stakeholder group). That being said, no city excelled in education and outreach, and all could be doing more to keep the public updated on their efforts and on the facts and myths of electric vehicles.

Process Integration

In general, overall evaluations for Process Integration were lower than those for Stakeholder Engagement and Focus Areas. Further, the average scores for each of the Process Integration measures (out of three, not out of five as with Focus Areas) are quite low, as can be seen in Table 6 and Figure 10. Most cities had an established mission for their electric vehicle activities; however, not many had clear goals, fewer still had metrics to evaluate those goals, and not many had good integration between their mission, goals and metrics. The sustainability and dynamism of different cities' efforts were equally dissimilar: in some cases, the stakeholder group is totally informal, with no institutional presence; in others, the stakeholder group is organized primarily around a limited-term project (such as The EV Project or ChargePoint America).

	Houston	Indianapolis	Orlando	Raleigh	Portland	Average
Mission	0	3	3	3	3	2.4
Goals	1	2	1	1	2	1.4
Metrics	0	2	0	0	2	0.8
Integration	0	1	1	2	2	1.2
Sustainability	1	3	1	3	2	1.2

TABLE 6: PROCESS INTEGRATION SCORES, WITH AVERAGES

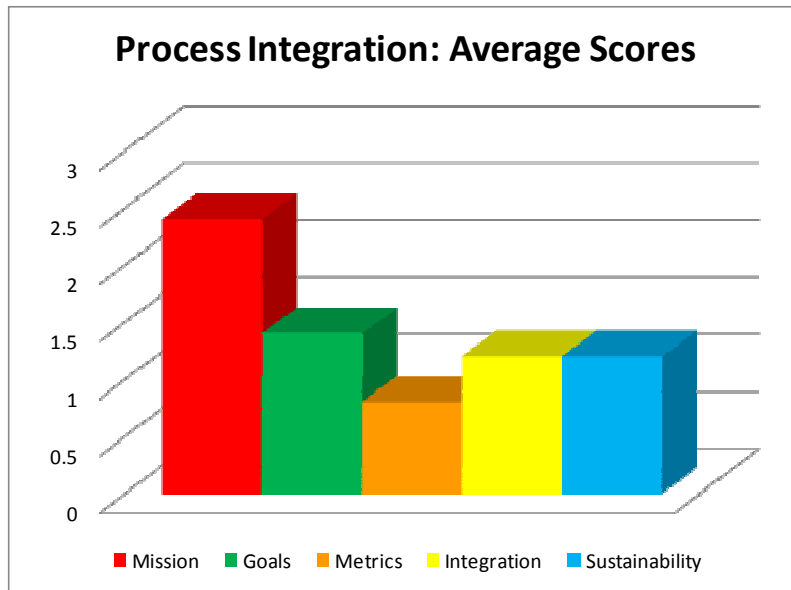


FIGURE 10: AVERAGE SCORES OF PROCESS INTEGRATION AREAS

Indianapolis, Portland and Raleigh are doing relatively well in Process Integration, but their efforts could still be improved upon. Indianapolis’ goals and metrics are ambitious and explicit, which is a positive step. However, many of the goals revolve around numbers of vehicles on the road and numbers of charging stations. If the goal is to have charging stations in locations where people can – and will – use them, the business literature indicates that a simple metric such as “number of charging stations” is a poor measure. Better measures could be use levels of existing charging infrastructure, or distribution of charging stations. Indianapolis could also develop goals that evaluate EV knowledge levels, in keeping with the mission of public outreach. By tightening the goals and metrics, drilling down on the true thing that is to be measured (or a sophisticated proxy for it), and making certain that all aspects of the mission play out in the goals and metrics, Indianapolis can improve its process integration.

Portland, on the other hand, is in the process of setting goals and metrics, and thus scored well in Process Integration. However, Portland would do well to model itself after Indianapolis, while adding some of the suggestions mentioned above.

Raleigh is doing particularly well in terms of sustainability – one best-in-class practice from this city is the development of a password-protected web portal that will be made available to other city planners

around the state of North Carolina, as smaller and more rural locations begin to establish EV presences. This type of thinking, planning and sharing will be decisive to the success of the EV endeavor overall.

Overall Assessment

Overall, this evaluation highlighted a few interesting dynamics among EV-forward cities:

- Generally, cities have the right people at the table making decisions, and they are focused on the right things;
- However, there is frequently a disconnect between focus and mission – cities tend to display backward integration between the two (the focus areas are all linked to the mission) but sometimes lack forward integration (not all pieces of the mission are played out in the focus areas);
- Further, very few cities have structures to determine: (1) whether they've been successful, and (2) who will continue this work in the future, and how.

Recommendations

This analysis leads to several recommendations – some for all cities (those mentioned here, and any other cities that are in the process of planning for electric vehicle deployment), and some specific to Oregon and the TEEC. For all cities, the following recommendations are in order:

- **Formalize a stakeholder group for planning and execution**
Stakeholder groups should be formal and should have independent institutional presence. If possible, the stakeholder group should have some sort of agenda-setting authority from the municipal or state government, as in Portland, Indianapolis or Orlando – this can enhance efforts enormously.
- **Develop a mission and set goals**
The group's mission should be mutually determined, and should seek to leverage the strengths of each of the stakeholders as well as of the city itself. Cities may take a page from this analysis and drill down on some of the six established focus areas – but more importantly, cities should ensure that mission and goals are strategically aligned, and integrated both backward and forward. It is essential for stakeholder groups to know what they want to achieve, and how they will know when they have achieved it.

- **Focus on education and outreach**

All cities can improve in their education and outreach efforts. This is low-hanging fruit, and is well within the purview of stakeholder groups. Further, it is crucial to dispelling myths about electric vehicles and overcoming consumer attitudes about adoption. Lastly, it may be necessary to justify the use of taxpayer dollars to develop EV infrastructure.

- **Take the long view**

Sustainability is an area that many cities could improve upon – how will goals and metrics be updated as we move up the learning curve? Who will be accountable for carrying the work forward after the first wave of EVs hit the road? The future of EVs is uncertain, but the planning process can be structured to manage that uncertainty, rather than be subject to it.

For Oregon in particular, Table 7 shows best-in-class practices that are recommended:

Analytical Area	Location	Practice
Incentives	California	Since none of the benchmarking cities are located in states with tax incentives for EV purchases, the TEEC should look to California, whose \$5,000 tax incentive is likely to make it a fast leader in the EV space.
Public Infrastructure	Houston	NRG Energy’s charging station network in Houston is unique in the nation as a business model for EV infrastructure. NRG is interested in launching the model in other locations, and the TEEC could consider a partnership of some kind.
Mission	Orlando	Orlando’s stakeholder group mission, and resulting strategy, is designed to leverage the city’s strength as a tourist destination. The TEEC should evaluate the strengths of Oregon’s cities (environmental consciousness, sustainable urban design, university presence, etc.) and leverage them in its efforts.
Goals/Metrics	Indianapolis	Indianapolis’ milestones and metrics are best-in-class, despite some shortcomings that might be easily fixed. This is undoubtedly the model to look to for inspiration in this area.
Sustainability	Raleigh	Raleigh’s web portal of planning documents is an excellent idea, and will make planning much easier for smaller cities in the area. If the TEEC wishes for EVs to spread far beyond Portland and other urban centers in Oregon, this could be one way to spur that growth.

TABLE 7: RECOMMENDATIONS FOR OREGON AND THE TEEC

Conclusion

As electric vehicles begin to hit the road in larger numbers over the next couple of years, city-level deployment and infrastructure development efforts will be ever more important to transforming the face of personal transportation. EVs face significant barriers to adoption, but can bring benefits to many groups. Additionally, the process of developing EV infrastructure and supervising deployment smoothly can bring together disparate stakeholders, creating new models of managing the challenges of sustainable urban design. And by taking cues from other EV-forward cities and addressing current areas of weaknesses, Portland, in particular, can continue its EV leadership and provide a national model of safe, clean, sustainable urban development.

Appendix A: Houston, TX

Website: www.houstontx.gov/plugin

Contact: Ray Cruz-Turcios

Role: Fleet Manager

Organization: City of Houston

Phone: (832) 393-0848

Website: www.evgonetwork.com

Contact: James Tillman

Role: Ready for EV Program Manager

Organization: NRG Energy

Phone: (281) 674-0040

Stakeholder Engagement:

Houston has an informal stakeholder group, and parallel efforts by the City of Houston and NRG Energy are resulting in a robust network of charging stations in the city.

The stakeholder group consists of representatives from the City of Houston, ECOtality, Houston-Galveston Area Council, Houston Advanced Research Center (non-profit), Texas A&M University, and local utilities such as Reliant Energy, which is owned by NRG Energy. The primary motivator behind the group has been the City of Houston.

Focus Areas:

Electric Vehicle Cluster (2)

The group has not formally reached out to local businesses along the electric vehicle/battery/charging station value chains, but there are local vendors for charging stations who are responding to RFPs for installations. There is also a company in Austin that is doing a demo project in the area. Obviously, NRG Energy's involvement is spurring economic development.

Education & Outreach (1)

NRG Energy is doing most of the education and outreach. The City is engaged in some outreach via the City Sustainability Coordinator. The City and NRG Energy each have websites devoted to EV rollouts, but the stakeholder group itself does not have a web presence.

Incentives (1)

Existing incentives are conducted through the ECOTality ARRA grant (incentives for home charging stations). The stakeholder group is seeking to establish HOV lane access for EVs, but that discussion is just starting and the outcome is still uncertain.

Public Infrastructure (5)

This is where most of the focus of Houston's progress has been. NRG Energy is moving ahead quickly, installing charging stations using a for-profit model that is the only one of its kind. The City, on the other hand, has spent time generating a long-term strategy report that analyzes the Houston market and evaluates consumer needs, and recommends charging station placement accordingly.

Private Infrastructure (4)

Houston has worked hard to streamline the permitting process for home charging stations. The city has achieved a best-in-class process by which residents' permit applications are instantly approved online, and there is a one-day turnover from permit application to installation and final inspection.

Grid Readiness (4)

Reliant Energy, the local utility, is very involved in the planning process, though it is unranked in the EEI study. The long-range strategy document discusses electricity load and the need to establish grid security and reliability.

Process Integration:

Mission (0)

The informal stakeholder group in Houston has no explicit mission, and the City itself does not seem to have a strong mission either.

Goals (1)

The long-range strategy developed by the City of Houston, Houston Advanced Research Center and ECOTality contains some projections and goals for charging station deployment, but not for other aspects that the city might consider. The current goal is to establish 60 charging stations in the city, in addition to the 50 that will be installed by NRG. Another bundle of charging stations may be coming soon.

Metrics (0)

No metrics or performance measurement processes are in place. Success criteria have been discussed informally, but have not be firmly established.

Integration (0)

With no mission, integration of mission and goals is not possible.

Sustainability (1)

Efforts that are spearheaded by the City seem to be somewhat sustainable, though city budgets will always be a limiting factor. NRG Energy is doing incredible work in the Houston area, but as a private entity is less interested in developing a stakeholder group and engaging in time-consuming planning. Market factors may result in a successful program for NRG Energy – this program is the only one of its kind in the country – but this really only addresses infrastructure issues, so other focus areas may be overlooked.

Appendix B: Indianapolis, IN

Organization Name: Project Plug-IN

Website: www.projectplugin.com

Primary Contact: Tim Pulliam

Role: Project Manager

Organization: Energy Systems Network

Phone: (317) 532-4776

Mission:

“Project Plug-IN has three specific objectives that will each be implemented through ESN’s comprehensive collaborative systems approach.

1. “Plug-IN Commute: Deploy a fleet of AEDVs and supporting charging infrastructure to evaluate performance and operation in a variety of real-world commuting environments allowing manufactures to optimize cost and provide the desired performance to achieve mass market penetration among consumers.
2. “Plug-IN Fleet: Deploy a broad range of AEDVs and supporting charging infrastructure in centralized fleet operations to evaluate performance and operation of multiple vehicles platforms allowing manufactures to optimize cost and provide the desired performance to achieve mass market penetration in the fleet market.
3. “Plug-IN Support: Develop, deploy, and evaluate an array of supportive services (i.e. data management, public outreach, and sales and service readiness) that will accelerate plug-in technology development, commercialization, and enhance consumer interest.

“Achieving these objectives will advance the manufacturing and marketing of AEDVs, realize the full potential of smart grid utilities, and educate and convince consumers of the benefits of AEDVs and plug-in technologies. These achievements will accelerate commercialization and sales of AEDVs while reducing cost, improving system performance, and creating jobs.”

Stakeholder Involvement:

“To ensure the above efforts are well integrated and all planning and management decisions, including identification of criteria for, and creation of go/no-go decisions, interim milestones and success/failure metrics, are made with input and support from the collective Project Plug-IN partners, a set of project

management teams will be established to enable effective project management. Teams include: Leadership, Data Management, Technical/Engineering, Market Research/Public Outreach, These teams will meet as a group at least monthly for the first 12 months of the project and then at least quarterly for the duration of the initiative. The teams will be responsible for developing a comprehensive project plan that focuses on their respective area of expertise. These plans will build on and if necessary modify the tasks, milestones, go-no-go decision points, and deliverables laid out in this proposal. The individual team plans will be rolled up into an overall Project Plug-IN management plan that will be approved and overseen by the leadership team comprised of senior level executives from each partnering company.”

Partners include Duke Energy and Indianapolis Power and Light (utilities); Midwest ISO; Ener1 (industry); Itochu, Think, Smart, Nissan and Navistar (OEMs), Energy Services Network (cleantech industry group), Tom Wood Automotive Group (dealership), Simon Property Group (malls), State of Indiana and Indiana Office of Energy Development (state government); Purdue University; Greater Indiana Clean Cities Coalition; Indianapolis Convention and Visitors Association and Rocky Mountain Institute.

Focus Areas:

Electric Vehicle Cluster (4)

ESN, a cleantech industry group, manages Project Plug-IN. Economic development is a big reason for the project, and the only EVs now available in Indiana go through final manufacturing phases within the state.

Education & Outreach (2)

Haven't yet pushed outreach in a meaningful way, but are planning on doing so soon. Projects are focused on proof of concept, rather than outreach or education. Milestones do mention marketing campaign and public outreach.

Incentives (1)

Indiana offers no EV incentives, and Project Plug-IN does not focus on policy measures regarding incentives (though it may in the future). In early phases, the project received a couple of grants that are used for private vehicle rebates. The eventual goal is to have market-driven system that doesn't rely on government subsidies.

Public Infrastructure (5)

Goals are ambitious, and this is one of the primary focus areas of Project Plug-IN.

Private Infrastructure (5)

The project viewed permitting and inspections as an early challenge, and worked with local municipalities to streamline processes for installation permitting.

Grid Readiness (5)

Local utilities are IPL (owned by AES) and Duke Energy. Duke Energy is very EV-forward; IPL is an EEI member but is not ranked in the Oct. 2009 study.

Process Integration:

Mission (3)

Strong mission, explicit and widely published.

Goals (2) and Metrics (2)

Indianapolis' goals and metrics are as follows:

Milestones – Phase 1 (1.5 years, 10/1/2009-3/30/2011)	Expected Completion Date
1. Comprehensive Project Plug-IN implementation plan completed by management teams and approved by leadership team	April 1, 2010
2. Comprehensive and ongoing Project Plug-IN public outreach and marketing campaign implemented	August 1, 2010
3. 200 charging infrastructure sites installed to support initial deployment vehicles for Plug-IN Commute and Plug-IN Fleet	October 1, 2010
4. 100 AEDVs and supporting charging infrastructure deployed and operational in Plug-IN Fleet and Plug-IN Commute	December 31, 2010
5. Project Plug-IN data hub operational & accessible to the broader community of science	March 1, 2011
Milestones – Phase II(1.5 years, 4-1/2011-9/30/2012)	
6. 200 Nissan EVs sold in Indianapolis area market with sales accelerated by Project Plug-IN and coordinated dealer network	June 1, 2011
7. 500 or more AEDVs sold in the Indianapolis market	September 1, 2012
Milestones – Phase III (1 year, 10/1/2012-9/30/2013)	
8. 100 Bright Automotive IDEA PHEV vans deployed for use in Plug-IN Fleet	October 1, 2012
9. 3 PHEV shuttle buses deployed for use at Indianapolis International Airport as part of Plug-IN Fleet	October 1, 2012

10. 500 fully integrated and operation AEDV charging infrastructure sites supported by and smart grid intelligent utility network and transaction settlement system	May 1, 2013
11. Complete final project report and evaluation including AEDVs and supporting infrastructure technologies to minimize petroleum consumption and reduce greenhouse gas emissions	July 1, 2013
12. At least 1,000 AEDVs sold in the Project Plug-IN Indianapolis markets	September 1, 2013

Goals are time-bound and measurable, and link directly to mission. However, the goals may be overly specific (naming particular vehicles/technologies) and an inadequate proxy for the true objective (number of charging stations versus use rates, locations, etc).

Integration (1)

The integration of mission and goals could be better. There are no metrics to evaluate economic development, which was cited as the major goal of the initiative

Sustainability (3)

Project Plug-IN is independently organized through ESN, which itself grew out of the governor’s office. The sustainability of these efforts seems strong – there is no sunset on the existing efforts. Goals and milestones were recently revisited, and the project itself may soon be undergoing a major overhaul.

Appendix C: Orlando, FL

Website: www.plugandgonow.com

Primary Contact: John Parker

Organization: Orange County Government, Florida

Phone: (407) 836-1445

Organization Name: Get Ready Central Florida

Mission:

“To facilitate the adoption of electric vehicles in Central Florida by accomplishing these five key objectives:

1. “Facilitate stakeholder working groups to identify opportunities and explore/resolve issues and barriers associated with electrified transportation.
2. “Educate the community and promote networking opportunities in order to enhance the viability of plug-in electric vehicles.
3. “Establish sound infrastructure to deliver a network of charging stations that meet the needs of vehicle owners without jeopardizing the stability of the power grid.
4. “Develop relationships with manufacturers of vehicles and charging components to encourage their participation in the Central Florida market.
5. “Explore opportunities to enhance success through investments in research, development, and demonstration projects.”

Stakeholder Engagement:

Committee	Purpose	Representation
Steering	<ul style="list-style-type: none">• Provide oversight and guidance	<ul style="list-style-type: none">• Progress Energy (utility)• City of Orlando (municipal government)• Orlando Utilities Commission (PUC)• Orange County Government (county government)• Space Coast Clean Cities Coalition (non-profit)• Metroplan Orlando

Marketing and Education	<ul style="list-style-type: none"> • Develop relationships with Central Florida media interested in following the progression of GRCF, and submit articles and media releases tracking electric vehicle and infrastructure successes. • Develop an informative and user-friendly Web site with information about the new electric vehicles and charging stations. • Promote electric vehicle awareness through public outreach. • Generate interest among fleet managers, businesses, and rental car companies to purchase electric vehicles and promote organizations that have purchased vehicles and installed vehicle-charging stations. 	
Infrastructure	<ul style="list-style-type: none"> • Promote development of viable charging infrastructure in Central Florida through activities such as refining local codes and hosting workshops for electricians and building inspectors to expedite the permitting process. • Provide electric vehicle infrastructure information to government and commercial fleets. 	
Vehicle Planning	<ul style="list-style-type: none"> • Build a viable market and purchasing channels and facilitate product life-cycle and disposal planning. • Focus on appropriate vehicle standards and vehicle-to-grid communication protocols. 	<ul style="list-style-type: none"> • Fleet owners • Leasing companies/lenders • Dealerships • Manufacturers • Vehicle owners

Focus Areas:

Electric Vehicle Cluster (2)

There are no local vehicle manufacturers, but there are dealerships for NEVs. The economic development arises from the fact that Orlando has one of the largest rental car fleets in the nation. Local businesses are tourist destinations, and are vying for business – therefore, they have incentive to install charging stations. Hertz and Enterprise have committed to having 10% of their Orlando fleets be electric.

Education & Outreach (4)

Local governments are marketing in their own way – Orange County converted hybrids to plug-in hybrids and advertised on the sides of those cars. The media has been jumping on board due to high gas prices. There is a climate change display area at the Convention Center – visitors can see a charging station, low-speed EVs, solar panels, etc. The website has been a major breakthrough for outreach, and the group has a presence on Facebook and YouTube. Film students from the local university have been involved as well.

Incentives (1)

State energy office was giving \$5,000 for conversions with EPA-approved battery pack, but this was only available to business customers. No other purchase incentives, and no plans to put them in place.

Public Infrastructure (5)

Biggest focus of the project. ChargePoint America city.

Private Infrastructure (1)

Group worked to educate county and city permitting bodies on what these stations would be like. It is currently an online process which residents can complete in a week.

Grid Readiness (5)

Progress Energy serves the Orlando area, and has been involved in planning. The local utility is Orlando Utilities, which has also been very involved.

Process Integration:

Mission (3)

Strong, explicit mission that is widely published and available.

Goals (1)

According to phone interviews, the goal right now is to get charging stations placed – Orlando is a ChargePoint America city, and Orlando Utilities has offered to place 200 of the 300 charging stations. However, this goal is not published or available to the public, and is limited in scope.

Metrics (0)

No metrics for success are currently in place.

Integration (1)

Goals could be better linked to the mission, and metrics would be helpful.

Sustainability (1)

Process is managed by Orange County Government, but there is little structure for carrying the process forward and managing goals in a long-term sense. Most of the activity is centered around ChargePoint America work.

Appendix D: Raleigh, NC

Organization Name: NC Get Ready

Website: www.advancedenergy.org/transportation/programs_and_initiatives/nc_getready.php

Primary Contact: Rob Underhill

Role: Transportation Project Manager

Organization: Advanced Energy

Phone: (919) 857-9000

Mission:

“NC Get Ready goals:

- “Facilitate stakeholder working groups to identify opportunities and explore/resolve issues and barriers associated with electrified transportation.
- “Educate consumers on the viability of electric vehicles and hybrid plug-ins and overcome misconceptions or concerns that hinder the adoption of new technologies.
- “Establish sound infrastructure to deliver a network of charging stations that meets the needs of vehicle owners without jeopardizing the stability of the power grid.
- “Develop relationships with manufacturers of vehicles and vehicle components and ensure the availability of electric and plug-in hybrids in the North Carolina market.
- “Explore opportunities for economic development among vendors and manufacturers seeking a viable and forward-thinking location to grow their business.”

Stakeholder Engagement:

NC Get Ready is a coordinating body, rather than a group that sets the agenda or drives deployment of electric vehicles. The group coordinates a number of projects that tie into the larger goals.

Committee	Purpose	Representation
Steering	<ul style="list-style-type: none">• Provide oversight and guidance	<ul style="list-style-type: none">• Core team members• Subject matter experts• Government officials• Other relevant organizations• Cary, Chapel Hill, City & County of Durham

Infrastructure	<ul style="list-style-type: none"> • Support development of viable charging infrastructure • Mapping charging station locations across the region 	<ul style="list-style-type: none"> • Utilities • Construction • Transit • Architects • Engineers • City planners • Parking garage owners • Electricians • Business owners
Vehicle Facilitation	<ul style="list-style-type: none"> • Build a viable market and purchasing channels 	<ul style="list-style-type: none"> • Fleet owners • Leasing companies/lenders • Dealerships • Manufacturers • Vehicle owners
Vehicle Technologies	<ul style="list-style-type: none"> • Facilitate research and development of new or improved technologies 	<ul style="list-style-type: none"> • Researchers • Academics • Automotive manufacturers • Component manufacturers • Infrastructure component developers
Standards	<ul style="list-style-type: none"> • Quantify the issues and opportunities associated with drivers such as incentives and permits 	<ul style="list-style-type: none"> • Legislative bodies • State-level departments • City planners • Utilities • Universities

Focus Areas:

Electric Vehicle Cluster (2)

This is not really a strategic focus for the group – there is no specific work with the vehicle supply chain, though there is some work being done in coordination with three local charging station manufacturers.

Education & Outreach (3)

This will be managed by Advanced Energy (forums, etc.), slightly outside of the formal NC Get Ready structure.

Incentives (2)

There are currently no purchase incentives in the state of North Carolina. The group is working to put incentives into place, but this must take place at the state level.

Public Infrastructure (3)

Significant public infrastructure is not a strategic focus – they want enough to be visible, but want to promote home charging foremost.

Private Infrastructure (5)

The group is focusing on permitting and standards – reducing application-to-installation time from 3 days to 1 day. There is a newer focus on multi-family residential buildings, as well.

Grid Readiness (5)

Working with Duke Energy, Progress Energy, electrical cooperatives. Utilities are actively pursuing smart grid projects, including demand-side management in relation to EVs.

Process Integration:

Mission (3)

Strong, explicit mission, readily available to the public.

Goals (1)

Goals are related to permitting process and inspections – there are no concrete goals for number of charging stations or number of vehicles on the road. The group takes the approach that they are creating the channels for EV deployment, if people are interested in the technology, rather than driving deployment. However, goals for education and outreach, for example, could be helpful.

Metrics (0)

No metrics for measuring success are in place.

Integration (2)

Decent integration between mission and goals, though both could be expanded in scope.

Sustainability (3)

The group identified a need for, and subsequently established, a password-protected communication portal where documents and plans can be shared online, so that smaller NC towns can eventually take advantage of NC Get Ready's learnings.

Appendix E: Portland, OR

Organization Name: Transportation Electrification Executive Council

Website: <http://www.orsolutions.org/statewide/electrification.htm>

Primary Contact: John MacArthur

Role: Sustainable Transportation Program Manager

Organization: Oregon Transportation Research and Education Consortium

Phone: (503) 725-2866

Mission: “Establish Oregon as the leader in transportation electrification and seize economic development opportunities by demonstrating a robust early adoption market and integrating Oregon business.”

Areas of Strategic Focus:

1. Strong public awareness and acceptance of transportation electrification
2. Necessary and appropriate charging infrastructure
3. Policy support for financial incentives and a streamlined regulatory process
4. Strong national and international partnerships
5. Support for existing and developing companies
6. Meeting Oregon's greenhouse gas reduction targets

Stakeholder Engagement:

Executive Council Members	
Jeff Cogen	Multnomah County
Charlie Allcock	Portland General Electric
Pat Egan	Pacific Power
David Mayfield	ECotality
Jerry Berger	Salem Electric
Betsy Boyd	University of Oregon
Duncan Wyse	Oregon Business Council
Robert Waterhouse	Entek
Thomas Brookes	Attorney
Lisa Adatto	Climate Solutions
Bob Acheson	Barefoot Motors

Ex-Officio Council Members	
Gail Achterman	Oregon Transportation Commission
Adam Bless	Oregon PUC
Tim McCabe	Business Oregon
Scott Simms	Bonneville Power Administration
Bob Repine	Oregon Dept of Energy
Ray Baum	Oregon PUC

Council Support	
Warren Fish	Multnomah County
George Beard	Portland State University
Chris Warner	Oregon Dept of Transportation
John MacArthur	Ore. Transportation Res. and Ed. Consortium
Art James	Oregon Dept of Transportation
Rick Wallace	Oregon Dept of Energy
Mark Brady	Business Oregon

Focus Areas:

Electric Vehicle Cluster (4)

Part of the Strategic Areas of Focus; Drive Oregon is very active with the TEEC.

Education & Outreach (3)

EVRoadmap.com is a good start, but more education and outreach is recommended.

Incentives (3)

Of the benchmarking cities, only Portland is in a state with state-level EV purchase incentives (\$1500 for a vehicle and \$750 for an in-home charging station). However, among states with purchase incentives, Oregon is on the lower end of the spectrum.

Public Infrastructure (5)

Connection with The EV Project helps, and public infrastructure is a big focus of the project.

Private Infrastructure (5)

Portland has a best-in-class process for permitting approval via the state’s minor label program, which allows permitting for up to 10 homes at a time by one installer.

Grid Readiness (5)

Portland General Electric is very involved in the planning process, and was ranked quite high on the EEI study, despite being about one-quarter of the size of Duke Energy.

Process Integration:

Mission (3)

Strong mission, explicit, and well-discussed over several months.

Goals (2) and Metrics (2)

Goals and metrics are in development – a draft is shown here, but the deliberative process has been well-received.

Metric	Current Measure	2015 Goal
Plug-in Electric Vehicles (PEVs) in Oregon a. Total Number b. PEV Vehicles/Total Registered Vehicles c. Fleet (government and private)	Not Currently Available	<i>(placeholder until analysis can be completed)</i> a. 18,000 registered PEVs b. 0.5% c. 12,500 registered PEVs
PEV Customer Satisfaction a. Vehicle b. User Experience	Not Currently Available	a. 90% Satisfaction b. 90% Satisfaction
Number of jobs in PEV industry companies	To be developed in coordination with Drive Oregon/Business Oregon	Increase in PEV related jobs
GHG reduction levels related to electrification	Under development	Reduced levels consistent with Oregon's GHG reduction goals
Oregon's net import/export of fuel dollars	Net Export of \$6.2 Billion	Measurable reduction in Net Export of fuel dollars

Integration (2)

Some parts of mission (national and international partnerships, for example) are not borne out in the goals and metrics.

Sustainability (2)

Sunset timeline on the TEEC's work is unknown, and it's not clear who will carry the work forward in the future. That being said, the authority from the state level is helpful to sustainability of efforts.

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