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## Executive Summary *of the* Texas River Cities Plug-in Electric Vehicle Infrastructure Plan

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## **CONTENTS**



### **PG / 02**

Introduction to the Texas River Cities  
Plug-in Electric Vehicle Initiative Plan

### **PG / 04**

Benefits of Plug-in Electric Vehicles

### **PG / 08**

Plug-in Electric Vehicles in the Region

### **PG / 10**

Texas River Cities Region

### **PG / 12**

Key Findings and Recommendations

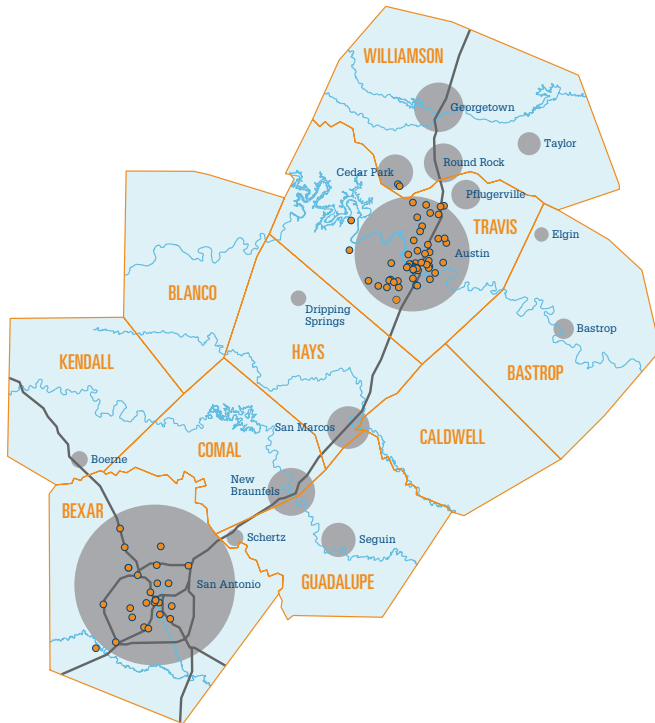
### **PG / 15**

Steps Forward

### **PG / 16**

Acknowledgments

The TRC Region (see pg. 11)



## Welcome

### Austin Energy® has a Strong Commitment to Plug-in Electric Vehicles



Austin Energy is proud to present the Texas River Cities (TRC) Plug-in Electric Vehicle (PEV) Infrastructure Plan.

The TRC vision is to develop a convenient, dependable charging infrastructure network

for the widespread deployment of plug-in electric vehicles throughout the Central Texas region, including Austin and San Antonio. The TRC Plan outlines concrete steps we can take to promote PEV adoption. This in turn reduces the use of imported oil in exchange for domestically produced electricity, strengthens the local economy, promotes energy security and improves air quality.

Austin Energy is a recognized national leader in demonstrating clean energy generation, energy efficiency programs and electric transportation initiatives. The Austin community recognizes the utility, environmental, and energy security benefits of plug-in electric vehicles. The national Electric Drive Transportation Association recognized Austin as a top “plug-in ready” city in the United States due to infrastructure already installed and utility programs which signal our commitment to PEV adoption. As an example, the Austin Energy Plug-in EVerywhere™ network includes over 110 public-access charging stations that are powered with 100% renewable energy through Austin Energy’s GreenChoice® program, the most successful voluntary green energy sales program in the nation.

In addition, Austin Energy is a founding partner of Pecan Street Inc. and its smart grid demonstration project in Austin. We collaborate with numerous clean technology research and development organizations, such as CleanTX Foundation, Center for the Commercialization of Electric Technologies, Austin Technology Incubator and Clean Technology and Sustainable Industries Organization to identify the most cost-effective, sustainable methods of producing and providing energy to our customers.

Thanks to the outstanding support from TRC partner utilities, local governments, universities, industry advisors, consumers and all those who are working to enable the PEV market. The city and the region now have an action plan supporting the widespread deployment of PEVs.

**Larry Weis**  
General Manager, Austin Energy

## Introduction to the Texas River Cities Plug-in Electric Vehicle Initiative Plan

The City of Austin is a national leader in promoting and supporting initiatives contributing to the advancement of plug-in electric vehicles (PEV) and charging infrastructure. Intelligent integration of PEVs with the electric system ensures Austin Energy can maintain its excellent operational reliability and provide a cost-effective and stable transportation fuel alternative.





Austin Energy is the prime recipient of Department of Energy funding and has successfully led an infrastructure planning process called the Texas River Cities Plug-in Electric Vehicle Initiative. The key deliverable of the TRC PEV Initiative is an approximately 500- page report (the TRC Plan) that can be downloaded from [www.texasrivercities.com](http://www.texasrivercities.com).

The TRC Plan represents one of the most comprehensive Electric Vehicle Supply Equipment (EVSE) infrastructure assessments to date in this industry. It is a regional/ community-based infrastructure readiness plan, providing a series of templates and tools that can be adopted by and adapted to any region or community in the country.

This executive summary highlights key components of the TRC Plan. The full report identifies, assesses and summarizes key

stakeholders' ongoing activities and future needs critical to successful PEV adoption.

Austin Energy is able to deliver this federally supported plan due to the outstanding support and contributions from TRC partner utilities, local and state governments, universities, industry advisors, PEV drivers and all those who support the PEV market.

### What are Plug-in Electric Vehicles?

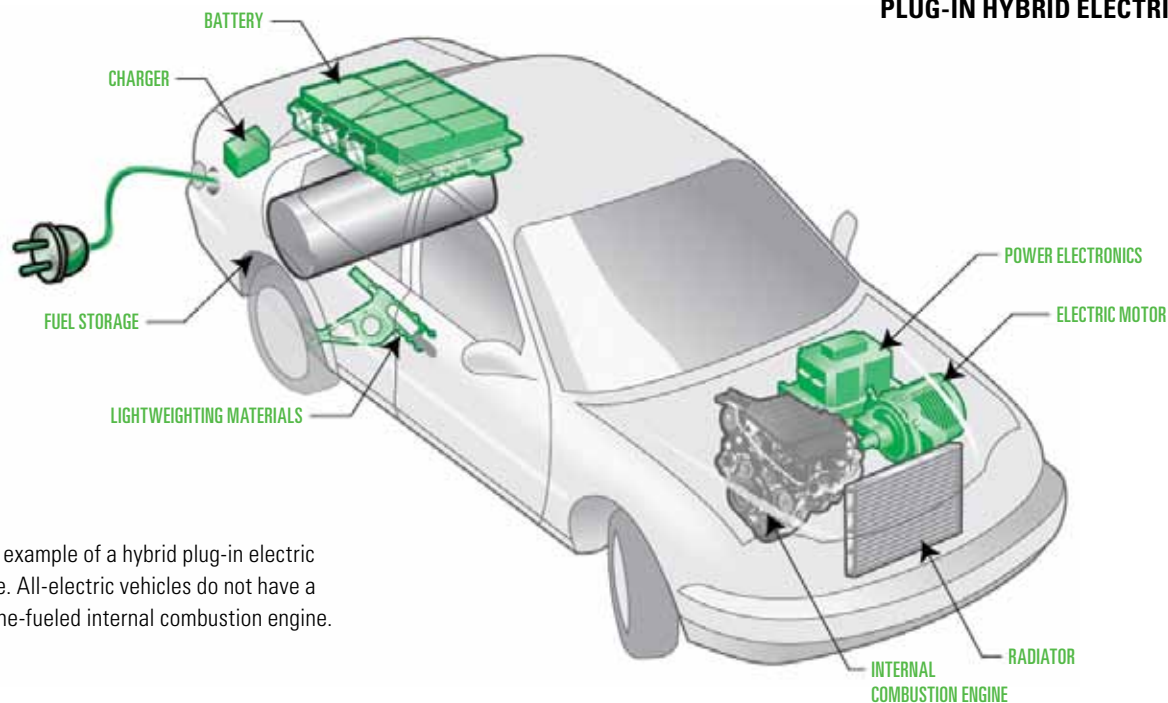
Hybrid and PEVs use electricity to charge large battery packs that power an electric motor. PEVs may plug into any power outlet or connect to special equipment that allows for a faster charging rate.

PEVs have the potential to double a home's electricity usage while at the same time presenting an opportunity for managed

charging programs. Managed charging, or "smart" charging programs, can reduce costs by ensuring that vehicle charging occurs at times when electricity prices are lower, for example overnight.

Electric drive vehicles have great potential to reduce U.S. petroleum imports, improve air quality, improve utility operations and support a healthy economy by stabilizing transportation costs and promoting job growth. The U.S. Environmental Protection Agency rates all-electric vehicles as zero-emission.

**ELECTRIC DRIVE VEHICLES  
HAVE GREAT POTENTIAL TO  
REDUCE U.S. PETROLEUM  
IMPORTS, IMPROVE AIR  
QUALITY, IMPROVE UTILITY  
OPERATIONS AND SUPPORT  
A HEALTHY ECONOMY.**



**PLUG-IN HYBRID ELECTRIC VEHICLE**

Visual example of a hybrid plug-in electric vehicle. All-electric vehicles do not have a gasoline-fueled internal combustion engine.

# Benefits of Plug-in Electric Vehicles

## Energy Security

Today, cars depend almost entirely on petroleum. The transportation sector accounts for two-thirds of total petroleum consumption for the U.S. In order to meet the demand, the U.S. imports over 45% from foreign countries.

Much of the world's petroleum reserves are located in politically volatile countries, making the price of it unstable due to potential supply disruptions. PEVs can help the United States become more energy independent as a vast majority of U.S. electricity is domestically produced from coal, nuclear, natural gas and renewable sources.

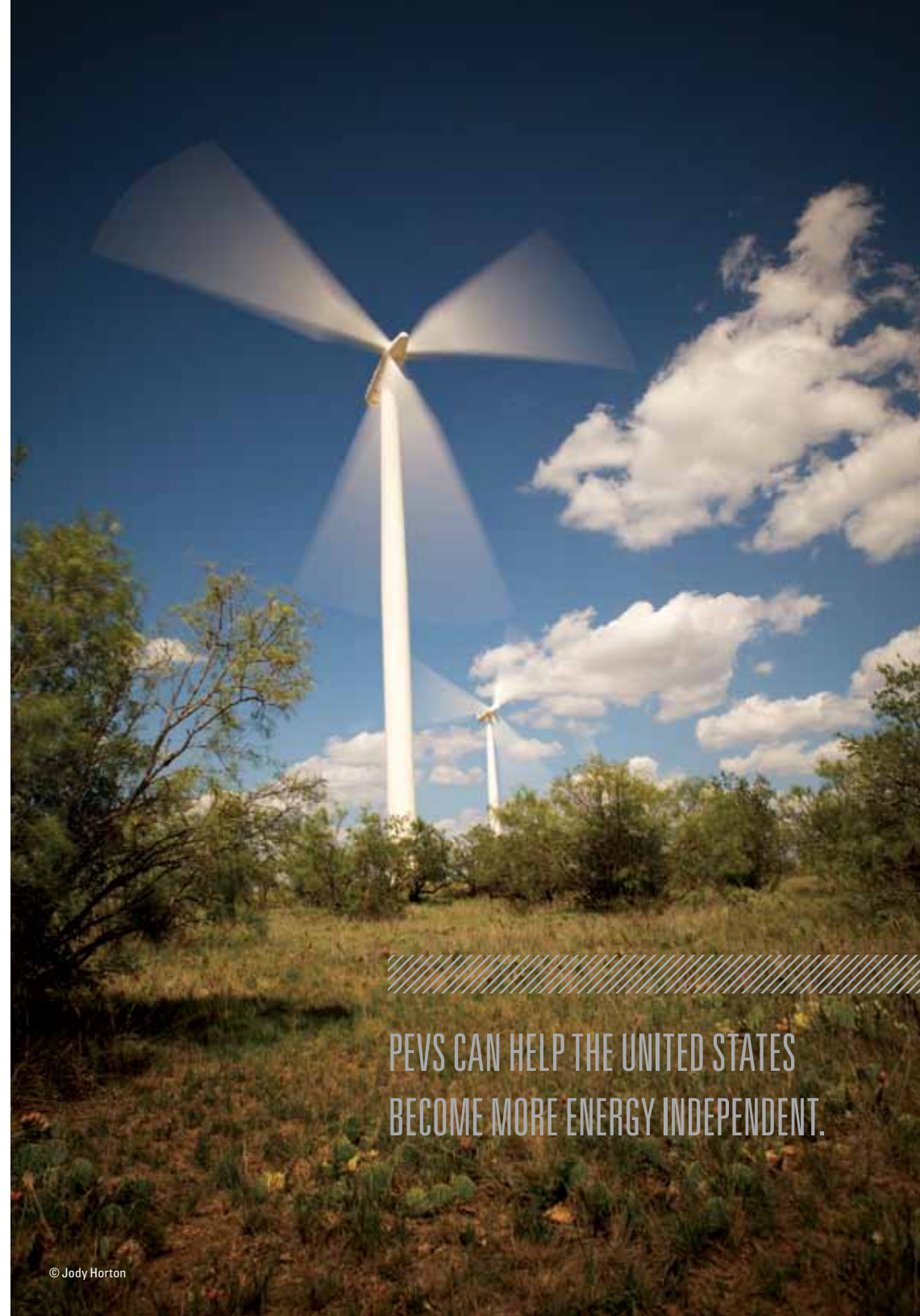
## Air Quality

PEVs produce much lower emissions than conventional vehicles. Conventional vehicle emissions produce greenhouse gases, primarily carbon dioxide, which are harmful to human health and contribute to climate change.

Hybrid vehicles, when in all-electric mode, produce neither tail pipe emissions nor use oil. According to the 2012 Union of Concerned Scientists' report, titled "State of Charge," plugging in a PEV to the grid produces fewer global warming emissions than operating a conventional vehicle.

Market forces, such as the declining price of natural gas, wind, and solar as well as regulatory policies, such as state renewable portfolio standards, are driving the electricity grid to be cleaner and operate more efficiently over the next decade. As opposed to petroleum, electric generators use a mix of fuels that offer a cleaner alternative with a continuous trend of improvement projected for the future.

In Austin, charging stations in the Austin Energy Plug-in EVerywhere™ network are powered with renewable energy through Austin Energy's GreenChoice® program.



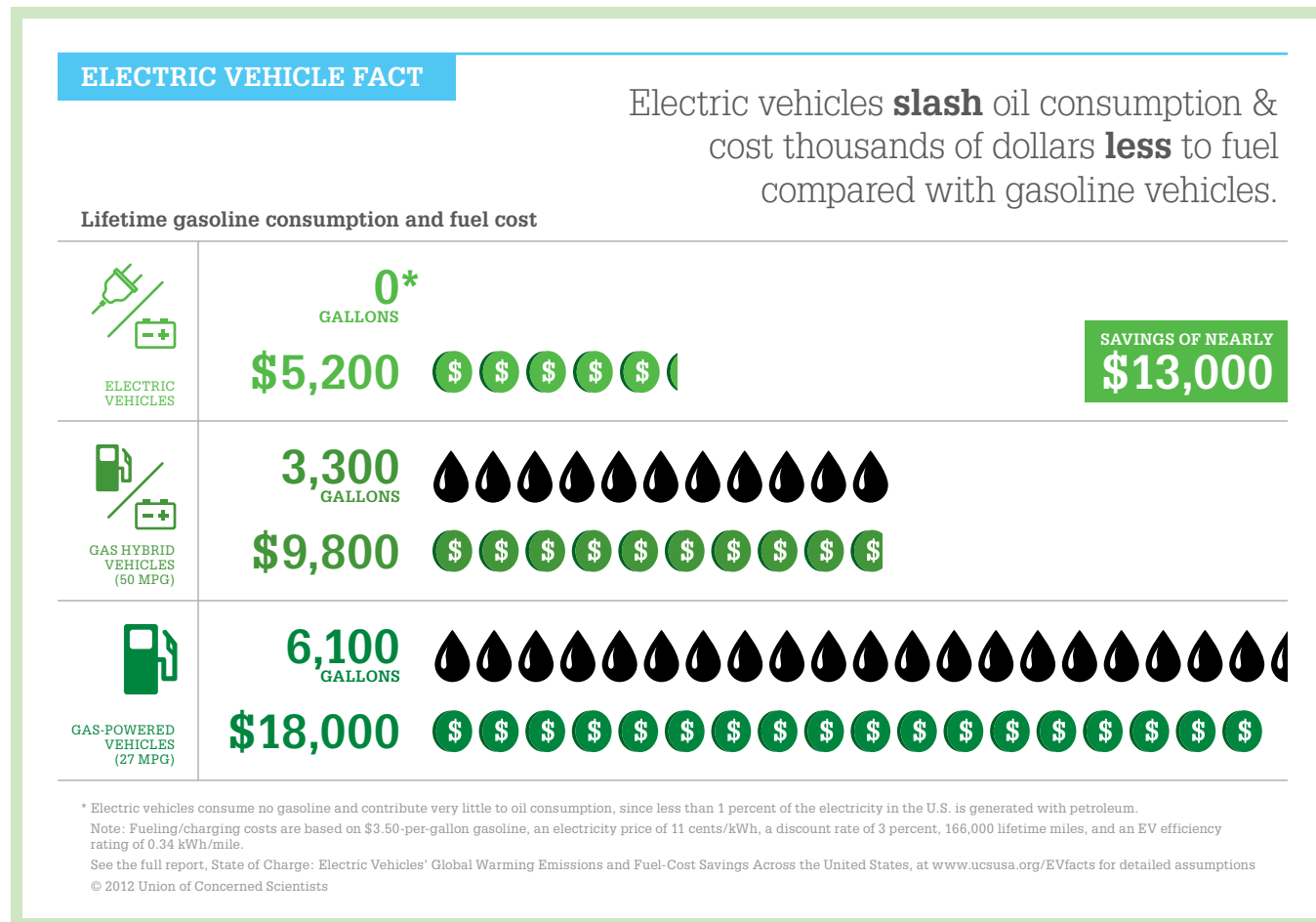
PEVS CAN HELP THE UNITED STATES  
BECOME MORE ENERGY INDEPENDENT.

## Economic Growth

PEVs significantly reduce fuel costs for households. The U.S. Department of Energy finds that PEVs cost only three to five cents per mile in electric mode. In comparison, a gasoline car with a fuel economy of 27.5 mpg costs about 14 cents per mile. The Union of Concerned Scientists (2012) calculated the annual savings for a household using a PEV in the Austin area as \$1,020 when compared to a 27 mpg gasoline vehicle.

In 2008 the United States spent \$400 billion on transportation fuel from imported petroleum. By utilizing domestically generated energy to power vehicles, the U.S. can significantly reduce the amount of money sent overseas while stabilizing domestic transportation costs.

Additionally, the Center for Climate and Energy Solutions found “the design and manufacture of new vehicles, including PEVs, has created thousands of jobs in the United States.” Research and development used to advance the vehicle market in the U.S. can help stimulate the national economy.



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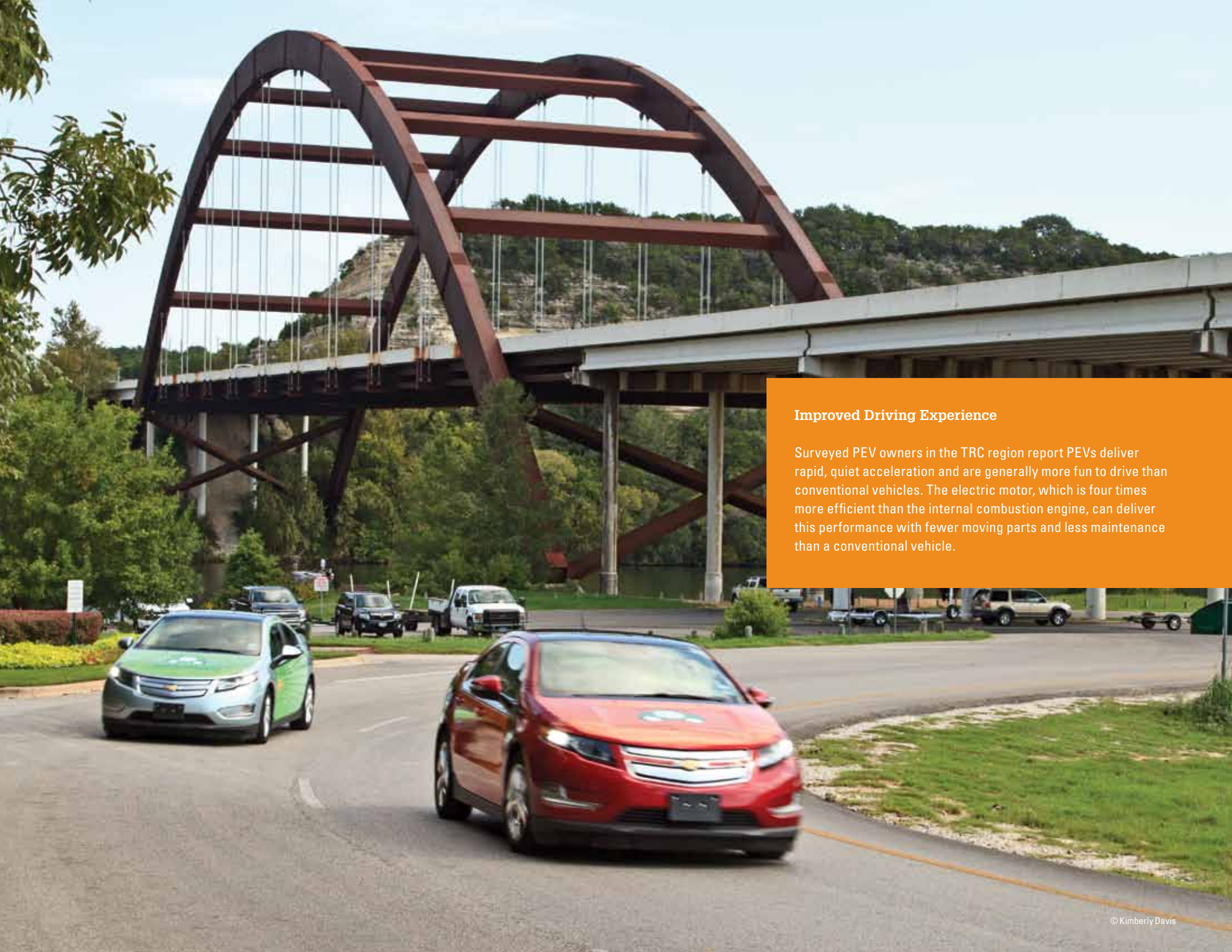
### **Convenience**

The 2012 TRC PEV Owners Survey, located within Section 2 of the full report, finds approximately 90% of drivers prefer to charge at home. Home charging and charging at work is available wherever the electricity grid extends; one simply needs an available electrical outlet.

Anecdotally, surveyed PEV owners who are often asked how long it takes to charge the vehicle battery, report "it only takes 15 seconds to get out and plug-in my car. The car takes care of the rest while I'm at home at night or at work during the day; it will even text me when the battery is full."

TRC partner utilities offer incentive programs to improve charging accessibility for customers living in a single family residence and are working on ways to provide incentives for multifamily properties, as further explored in Section 4 of the full report.





### Improved Driving Experience

Surveyed PEV owners in the TRC region report PEVs deliver rapid, quiet acceleration and are generally more fun to drive than conventional vehicles. The electric motor, which is four times more efficient than the internal combustion engine, can deliver this performance with fewer moving parts and less maintenance than a conventional vehicle.



## Plug-in Electric Vehicles in the Region

### National and TRC Region Market for Plug-in Electric Vehicles

Every major automaker has announced plans to offer a PEV by the end of 2013. Automakers sold approximately 17,000 PEVs in the U.S. in 2011 and are on track to sell an additional 34,000 in 2012. Automakers continue to experiment with different vehicle options, such as battery size and electric range, to meet consumer demands.

According to industry experts surveyed by TRC, the TRC region is projected to have 4,259 PEVs in 2015 and 17,336 in 2020. See Sections 5 and 8 of the full report for further details.

### Charging station availability in the TRC region

There are currently 239 utility-operated publicly accessible charging stations in the TRC region in addition to privately owned stations. PEVs can also plug into any electrical outlet, meaning that charging opportunities are as available as the reach of the electric grid.

EVERY MAJOR AUTOMAKER HAS  
ANNOUNCED PLANS TO OFFER A  
PEV BY THE END OF 2013.

Nissan Leaf charging at Howson Library in Austin, Texas. The charging station is co-located with solar energy panels.







## Potential for Market Adoption

The PEV market has the potential to grow rapidly. As reported by Bloomberg New Energy Finance's Advanced Transportation Insight Service Overview (2012), "increasing oil costs, emissions targets and the

**RAPIDLY MATURING TECHNOLOGIES AND DECREASING COSTS FORESHADOW THE COMING TO MARKET OF ELECTRIC VEHICLES.**

desire to reduce dependency on foreign oil as well as heightened consumer environmental awareness are driving the demand for lower-emission transportation. Simultaneously, rapidly maturing technologies and decreasing costs foreshadow the coming to market of electric vehicles suitable for widespread adoption."

The July 2012 McKinsey Quarterly "Battery Technology Charges Ahead," states the price of lithium-ion batteries will continue to drop through 2020 making PEVs cost competitive and a real option to rising gasoline costs.

## Austin Area

The City of Austin and its community-owned electric utility, Austin Energy, are recognized national leaders in demonstrating innovative green building programs, resource conservation initiatives, sustainable community development, renewable energy generation and transportation electrification.

Austin Energy's Plug-In EVerywhere™ program offers PEV owners in its service area a rebate of 50% of the cost of the purchase and installation of a Level 2 charging station (allowing faster charging times). The utility also operates the Plug-In EVerywhere™ network that is powered with renewable energy.

Austin Energy is working with stakeholders to install privately-owned stations at retail premises, workplaces, and multifamily sites that connect to the Plug-in EVerywhere™ network. Austin Energy will apply the lessons learned from the TRC Plan to enhance existing programs.





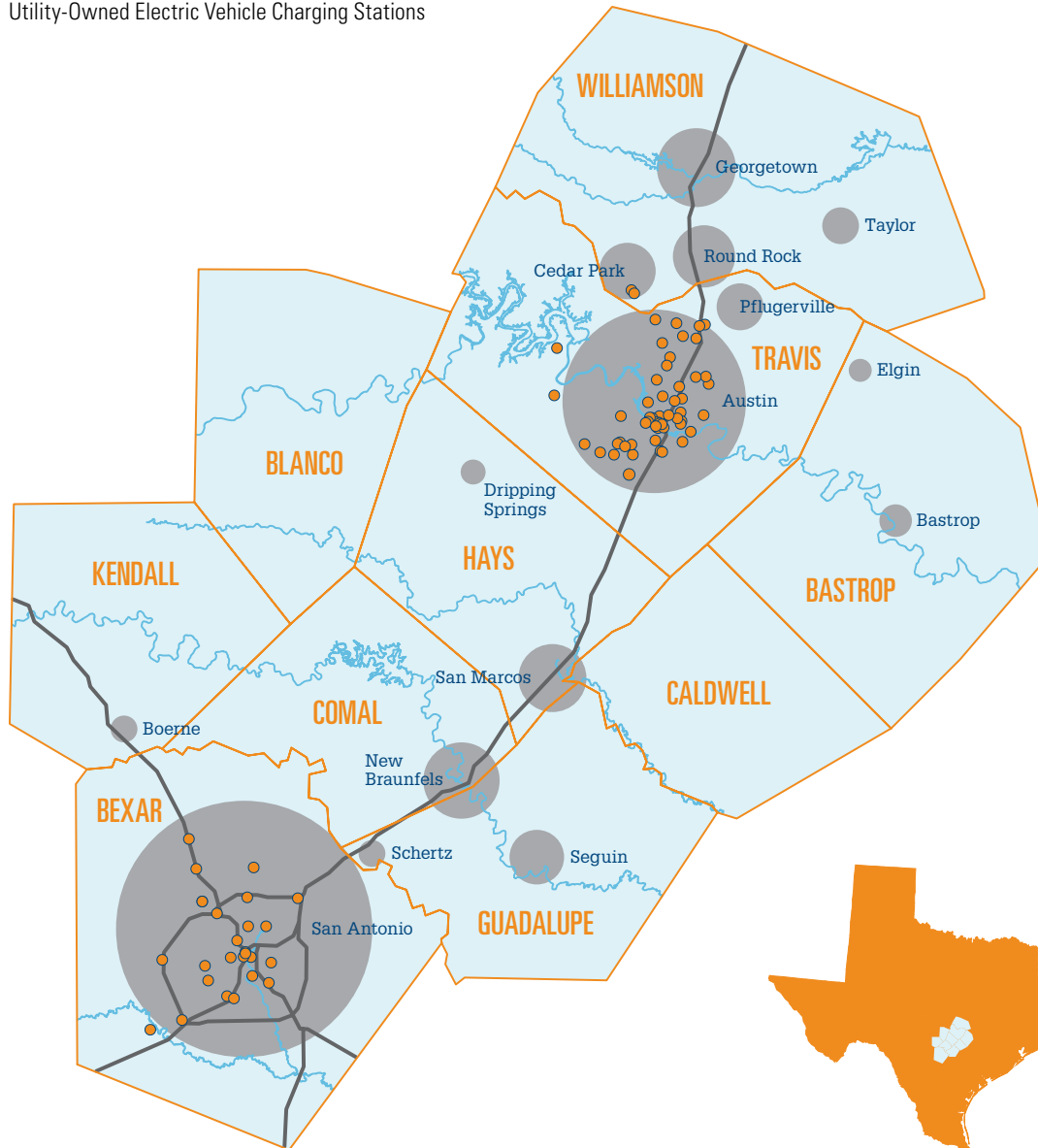


## Texas River Cities Region

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The TRC region includes ten counties with nearly four million people. The majority of the TRC region is served by publically-owned utilities: Austin Energy, CPS Energy, Bluebonnet Electric Cooperative and Pedernales Electric Cooperative. The TRC Plan findings and recommendations are particularly relevant to public power entities, but provide a template for any community interested in supporting PEV adoption.

● Utility-Owned Electric Vehicle Charging Stations



**THE STRENGTH OF THE TRC PLAN IS DERIVED FROM THE BREADTH OF ANALYSES AND THE DIVERSITY OF ITS CONTRIBUTORS.**

The purpose of this project is to identify, assess, and summarize key stakeholders' ongoing activities and future needs critical to successful PEV adoption. The resulting report, which can be downloaded at [www.texasrivercities.com](http://www.texasrivercities.com), details an action plan addressing infrastructure needs and policy changes to support the adoption of PEVs. The TRC Plan can be adapted and tailored to fit other regions. It includes needs analysis, best practices, and stakeholder tools to develop the PEV market in the TRC region. The TRC Plan is composed of:

1. Needs Analysis, Typology and Best Practice Guide
2. Electric Vehicle Supply Equipment Codes, Ordinances, and Permitting Toolkit
3. Workplace and Multifamily Housing Issue Identification
4. New Utility Business Models with Third-Party PEV Infrastructures
5. EVSE Technology Interoperability Roadmap
6. Communications Plan
7. Projection of PEV Market Penetration for the TRC Region
8. Creation, Administration, Growth of Texas River Cities Initiative
9. Market Research Surveys and Results

The strength of the TRC Plan is derived from the breadth of analyses and the diversity of its contributors. A total of 69 individuals representing 51 companies volunteered their time and effort to assist in the process. TRC collected data from six surveys, incorporating over 1,000 PEV industry stakeholders and experts.

## Key Findings and Recommendations

This Plan represents one of the most comprehensive Electric Vehicle Supply Equipment (EVSE) infrastructure assessments to date in our industry. Stakeholders identified the components for a roadmap leading to the wide-spread adoption of PEVs for one of the most innovative energy service corridors in the country. Throughout the course of the project several themes repeatedly emerged from stakeholders and research.

### Key Findings

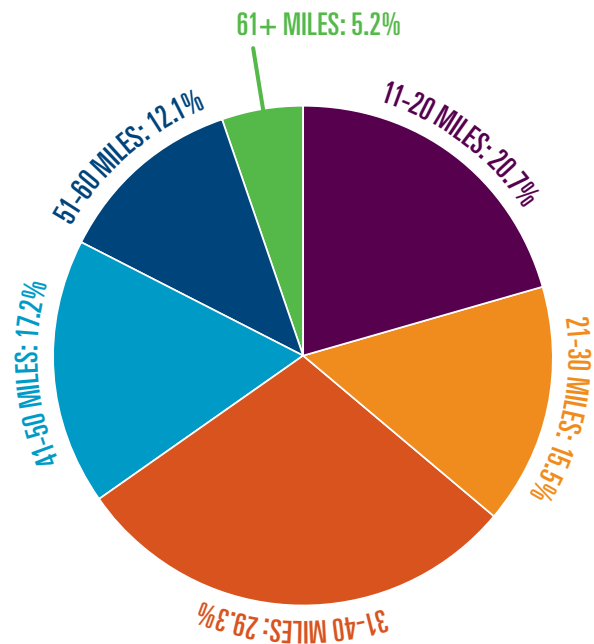
- 1. PEVs are viable in Central Texas now and are fun to drive.** As supported by the PEV owners survey conducted during the planning process, PEV drivers are not sacrificing trip mileage to drive the majority of their miles in electric mode. The PEV owners survey confirms that owners enjoy driving PEVs and appreciate the vehicle's quiet, rapid acceleration. As more models come on to the market, consumers will have more choices and price points to meet their demand. TRC partners expect increased adoption as vehicle availability becomes more uniform.
- 2. PEVs will become price competitive.** A recent McKinsey study forecasted declining battery costs combined with a \$3.50 or more per gallon of gasoline price will make PEVs a more economical choice in years ahead. Price parity with conventional vehicles – the single biggest determinant of future market adoption – and/or attractive lease options will help increase market share, particularly if gas prices continue their upward trend.

- 3. Charging infrastructure needs to be seamless and easy to use.** Stakeholders identified a clear need for a convenient network of charging infrastructure throughout the TRC region. Utilities have made initial investments in publicly accessible infrastructure through support from the U.S. Department of Energy. Absent additional federal incentive programs, future EVSE installations need to be market-driven, particularly in the areas of charging at workplaces and multifamily properties. Public/private partnerships between utilities, property managers and infrastructure providers are essential. Furthermore, EVSE should have a common payment system as a convenience to PEV owners throughout the TRC region.

- 4. Utilities need to monitor EVSE demands and potential impact on the grid as PEV adoption increases and faster charging technologies become available.** At this time, partner electric utilities report no major grid impacts due to PEV adoption. Off-peak capacity is more than adequate to support the emerging PEV market. However, charge management programs and policies will become crucial as the Electric Reliability Council of Texas market does not have the reserve capacity to support future widespread on-peak charging. As for potential grid issues, utilities will monitor the installation and usage of EVSE and the impacts on distribution grid operations. New Fast-Charge technologies may also cause localized grid impacts; therefore, utilities will want to monitor the evolving EVSE technology landscape closely.

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### AVERAGE DAILY MILES TRAVELED FOR PLUG-IN ELECTRIC VEHICLE DRIVERS



20.7%



17.2%



15.5%



12.1%



29.3%



5.2%



According to the Environmental and Energy Study Institute, electric vehicles with a range of 60 miles can satisfy 83% of daily travel needs for drivers. Further details about this chart can be found in the full report.



**TRC stakeholders support the following key recommendations:**

TRC efforts are funded through June 2013, using DOE Award FOA-451. TRC will seek additional funding prior to committing to the TRC Plan’s recommendations.

**1. TRC stakeholders recommend establishment of the TRC initiative as a formal entity.** The entity will review the plan outlined in the report, adopt plan elements, and pursue implementation of those elements and recommendations. Continuation and implementation of the TRC objective will help facilitate widespread adoption of PEVs in the region through the adoption of interoperable equipment and complementary policies across the region.

**2. To build consumer confidence in PEV technologies, TRC will launch an education and outreach campaign.** The campaign objective is to reveal PEVs as fun, attractive and a reliable option for Central Texans. It will educate primary and secondary audiences identified in the communications plan, which is part of the full report, on how local communities can support PEVs. The campaign will also promote the regional economic benefits of PEVs.

**3. TRC will support and promote PEV rebates and other incentives.** Price parity of PEVs with conventional vehicles is the single biggest factor influencing PEV adoption according to the research completed as part of the full report. Until

economies of scale result in lower prices, incentives are needed to accelerate adoption. TRC will work with entities across the region to influence local support and subsidization of PEVs and related infrastructure to help bridge the price parity gap. TRC will solicit federal funds as appropriate and available.

**4. TRC will work with stakeholders to develop programs and incentives targeting charging infrastructure at multifamily properties and workplaces.** Regional surveys conducted indicate modest interest in PEVs among multifamily tenants. Surveys additionally show that, second to home recharging, PEV owners are most likely to charge their vehicles at work (see pg. 14). Providing education and training to apartment managers, property owners, and employers will increase the potential for EVSE installations at these sites. TRC and its partner utilities may also accelerate

experience and acceptance of EVSE by implementing pilots at these locations. Developing a “PEV-Ready” real estate certification program within the TRC region may also provide the impetus for workplaces and multifamily properties to install EVSE.

**5. TRC will address challenges of charging infrastructure interoperability throughout the TRC region.** PEV owners expect readily available access to EVSE infrastructure allowing them to fuel their vehicles wherever they drive. Furthermore, they expect the charging process to be essentially the same. Currently, there are multiple EVSE providers with proprietary systems installed throughout the United States; a PEV owner may have to be a member of multiple systems to charge his/her PEV across the region. This issue must be resolved to ensure the growth and regional economic benefits of PEVs. Therefore the TRC will:

» **Pursue development and execution of a regional PEV charging infrastructure reciprocity agreement between participating utilities.** Interoperability is a key issue that must be addressed through industry and government action to lower electricity costs and make charging customer friendly.

» **Develop general functional and technical requirements for EVSE equipment and applications.** These requirements will allow for interoperability of devices, systems and applications that will be installed in the TRC region.

A summary of all recommendations developed can be found in Appendix A of the full report, [www.texasrivercities.com](http://www.texasrivercities.com).



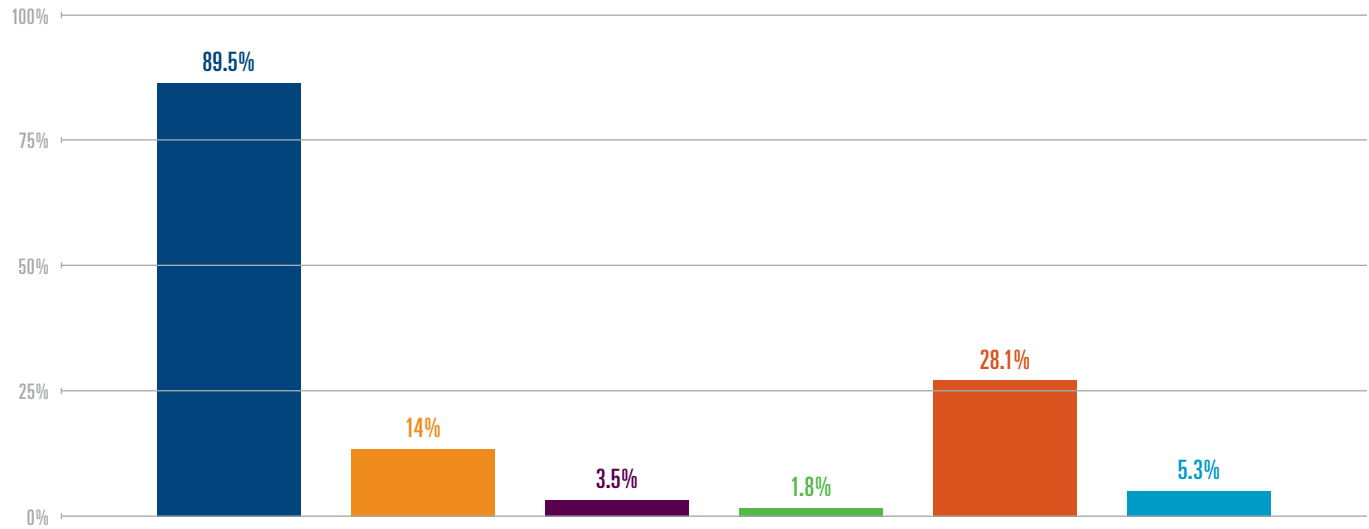
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### PEV DRIVERS CHARGE THEIR VEHICLES AT THE FOLLOWING LOCATIONS\*:

- At home with a charging station
- At home plugged into a standard 110 volt electric outlet
- At work plugged into a charging station
- At work plugged into a standard 110 volt electric outlet
- Public Charging Stations (i.e. grocery stores, etc.)
- Other

\*Drivers selected all locations that apply



Further details about this chart can be found in the full report.



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## Steps Forward

TRC stakeholders will vote on creating a formal TRC entity. Austin Energy, as the grant recipient, will begin implementation activities outlined in the full report:

- » **Marketing Communications** — TRC will develop and distribute marketing collateral to multifamily properties, workplaces and auto dealerships in the region
- » **Business Models** — TRC will develop and conduct business model and scenario analysis, explore opportunities for public Level 1 charging and support Electric Reliability Council of Texas efforts on PEV charge management
- » **Interoperability** — TRC will develop recommendations to facilitate a seamless electric vehicle charging experience throughout the region





## Acknowledgments

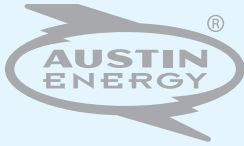
The Texas River Cities Plug-in Electric Vehicle Initiative would like to thank the U.S. Department of Energy for the award and support of this project funded through a Clean Cities grant awarded to Austin Energy under FOA-000451.

TRC appreciates the time and effort from stakeholders representing the companies listed below, who worked diligently to make this report possible. Over the course of the project, the following organizations contributed to the project deliverables:

- » Alamo Area Council of Governments (AACOG)
- » AMLI Residential
- » Austin Apartment Association
- » Austin Energy
- » Austin Technology Incubator's Clean Energy Incubator
- » Better Place
- » Bluebonnet Electric Cooperative
- » Capital Area Council of Governments (CAPCOG)
- » Capital Area Metropolitan Planning Organization (CAMPO)
- » Center for the Commercialization of Electric Technologies (CCET)
- » Central Texas Clean Cities
- » ChargePoint (formerly Coulomb Technologies)
- » The City of Austin, including the Sustainability Office
- » The City of San Antonio, including the Office of Environmental Policy (OEP)
- » CPS Energy
- » EATON
- » ECOtality
- » Electric Reliability Council of Texas (ERCOT)
- » Environmental Defense Fund (EDF)
- » Environment Texas
- » EV Autos Texas
- » Ford Motor Company
- » Gables Apartments
- » General Electric (GE)
- » General Motors (GM)/Chevrolet
- » Good Company Associates, Inc.
- » Greater Austin Chamber of Commerce
- » Greater Austin-San Antonio Corridor Council
- » GRIDbot
- » Gulf States Toyota
- » Hubbell Wiring Device-Kellems
- » ICF International
- » Liberty PlugIns, Inc
- » Mission Verde Alliance
- » New Braunfels Chamber of Commerce
- » Nissan
- » NRG Energy
- » Oncor Electric Delivery Company
- » Pecan Street, Inc.
- » Pedernales Electric Cooperative
- » Plug-In Texas
- » Potential Difference
- » Pvilion
- » SAIC
- » Southwest Research Institute (SwRI)
- » Texas Commission on Environmental Quality (TCEQ)
- » Texas Department of Transportation (TxDOT)
- » Texas Military Forces
- » Travis County
- » Tuttle Consulting
- » University of Texas-Austin
- » University of Texas-San Antonio (UTSA)
- » U.S. Green Building Council (USGBC) – Balcones Chapter
- » Verdek
- » Via Motors

## Resources

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