HOUSTON'S ELECTRIC VEHICLE REVOLUTION STARTS HERE.

# ELECTRIC VEHICLE ROADMAP

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EVOLVE HOUSTON



# EVOLVE HOUSTON IS UNIQUELY SITUATED AT THE HEART OF TRANSPORTATION ELECTRIFICATION WITHIN THE ENERGY CAPITAL.

Evolve Houston is a public-private coalition that convenes public entities, industry, and community residents to accelerate EV adoption and deliver real benefits to society through the shared values of environment, economy, and equity.

Together with the leadership and collaboration of Evolve's member organizations, Evolve is working to improve air quality and reduce GHG emissions throughout the Greater Houston area.

**FOUNDING MEMBERS**

City of Houston Texas · CenterPoint Energy · University of Houston · nrg · Shell

**MANAGED BY**

LDR Advisory Partners

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# INSPIRED BY A VISION, MOTIVATED BY A RESPONSIBILITY.

Inspired by a deep commitment to the health and well-being of all local residents, Mayor Sylvester Turner has championed bold action to improve air quality and reduce greenhouse gas (GHG) emissions in Houston. Recognizing transportation as a key opportunity area, Mayor Turner, in Houston's Climate Action Plan, called for the creation of a public-private partnership to accelerate Electric Vehicle (EV) adoption throughout the region. He engaged local leaders to join him in this effort, thus laying the foundation of Evolve Houston, a coalition of sustainability-minded civic, business, and academic leaders who want to accelerate clean transportation through electrification.

Evolve Houston convenes government, academic, private industry, and community leaders to accelerate EV adoption and deliver real benefits to society through the shared values of environment, economy, equity, and building forward. Collaborating with its stakeholder group, Evolve Houston is working to improve air quality and reduce GHG emissions throughout the Greater Houston area.

As a region that has been called the Energy Capital of the World, Houston shoulders a responsibility to lead in new energy technologies, such as electrified transportation, to innovate, and to demonstrate new ways of advancing the health and prosperity for people in all walks of life.

## FOUNDERS

**Dr. Renu Khator**
President
University of Houston

**Sylvester Turner**
Mayor
City of Houston

**Gregg Knight**
EVP,
Customer Transformation
& Business Services,
CenterPoint Energy

**Mauricio Gutierrez**
CEO
NRG Energy

**Gretchen Watkins**
President
Shell

**Ryan Martin**
Principal
LDR

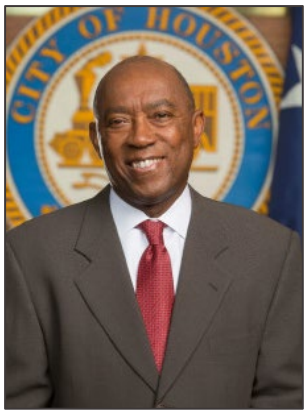
**Chris George**

*"Evolve Houston and its members are key to implementing the ambitious goals outlined in the City of Houston's Climate Action Plan and Resilience Strategy."*

*- Mayor Sylvester Turner*

## Message from our Champion,

# Mayor Sylvester Turner




As Houstonians, we know that building a resilient and sustainable city is essential to having a thriving economy and vibrant way of life that benefits all residents. As the Energy Capital of the World, Houston has a unique responsibility and an opportunity to emerge as a leader in shaping how cities improve air quality and reduce greenhouse gas emissions, especially in the transportation sector. That's why I brought together some of Houston's smartest minds to create a first of its kind electric vehicle initiative to drive Houston forward.

Mobility is at the heart of everything we do; it connects our communities and keeps our economy moving. It is foundational to our current and future success. Evolve Houston and its members are key to implementing the ambitious goals outlined in the City of Houston's Climate Action Plan and Resilience Strategy. As Houston continues to grow, we will set the standard for smart, sustainable, and emissions-free transportation. I encourage everyone, from the smallest community to the largest corporation, to take part in Evolve Houston and help make Houston a more sustainable and resilient city.

Sincerely,

Mayor Sylvester Turner

## A message from Mauricio Gutierrez

NRG is proud to be a founding partner with this innovative organization, supporting the electrification of transportation in Houston. Evolve Houston is a great example of how public and private partnerships have the potential to bring meaningful progress towards decarbonizing our economy.

On a personal level, I started driving an EV in 2012 and today at NRG we have over 50 EV drivers. As early adopters we understand the benefits and barriers facing consumers. I am convinced that the transition to EVs will be faster than the transition from landlines to iPhone. The need to decarbonize the economy, including transportation, is an imperative that is driving significant innovation in the sector and shifting consumer demand that can be achieved through a competitive platform.

Finally, I wish to recognize and thank Mayor Turner for his visionary leadership and environmental stewardship.

Sincerely,

Mauricio Gutierrez

## A message from Gretchen Watkins

At Shell, we recognize that reducing greenhouse gas emissions from the transportation sector will require a cross-sector coalition of a scale rarely seen before. Evolve is exactly that kind of coalition.

As a Founding Member of Evolve, Shell is very pleased to strengthen our long-standing relationship with the City and to form new partnerships with organizations who share our commitment to transportation electrification and improving air quality in Greater Houston -- and who are taking action to accomplish that goal.

Amid a global transition to a lower-carbon energy system, it is only fitting that the energy capital of the world provide a demonstration of how to take emissions off our roads. On behalf of the roughly 10,000 Shell employees who call this region home, we look forward to doing our part to achieve a cleaner, more electrified transportation system in Houston.

Sincerely,

Gretchen Watkins

## A message from Gregg Knight

CenterPoint Energy is privileged to partner with Mayor Sylvester Turner and the other founding members of this organization dedicated to accelerating the adoption of electrified transportation in the Greater Houston Area. Together we can work to ensure that all those in our region have adequate access to electric vehicles and charging infrastructure.

CenterPoint Energy has a long and proud history of making a positive difference in the communities we touch, and environmental stewardship is a key component of our overall corporate responsibility approach.

As part of CenterPoint Energy's commitment to lead by example and to promote clean air in the communities we serve, since 2011 we have worked to offset our carbon footprint and promote cleaner air by replacing fossil-fueled vehicles and equipment with electrified alternatives. We will continue to expand our fleet electrification as suitable vehicles become available, and we will proudly support other like-minded organizations who wish to do the same.

Sincerely,

Gregg Knight

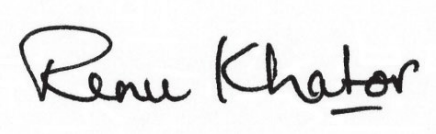
## A message from Dr. Renu Khator

An initiative as transformative as Evolve requires great leadership and commitment from across our city and I am proud that Mayor Turner has included University of Houston in achieving this important public private partnership.

We are committed to being the Energy University and a long-term partner and resource for industry and Houston in addressing society's greatest challenges. Each year UH awards 10,000 degrees and 40 percent of our students pursue energy-related degrees. The leaders of Houston's energy companies who comprise our Energy Advisory Board enhance UH research focusing on energy and environmental sustainability.

It's also our responsibility to lead by example in shifting the energy landscape. That is why we are phasing out all of our gas-powered service carts for electric vehicles and have grown our sustainability program to include a campus garden and bike sharing stations. We look forward to joining this effort.

Sincerely,



Dr. Renu Khator

## A message from Ryan Martin

As a founding member of Evolve Houston, LDR has witnessed the commitment, energy, and vision of the many people who helped to build this organization. Evolve Houston is a demonstration of corporate responsibility, environmental stewardship, and innovation working in concert in a City poised to lead the future of energy.

Houston is quickly emerging as a global "City of the Future" and this organization is a perfect example of how Houston's unique model works to improve the lives of residents when leaders come together to create demonstrable value for the region. I am excited Evolve Houston has taken a distinctive leadership role by committing to improve Houston's air quality and reduce its greenhouse gas emission through electrified transportation.

LDR is honored to support this organization and its founding members in paving the way for a brighter, safer, and more sustainable future. Thank you to all who have contributed to a vision that will, without a doubt, Evolve Houston.

Sincerely,

Ryan P. Martin

## A message from Katheryn Abou-Chakra

I am excited to work with Houston's most ambitious leaders in government, energy, transportation, and academia. As Houstonians, we are uniquely qualified to lead the global conversation around electrification and air quality.

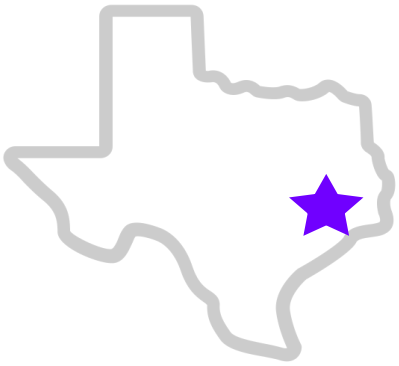
As Interim Executive Director, I aim to work closely with the city's growing EV community to not only achieve the "30 by 30" goals laid out in the climate action plan and Evolve Houston roadmap, but also to establish Houston as a hub for EV innovation and economic development.

Our city boasts an abundance of talented and ambitious individuals, and It is my job to engage them and work together to make our city a destination and proving ground for the EV industry. With this incredible group of founding members, I believe we are well on our way. I couldn't be more thrilled to represent this great city on electrification and air quality moving forward.

Sincerely,

Katheryn Abou-Chakra

Our goal is for Electric Vehicles to reach a 50% share of annual new car sales by 2030.



## OUR NORTH STAR

Evolve Houston targets regional EV to reach a 50% share of annual new car sales by 2030, allowing Greater Houston Area residents to enjoy improved air quality, reduced greenhouse gas emissions, new clean energy careers, and affordable clean transportation.

# EXECUTIVE SUMMARY

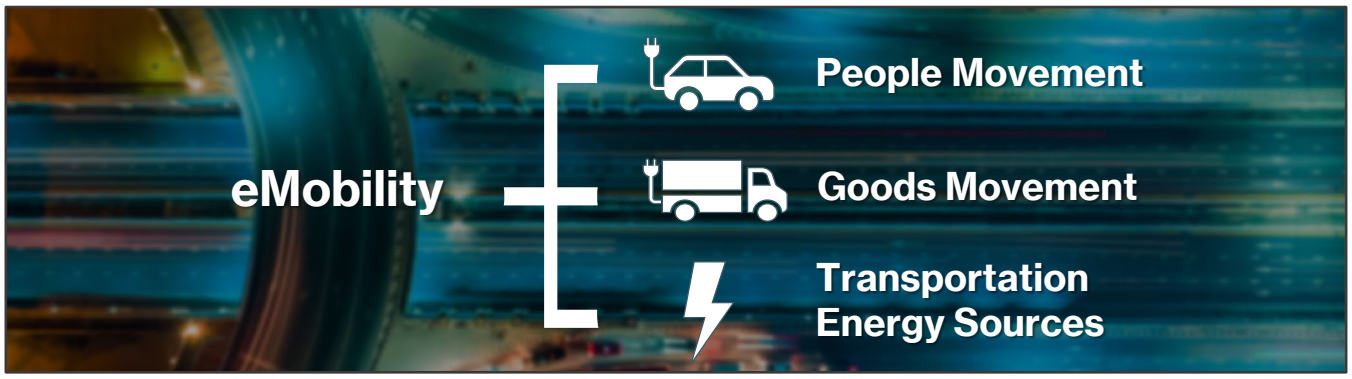
Air quality and GHG emissions are significant concerns for the Greater Houston area. Emissions of nitrogen oxides (NOx) and volatile organic compounds (VOCs) cause declines in public health and higher incidents of respiratory illness, including asthma. They lead to increased school and work absences, emergency room visits, and chronic health complications. GHG emissions, for their part, lead to increased climate risk, placing our region at greater vulnerability with cases of flooding and other extreme weather events.

Transportation is a primary source of harmful emissions in the Greater Houston area. Transportation accounts for 67% of ozone-causing NOx emissions and 23% of VOC emissions in the region. Furthermore, studies from Houston's Climate Action Plan show that transportation accounts for 47% of total GHG emissions within the City of Houston.

For these reasons, **Evolve Houston considers eMobility to be a key opportunity for our region. eMobility to refers to electric vehicles and all forms of electrified transportation.** eMobility is about the movement of people and goods, and the energy sources that power it all.

As technology improves and the cost of vehicles declines, EVs become increasingly attractive from a financial perspective. In the passenger vehicle segment, some EVs are already less expensive than their conventional counterparts when considering the total cost of ownership. This is particularly true for drivers making long, daily commutes. With declining battery costs, the economics only improve. Many experts predict that EVs will become categorically price-competitive with conventional vehicles as early as 2022.

With this Electric Vehicle Roadmap, Evolve Houston targets accelerated growth of electric vehicle market share in the region by implementing strategic actions in three focus areas, (1) awareness, (2) affordability, and (3) availability. Success in all three focus areas is critical to Evolve Houston's ultimate success in achieving its goal of EVs reaching a 50% share of annual new car sales by 2030.



# REGIONAL EMOBILITY HISTORY

The City of Houston has long been a leader in electrified transportation. Prior to Hurricane Harvey, the City had the fourth largest municipal hybrid fleet in the nation. Houston was also among the first cities in the nation to use electric vehicles in its municipal fleet-share program.

Unfortunately, due to the severe flooding in the parking garages under City Hall, nearly all of Houston's Electric Vehicle fleet was destroyed during Hurricane Harvey in August 2017. Thanks to support from Nissan, the City hopes to soon have 29 EVs in operation as a next step to advancing the City's EV fleet. Researchers from Rice University are helping to analyze and propose recommendations that will ultimately inform the City's goal to electrify 100% of its non-emergency light-duty fleet vehicles by 2030.


As one of the 11 cities selected under the Electrify America program, the City of Houston is working with local businesses and neighborhoods to expand public EV infrastructure to be accessible to as many residents as possible.

## Climate Action Plan

In September 2018, Mayor Sylvester Turner announced Houston's first Climate Action Planning process. Initial assessments revealed that 47% of GHG emissions within the city's limits are the result of transportation. Consequently, the working groups that contributed to the Climate Action Plan identified the adoption of zero-emission vehicles as a key lever for driving Houston to net zero carbon emissions by 2050.

Beyond electrifying the City's own fleet and offering limited incentives for vehicle electrification, Houston needed a broader stakeholder effort that included private industry action to accomplish its Climate Action Plan goals. That's why Mayor Sylvester Turner called for the creation of Evolve Houston, a coalition of sustainability-minded civic, business and academic leaders working to accelerate the adoption of clean transportation through electrification.

# *The journey to an EVolved Houston*


## CENTERPOINT ENERGY

As part of its commitment to lead by example and to promote clean air in the communities it serves, CenterPoint Energy has been testing, demonstrating, and using electric vehicles in its fleet since 2011. Today, CenterPoint Energy's fleet includes 13 EV passenger cars, four pickup trucks, 11 electric forklifts, 12 electric golf carts, 17 bucket trucks with electric aerial lifts, and 35 level two charging stations. CenterPoint Energy continues to expand its fleet electrification as suitable vehicles and technologies become available.

## NRG ENERGY

NRG brings the power of energy to people and organizations by putting customers at the center of everything we do. As technology transforms society, enabling a future that's low-carbon, increasingly digital and customizable, we are focused on providing solutions that improve the way customers engage with electricity – including partnering with customers as they become ready to embrace eMobility. Whether electrifying a commercial fleet or a residential homeowner bringing home their first EV, we're innovating plans and solutions that simplify our customer's transition to an electrified future.


## SHELL

Accelerating the adoption of electric mobility is critical to meeting growing demands for transport in a lower-carbon world. As part of Shell's ambition to reduce our net carbon footprint, we aim to reduce our own emissions, as well as to help drivers reduce their emissions through products and services we offer. In early 2019, Shell announced the acquisition of Greenlots, a leading provider of electric vehicle charging software and services that enable cities, utilities, fleets, automakers and other businesses to deploy and manage electric vehicle charging infrastructure at scale. Growth in EV technology, infrastructure and adoption requires collaborative and coordinated action across sectors – and we welcome the opportunity presented by Evolve to serve current and future electric vehicle drivers, on and beyond our sites, while supporting Houston's emission reduction goals.


## UNITED

United Airlines has been leading the electrification of airport ground support equipment for nearly 20 years. At Bush Intercontinental Airport, United has more than 1,000 electrified pieces of equipment with plans to add more. United's electric vehicle programs do more than keep our air clean; they also make good business sense saving United operations and maintenance expenses on its Houston airport operations.

## HOUSTON-GALVESTON AREA COUNCIL

In 2017, the Houston-Galveston Area Council (H-GAC) began a Zero-Emission Truck project to demonstrate the effectiveness of fully-electric delivery vehicles in the package delivery space within the Houston region. H-GAC received more than $2 million from the U.S. Department of Energy for this project and partnered with Workhorse, an electric vehicle manufacturer, to deploy 18 fully electric delivery vehicles and charging stations at facilities within the region. This project demonstrated that fully-electric vehicles are capable of operating in the delivery sector under the challenging operating situations found in the Houston region.



## METRO

METRO currently operates a fleet of more than 1,230 buses, and approximately 40% of its fleet has been converted to hybrid technology that uses less diesel and reduces NOx emissions by as much as 50%. In addition, METRO operates approximately 23 miles of electric rail and a fleet of 76 electrified light-rail vehicles.

## THE UNIVERSITY OF HOUSTON

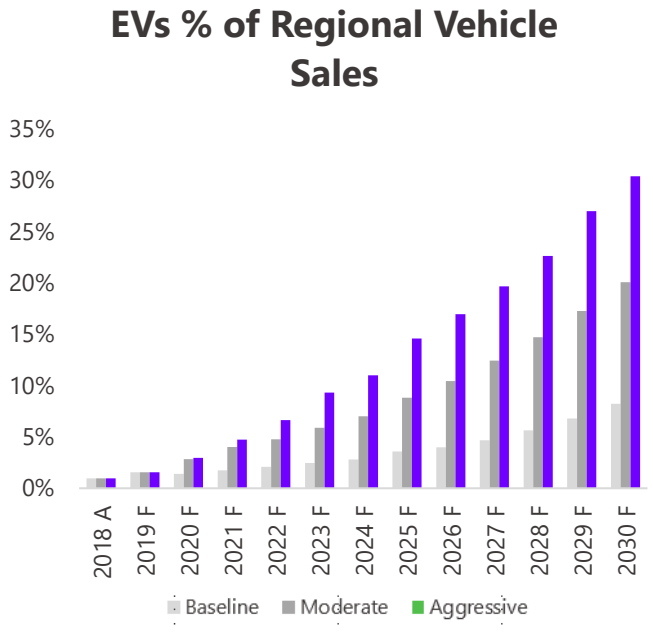
The University of Houston is recognized as a leader in the education, research and development of energy. As the world's energy transitions to a more sustainable focus, UH has led planning, education, research and community outreach on the electrification of mobility and improvements in air-quality and human health. From its leading research on electric vehicle technologies led by the Power Electronics Center (PEMSES), to its air quality modeling laboratory and its urban planning and resilience research led by the Center for Sustainability and Resilience (CeSAR), UH has developed thought leadership through its various centers and colleges on the adoption of electric vehicles to transform the energy landscape. The University of Houston Fleet Services department, recognizing the economic and overall advantage of converting to electric vehicles, is transitioning the university's service carts to be 100% electric. UH currently maintains over 100 electric carts in the fleet.

# EV TARGETS

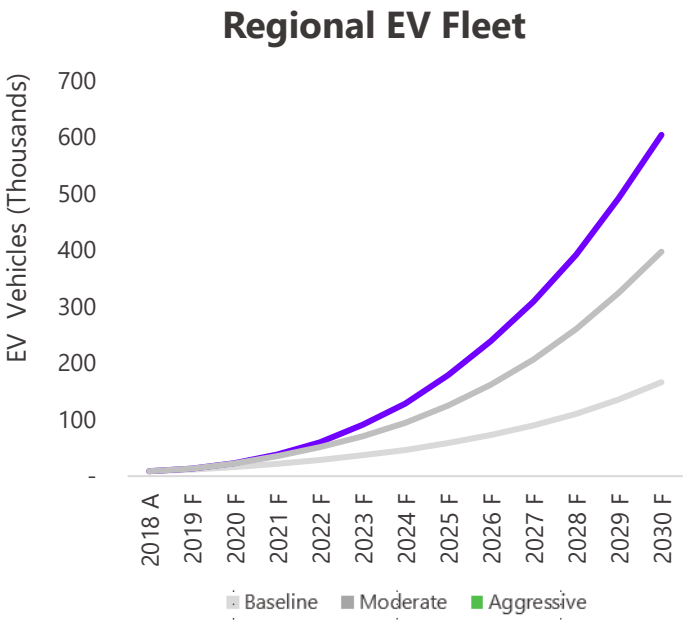
**With this Electric Vehicle Roadmap, Evolve Houston targets accelerated growth of electric vehicle market share in the region by implementing strategic actions in three focus areas:**

1. awareness
2. affordability
3. availability

**Success in all three focus areas is critical to Evolve Houston's ultimate goal of EVs reaching a 50% share of annual new car sales by 2030.**




*Source: Evolve Houston*




*Source: Evolve Houston*

# SHARED VALUES

eMobility presents an opportunity to improve the health and well-being of those living in the Greater Houston area. For Evolve Houston, developing impactful programs, partnerships, and policy positions requires a focused strategy rooted in prioritizing which actions will deliver the greatest value. That is why we have established the following values framework to ensure that our actions are aligned with our ultimate goals.

We have identified four core values for Evolve Houston – environment, economy, equity, and building forward. In the sections below we define each and describe how they can be measured. Recognizing that not all value can be quantified, we discuss possible metrics as a step to highlight data needed to assess and validate the impacts of our efforts.

Evolve Houston will strive for a balanced portfolio of initiatives that addresses all four values. Some initiatives may focus on all four broadly, while others may focus narrowly on one. In sum, it is our intention that the total Evolve Houston portfolio should support a strategic balance of all four.


## POWERED BY VALUES.

- Environment
- Economy
- Equity
- Building Forward

# 1. ENVIRONMENT

With the initiation of its first Climate Action Plan, the City of Houston has established a goal to be carbon-neutral by 2050. Local leaders are also seeking air quality improvement solutions to address the region's non-attainment status under the National Ambient Air Quality Standards. With transportation causing as much as 47% of Houston's GHG emissions and 67% of the region's NOx emissions, transportation electrification needs to be a significant component to any proposed solution. Progress on environmental improvement will require focus on people movement, goods movement, and transportation energy sources.

**EVOLVE HOUSTON INITIATIVES THAT ARE BENEFICIAL TO THE ENVIRONMENT WILL:**

- *Deliver maximal potential GHG, NOx, and VOC reduction benefits*
- *Prioritize electrification of vehicles with the technological readiness and the highest potential to displace emissions*
- *Positively impact areas with the poorest air quality and related health impacts*

**METRICS TO EVALUATE AND TRACK EVOLVE HOUSTON'S PROGRESS WITH RESPECT TO THE ENVIRONMENT INCLUDE:**

- *Displaced emissions of GHG, NOx, and VOC*
- *Air quality measures*
- *Electric vehicle miles traveled*

# 2. ECONOMY

The Greater Houston area boasts a diverse and growing economy. Local energy industry concentration has earned Houston the moniker of "Energy Capital of the World," even as medical competencies have led to creation of the world's largest medical center. Future growth of the local economy relies on long-term strategic vision and diversification into new and growing industries, all while developing local talent and resources. eMobility is a fast-growing industry that is naturally allied with renewable and low-carbon energy industries that leverage existing regional technological competencies. To best support economic development in the Greater Houston area, Evolve Houston initiatives should focus on value-creating opportunities, including attracting and incubating new industries and developing the people, careers, and intellectual capital necessary to support them.

**EVOLVE HOUSTON INITIATIVES THAT ARE BENEFICIAL TO THE ECONOMY WILL:**

- *Attract eMobility companies and private investment to the region*
- *Provide training and education for careers in eMobility*
- *Create economic value for the region*

**METRICS TO EVALUATE AND TRACK EVOLVE HOUSTON'S PROGRESS WITH RESPECT TO THE ECONOMY INCLUDE:**

- *eMobility value chain businesses*
- *EV sales and charging station installations*
- *Students in eMobility-related college and university programs*

## 3. Equity

Though the Greater Houston area has made great strides to improve livability, more can be done to ensure the benefits of improvement flow equitably to all residents. Some of Houston's communities remain disproportionately in need of a cleaner environment, better services, and greater career opportunities. eMobility has the potential to provide economic benefits through improved mobility options and increased workforce opportunities that focus on ensuring a just transition. As a result, Evolve Houston is committed to advancing environmental and social justice through its programs.

**EVOLVE HOUSTON INITIATIVES THAT ARE BENEFICIAL TO EQUITY WILL:**

- Expand eMobility access to communities with relatively fewer transportation resources and options
- Promote inclusive collaboration to ensure all communities have a voice in helping to shape outcomes
- Prioritize initiatives that maximize benefits to vulnerable communities

**METRICS TO EVALUATE AND TRACK EVOLVE HOUSTON'S PROGRESS WITH RESPECT TO EQUITY INCLUDE:**

- Air quality measures in communities with relatively high concentrations of transportation-related emissions
- Access to electrified modes of transportation and charging infrastructure
- Number of EV owners in low-income communities

## 4. Building Forward

After three "500-year floods" in recent years, culminating with the largest rain event in North American history, it is time that we build forward to achieve a more resilient region. Resilience is the capacity of individuals, communities, institutions, businesses, and systems within a region to survive, adapt, and thrive no matter what kinds of chronic stresses and acute shocks they experience. To build forward, we must plan, design, and implement infrastructure that ensures Houston is smarter, safer, stronger and more resilient. To best support resilience and innovation, Evolve Houston will coordinate with other significant regional initiatives to align long-term objectives, support resilient investments, and keep Houston at the leading edge of technology.

**EVOLVE HOUSTON INITIATIVES THAT ARE BENEFICIAL TO RESILIENCE AND BUILDING FORWARD WILL:**

- Align with parallel and adjacent technology and infrastructure initiatives
- Promote solutions designed to withstand and address numerous shocks and stresses
- Demonstrate leading edge technologies that keep Greater Houston at the forefront of innovation

**METRICS TO EVALUATE AND TRACK EVOLVE HOUSTON'S PROGRESS WITH RESPECT TO RESILIENCE AND BUILDING FORWARD INCLUDE:**

- Aligned regional technology and infrastructure programs
- Identified eMobility risks and mitigations
- Emerging technology demonstration projects

**In addition to these core values, Evolve Houston seeks to help Greater Houston maintain and expand its leadership in the energy industry through eMobility, ensuring that zero-emission transportation and clean energy is an accessible benefit to all residents.**

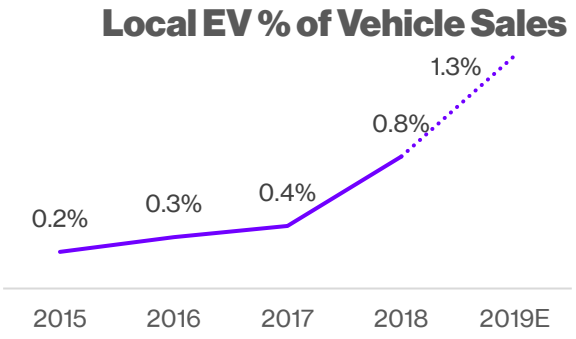
As one of the most populous metropolitan areas in the U.S. and a global leader in energy, Greater Houston can be a catalyst for change for other cities both nationally and worldwide. Through well-designed, equitable programs that benefit the environment, economy, and all residents, Evolve Houston can transform the transportation sector through leadership and facilitation.

**By staying true to these values, Houston has the power to transform the transportation sector as the energy capital of the world.**

# EMOBILITY LANDSCAPE

## PASSENGER CARS

The market for passenger class EVs is approaching an inflection point where adoption could begin to increase rapidly throughout the next decade. In 2018, the United States reached an unprecedented1,000,000 EVs on the road nationally. In the Greater Houston area, the number of EVs on the road exceeded 10,000 and EV sales reached 1% of new car sales in June 2019, despite low gasoline prices, lean EV model availability, and limited access to EV purchase incentives.




*Source: County registration, Evolve Houston forecasts*

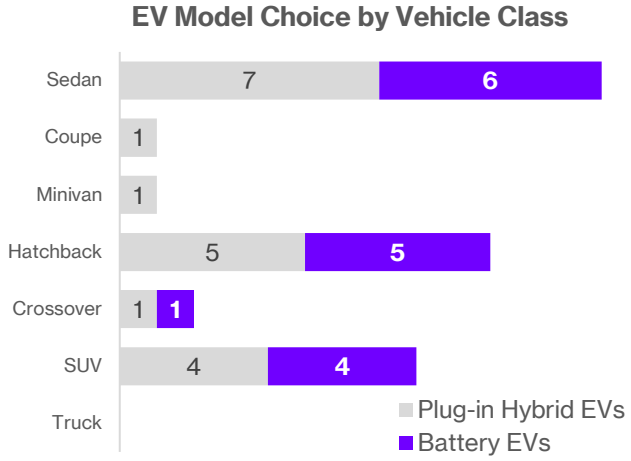
Global trends toward aggressive emissions targets, particularly in Europe, China, and California will increasingly put policy pressure on automakers to focus production investments in EVs. With reports emerging that fueling vehicles with electricity can be as much as six to seven times cheaper than fueling with fossil fuels, economics are also driving automakers to focus new investments in EV production. Global EV sales are expected to reach between 23 million to 28 million annually by 2030.

### Local demand for EVs is shaped by a number of factors:

### *AVAILABILITY*

**Vehicles:** In the Greater Houston Area, the vast majority of EVs available for purchase are small to midsize sedans. This is not enough to address the local passenger vehicle market because 72% of local new car sales are SUVs and pickup trucks, vehicle classes for which there are few or no EV options.

Currently, there are no EV pickups available for purchase in the US that are made by a major auto manufacturer. Of the few SUVs and crossover utility vehicles (CUVs) that are available, most are priced outside the budgets of most shoppers. Consumers often will not purchase vehicles that do not fit their preferences, and rather will be more likely to purchase EVs when they are available in the classes and price ranges they would typically consider.



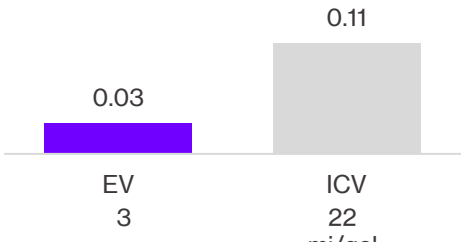

*Source: Plug-in America - PlugStar*

**Chargers:** Consumers also require access to charging infrastructure. Low availability of public charging infrastructure is a barrier to adoption for short-range EVs and for consumers who lack access to charging at their residence or workplace. With new EVs featuring battery ranges of more than 200 miles per charge, many consumers have little need of public charging unless they are driving long distances between cities. However, some 18% of regional residents occupy apartment complexes, many of which do not offer on-site charging. Since low-income residents disproportionately occupy such dwellings, the limited access to charging infrastructure, combined with the high cost of currently-available EVs, together produce an equity gap that prevents many low-income residents from entering the market and reaping the associated cost-saving benefits of EVs in terms of maintenance and fuel.

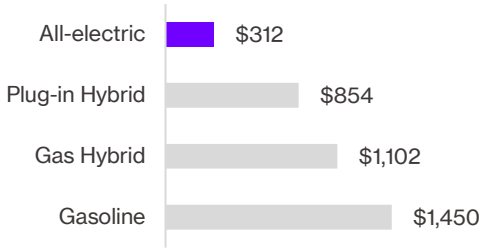
## AFFORDABILITY

**Operating Costs:** EVs cost less to operate as compared with internal combustion vehicles (ICVs). Lower fuel costs and less maintenance are the drivers of this cost savings. Fuel for an EV costs about 70% less than that for an ICV, assuming local average prices of $0.08 per kilowatt-hour (kWh) of electricity and $2.45 per gallon (gal) of gasoline. This fuel cost advantage would persist even if electricity rates were to increase as a result of increased demand on electricity grids. With EVs approaching four miles per kWh and ICVs averaging 22 miles per gallon, EVs will continue to be more fuel efficient even under extreme prices changes. It would require electricity rates tripling to more than $0.30 per kWh and gasoline prices dropping below $2.00 per gallon before ICVs could begin to match the fuel efficiency of EVs.

**Fuel Cost per Mile is Lower for EVs**




**EV Annual Maintenance Costs Lower**




*Source: NYC Dept. of Citywide Administrative Services*

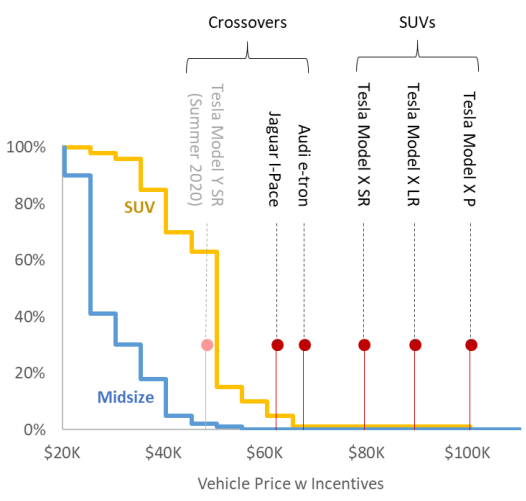
In addition to fuel savings, EVs also cost less to maintain than their ICV counterparts since they have fewer parts, averaging at 18,000 parts per EV compared to 30,000 parts per ICV. Fewer parts lead to less materials and labor expenses needed to maintain a vehicle. Case studies of EV fleet operators now prove that very point. In March 2019, New York City's Department of Citywide Administrative Services (NYC DCAS), an institution with more EV experience than most, published its findings that the municipal fleet's all-electric vehicles cost as much as 78% less to maintain as compared with ICVs.

**Purchase Price:** Operating cost savings are offset today by the relatively high up-front purchase price of EVs. To reduce this gap, reductions in EV component prices are needed, especially with batteries, which can represent nearly 35% of the vehicle cost.

Lithium-ion batteries have rapidly declined in price in recent years, dropping more than 80% from approximately $1,000 per kWh in 2010 to $176 per kWh in 2018, and are expected to fall further. At the current pace of technological advances, it is expected that battery prices will decline, and electric drivetrain production will improve in efficiency such that within the next five years most EVs will have comparable prices their ICV counterparts on an unsubsidized basis.

As vehicle prices fall and variety of EV models increases, regional EV sales will continue to rise. Some manufacturers have already announced the anticipated release of more affordable SUV and CUV models as early as 2020. Some of the same manufacturers are expected to launch EV pickup models as early as 2021. Affordable options in these vehicle classes will significantly increase the adoption of EVs throughout the Greater Houston area.

**% of Buyers willing to Pay at Price**




Source: Bloomberg New Energy Finance, Plug Star, Tesla

## AWARENESS

Consumer purchasing decisions are driven by a multitude of factors, including economics, safety, sustainability, and lifestyle. Different consumers make their vehicle purchasing decisions differently, but what is consistent is that all consumers draw their selections from the set of vehicles they identify as familiar and appropriate. Most consumers have never driven an electric vehicle and are neither familiar with the technology nor the experience of driving and owning and EV. Awareness campaigns, such as ride-and-drives, have proven to be an effective grassroots tool for raising consumer awareness. Mainstream auto manufacturer advertisements for electric vehicles are also effective television ads have begun in the Houston market.

# TRUCKS

Battery-electric medium- and heavy-duty (MD/HD) trucks are increasingly advancing toward viable replacements for diesel commercial vehicles. Compared to smaller electric cars, these vehicles have the potential for greater emission reduction but adoption of electric medium- and heavy-duty (MD/HD) trucks remains at a very early stage and will vary based on local enabling factors. We have identified several important market factors that will influence truck electrification.

## AVAILABILITY

**Vehicles:** Medium- and heavy-duty truck electrification is a long game in today's market. Of the few auto manufacturers who are producing vehicles, most are doing so on limited scale and are focused on markets like California that require such vehicles for compliance reasons. This means that model availability will likely be a bottleneck for the Greater Houston region. One method to surmount this challenge is to increase the scale of local demonstration projects to attract auto manufacturer focus to the region.

**Range:** The largest concern for many fleets interested in beginning the transition to EVs is whether all-electric vehicles will have the necessary range to support the daily operations of a successful business. While this "range anxiety" can certainly be a concern over long-haul routes, electrifying medium and heavy-duty truck applications has become increasingly viable for vehicles that operate with predictable weights over shorter, more local routes (such as in delivery or local transport applications). In many cases, only small changes need to be made to existing logistics to accommodate the introduction of EVs. Long-haul routes still present specific challenges to effective commercial usage. Without the availability of significantly larger batteries, long-distance uses for EVs remain limited, due to lack of infrastructure and long charging times.

**Charging:** Despite range challenges, emerging solutions for rapid and more frequent charging offer a path to making EVs more attractive for various truck applications. Overall, the availability of charging infrastructure will determine whether certain truck applications are economically viable. Networks of ultra-fast charging are essential for trucks whose battery capacities are less than the amount necessary to complete daily routes in one charge.

## AFFORDABILITY

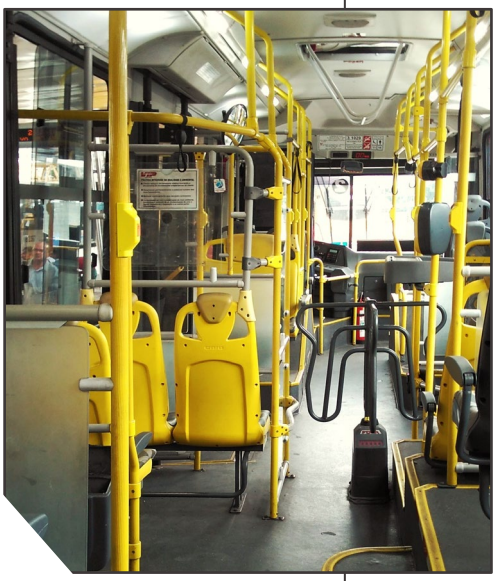
Fleet managers make vehicle purchase decisions on a total cost of ownership (TCO) basis. Fortunately, a majority of TCO components benefit from better economics through electrification:

- Battery costs are declining as lithium ion and other battery chemistries reach scale
- Cost per vehicle declines are OEM production increases
- Declining cost of electricity prices relative to fossil fuels as renewables increasing edge out alternative fuels on a levelized cost of energy basis
- Case studies validate the effectiveness of EV options for certain use case
- Public fast-charging infrastructure, especially large multi-use complexes, enable a variety of MD/HD use cases

**Grants and Subsidies:** Grant and subsidy programs devoted to clean air and energy technology initiatives, and available through a variety of government and private programs, can reduce the up-front cost of electric commercial vehicles.

**Risk Tolerance:** Converting a fleet to electric is not as simple as swapping out vehicles. Facilities, purchasing agreements, warranties, maintenance staff, facilities, and duty cycles could all potentially be impacted. Larger fleets are typically more sophisticated and better able to absorb pilots within their normal operations. They have the organizational capacity to take on the design, implementation, and execution risks inherent in new technology demonstrations. Smaller fleets often lack the scale and skills necessary to do the same, and accordingly require the ability to leverage case studies and other knowledge resources from proven models.

## BUSES



Buses face the same challenges as medium- and heavy-duty truck fleets. The purchase prices for electric buses are high, often costing as much as $800,000, or double that of a comparable diesel bus. This difference in cost may be offset by fuel savings, but only if local electricity rates are favorable and fleet charging behavior is properly orchestrated to avoid incurring excessive demand charges.

Despite certain costs challenges, buses have the advantage of predictable routes that can be matched with current electric bus technology capabilities. Additional studies must be done to ensure that these vehicles are able to withstand the confluence of both distance and climate requirements specific to local transit operations. Global trends suggest that electric bus technology is advancing rapidly and may soon be sufficiently mature for a wide variety of local transit applications, if not already so.

## LOCAL IMPACT

eMobility can improve local air quality and reduce GHG emissions. Clean air is desirable to all residents. A 2018 study by the Kinder Institute found that 61% of Houstonians believe that much more needs to be done to curb emissions and improve air quality. Ozone has been Houston's main air quality concern for several years. Area climate conditions combined with the variety of emissions from local industry and transportation make the city a prime medium for ground-level ozone formation, with transportation contributing as much as 67% of NOx and 23% of VOC emissions.

Growing population will exacerbate transportation-related pollution unless something is done to mitigate the effects. If the region were to grow by 50% by 2040, emissions could rise by as much as 30%-80% within the same timeframe. Bold measures, such as accelerated electrification of transportation would enable the region to grow without causing a sharp rise in transportation-related emissions and corollary health impacts.

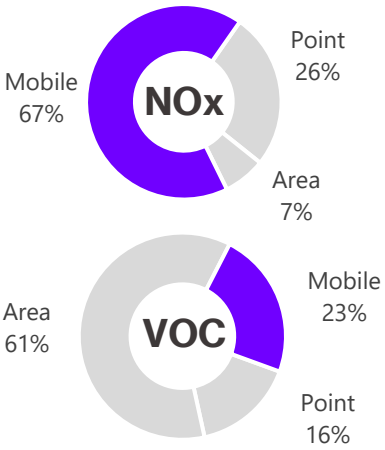
### Projected benefits of reduced emissions in Houston

**246** **Fewer deaths from emissions exposure**

**$2B** **In benefits from prevented mortality and reduced emissions exposure**

Source: Houston Climate Action Plan

**Ozone-related Emissions by Source**




Source: TCEQ

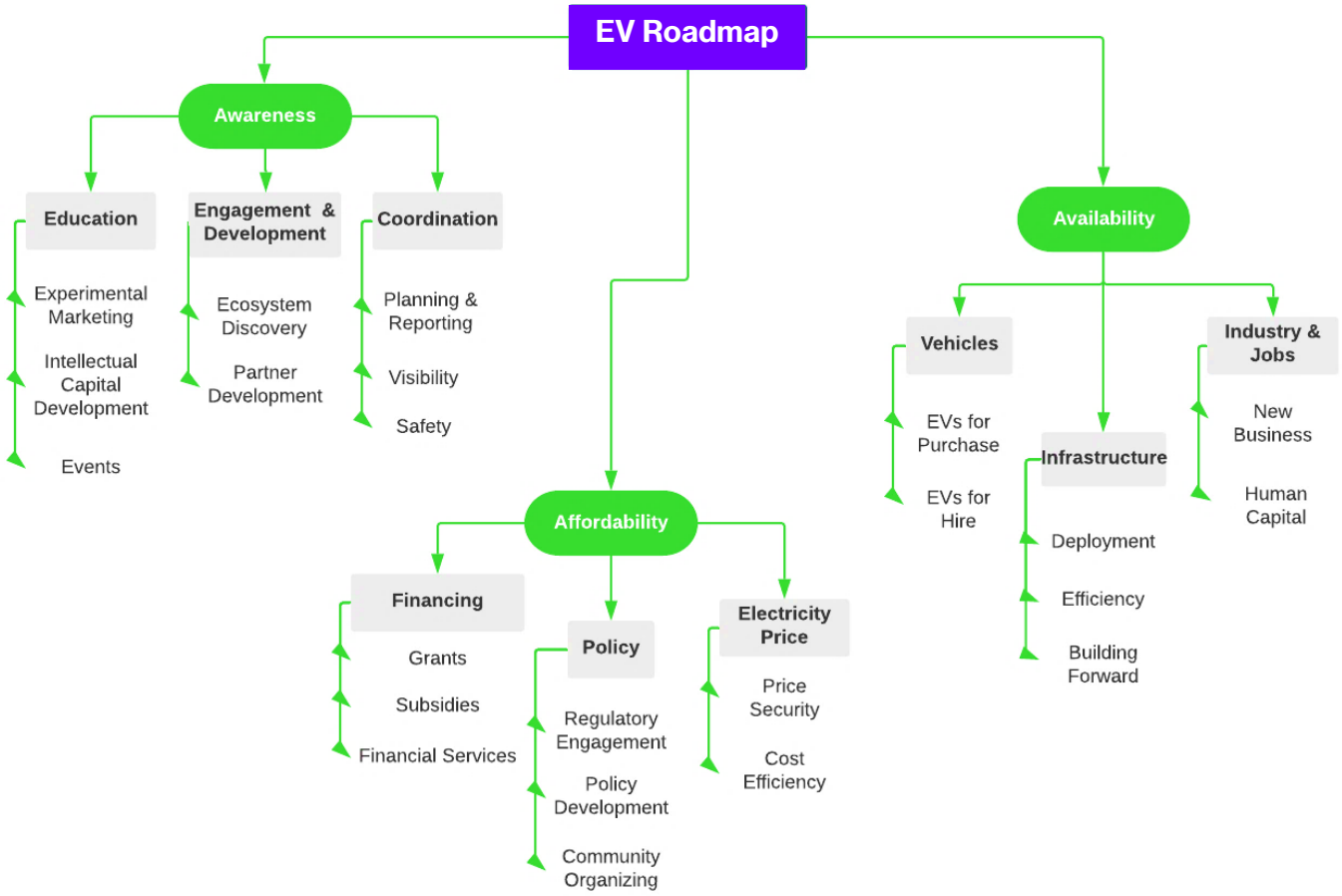
eMobility could reduce transportation-related emissions by as much as 90% if all on-road transportation were electrified and powered by renewables. The results of such a scenario might include as many as 246 fewer deaths from emissions exposure and over $2 billion in benefits from prevented mortality and reduced emission exposure.

With respect to GHG reduction, EVs have the greatest impact when the electricity fueling them is generated from renewable energy resources. The potential to do so is great given that Texas has an abundance of wind energy available for overnight use, when it is most beneficial for EVs to charge off-peak. The potential for GHG reduction when EVs are combined with renewable electricity is illustrated by the state of Washington, which gets 70% of its electricity from hydropower. An analysis by the U.S. Department of Energy estimates that an EV in the state of Washington reduces well-to-wheel GHG emissions by 92% as compared with a conventional gasoline car. According to the same analysis, an EV in Texas today reduces 60% of GHG emissions as compared with a conventional gasoline car.

# ROADMAP ACTIONS - OVERVIEW

Evolve Houston worked with community subject matter experts to develop a list of key actions necessary to accelerate the adoption of electric vehicles throughout the Greater Houston area. These roadmap actions are organized around three focus areas:

1. **Awareness**: Improve awareness and education among vehicle buyers to increase their propensity to purchase EV options
2. **Affordability**: Improve the affordability of EVs competing relative to ICV substitutes by identifying financing, revenues, incentives, and capabilities that offset relatively higher up-front costs for individual and commercial consumers
3. **Availability**: Improve the availability of application-appropriate electric vehicles and the availability of refueling infrastructure for charging



# ROADMAP ACTIONS (page 1 of 5)

| Index | Title | Description | Key Stakeholders |
|---|---|---|---|
| **1** | **Awareness** | | |
| **1.1** | **Education** | | |
| **1.1.1** | **Experiential Marketing** | | |
| **1.1.1.1** | **Ride & drives and extended test drives** | Conduct regular ride & drive events to promote awareness and familiarity with EVs.<br>Develop options for extended test drive programs.<br>Develop a corporate ride & drive playbook that would enable companies to easily host a company ride & drive event. | - Car dealerships<br>- EV enthusiasts<br>- Companies<br>- Schools |
| **1.1.1.2** | **Influencer promotion** | Recruit influencers to document and promote EV experiences.<br>Collect and disseminate existing such documentation. | - Celebrities<br>- Company leaders<br>- Media outlets |
| **1.1.1.3** | **Fleet manager tours** | Organize fleet owner/manager tours of commercial EVs in action to demonstrate possibilities. | - Auto manufacturers<br>- Fleets<br>- Advocacy organizations |
| **1.1.1.4** | **EVs in schools** | Promote EV awareness through school programs that increase student knowledge of the technology and environmental benefits of EVs. Pair with efforts to enable school bus electrification. | - School districts<br>- Research institutions |
| **1.1.2** | **Intellectual Capital** | | |
| **1.1.2.1** | **Fleet electrification playbook** | Create a playbook for fleet electrification, including recommendations for planning, stakeholder engagement, and execution. Include playbooks for both light-, medium-, and heavy-duty applications. | - Auto manufacturers<br>- Fleets<br>- Colleges & universities<br>- Research institutions |
| **1.1.2.2** | **Fleet strategy workshops** | Host periodic (e.g., quarterly) educational events to bring fleet owners/managers together to learn about emerging technologies, best practices, facilitative resources, funding, and implementation opportunities, having EVs available for attendees to interact with. | - Fleets<br>- Auto manufacturers<br>- EVSE service providers |
| **1.1.2.3** | **EV program manager training** | Develop local resources for facilitating EV conversion programs. | - Colleges & universities<br>- EVSE service providers |
| **1.1.3** | **Events** | | |
| **1.1.3.1** | **Locally hosted EV conferences and symposiums** | Attract major EV conferences to Houston.<br>Organize Houston's own EV conferences. | - Municipalities<br>- Advocacy organizations<br>- Complimentary events |
| **1.1.3.2** | **Lunch & Learn Program** | Provide in-person and webinar-based education delivered by local EV champions, which can be particularly effective when conducted with partner companies, leveraging their internal communication systems. | - Member companies<br>- EV enthusiasts |
| **1.2** | **Engagement and Development** | | |
| **1.2.1** | **Ecosystem Discovery** | | |
| **1.2.1.1** | **Voice of the customer studies** | Conduct outreach engagement with various user segments to determine sentiment and barriers to adoption. | - Research institutions<br>- Fleets<br>- Residents |
| **1.2.1.2** | **Fleet studies** | Work with local fleets to conduct empirical analyses of fleet characteristics and business cases for EV conversion. | - Fleets<br>- Research institutions |

# ROADMAP ACTIONS (page 2 of 5)

| | | | |
|---|---|---|---|
| **1.2.2** | **Partner Development** | | |
| **1.2.2.1** | **Community and civic group engagement** | Engage with civic and community organizations to grow grassroots support for Evolve Houston initiatives. Begin with listening tour and then identify how and with whom to ally. | - EV enthusiasts<br>- Civic organizations<br>- Advocacy organizations |
| **1.2.2.2** | **Fleet partner pipeline management** | Engage deeply with fleets to (1) generate interest, (2) understand fleet needs and data, and (3) usher along a maturation continuum to pilots and conversions. | - Fleets |
| **1.2.2.3** | **Roadmap alignment** | Engage with adjacent planning organizations, grant providers, and philanthropic foundations to understand long-term plans and roadmaps, so that Evolve Houston's objectives may be shaped to align with and benefit from larger plans. | - TxDOT<br>- HGAC<br>- DOE<br>- FHWA<br>- Foundations |
| **1.3** | **Coordination & Synergy** | | |
| **1.3.1** | **Planning & Reporting** | | |
| **1.3.1.1** | **Regional fleet analysis and coordination** | Globally assess regional fleets based on collected data to proactively strategize coordinated pilots and programs. | - Fleets<br>- Grant providers<br>- HGAC |
| **1.3.1.2** | **Pilot project tracking and reporting** | Maintain data on pilot programs; summarize and report findings as case studies for the benefit of key stakeholders. | - Fleets<br>- Research institutions |
| **1.3.1.3** | **Regional analysis of EVSE needs, penetration potential, and anticipated impact of EV adoption** | Conduct an analysis of EVSE needs and estimated long-term impact based on regional characteristics and estimates of future adoption to be used as the basis for planning, values alignment, and policy making. | - Research institutions<br>- HGAC<br>- TxDOT |
| **1.3.2** | **Visibility** | | |
| **1.3.2.1** | **Lead by example initiatives** | Recruit large fleets to convert or make commitments to convert their fleets to EV in order to set an example and help build a critical mass of demonstrations. | - Fleets<br>- Member organizations |
| **1.3.2.2** | **Competition/recognition programs** | Gamify EV adoption among member companies through friendly competition programs that reward the winners with public recognition. | - Member organizations |
| **1.3.2.3** | **EV charging station signage** | Increase awareness of existing EV charging stations through improved signage and other methods of spreading awareness. | - Member organizations<br>- TxDOT<br>- FHWA<br>- HGAC |
| **1.3.3** | **Safety & Sustainability** | | |
| **1.3.3.1** | **EV and battery safety program** | Develop a literature review of the risks of EVs and batteries, then develop safety recommendations prioritizing those most pertinent to Houston | - Research institutions<br>- Auto manufacturers<br>- Waste companies |
| **1.3.3.2** | **Emergency responder training** | Provide training to emergency responders to inform best practices for responding to incidents involving an EV. | - Research institutions<br>- Emergency responders |
| **2** | **Affordability** | | |
| **2.1** | **Financing** | | |
| **2.1.1** | **Grants** | | |
| **2.1.1.1** | **Grant tracking, advisory, and applicant solicitation** | Track available grants and pair with fleet readiness assessments (1.2.2.2) to proactively solicit fleets to apply. Seek opportunities to leverage grants to facilitate low-income EV purchase programs. | - Grant Providers<br>- Fleets |
| **2.1.1.2** | **Grant-writing support** | Provide grant-writing support resources to high-potential candidate fleets. Develop programs to assist low-income EV-buyers. | - Fleets<br>- Advocacy organizations<br>- Grant providers |
| **2.1.1.3** | **Grant project facilitation** | Provide facilitation resources to assist project management for active pilots. | - Fleets<br>- EVSE service providers |

# ROADMAP ACTIONS (page 3 of 5)

| | | | |
|---|---|---|---|
| **2.1.2** | **Subsidies** | | |
| **2.1.2.1** | **Purchase incentives for new EVs** | Offer incentives for new EV purchases, including discounts on vehicles and other incentives. | - Auto manufacturers<br>- Utilities<br>- Government institutions<br>- Philanthropic organizations |
| **2.1.2.2** | **Purchase assistance and marketplace for used EVs** | Develop incentives for second-hand EV purchases and help develop marketplace. | - Government institutions<br>- Utilities<br>- Member companies<br>- Philanthropic organizations |
| **2.1.2.3** | **Rebates and financing incentives for chargers** | Develop incentives for EV chargers including public infrastructure investments, rebates, discounts on equipment and installations as well as financing options. Ensure that equity considerations are an integral part of key programs. | - Government institutions<br>- Utilities<br>- EVSE service providers<br>- Philanthropic organizations |
| **2.1.3** | **Financial Services** | | |
| **2.1.3.1** | **Lease programs** | Increase the availability of lease programs to defray the up-front costs of EVs and chargers. | - Financial institutions<br>- Philanthropic organizations |
| **2.1.3.2** | **EV and battery second-life market development** | Develop proficiency in leveraging second-life market for EVs and batteries to provide certainty around salvage value for business cases. | - Fleets<br>- Financial institutions |
| **2.1.3.3** | **Shared capital partnerships** | Work to establish partnerships that leverage multi-stakeholder resources toward common objectives. | - Government institutions<br>- Member organizations |
| **2.2** | **Policy** | | |
| **2.2.1** | **Regulatory Engagement** | | |
| **2.2.1.1** | **Policy engagement** | Maintain lines of communication with local and state representatives to ensure Evolve Houston's message is heard. Operate in concert with allied cities, counties, utilities, advocates, and other organizations | - Government institutions<br>- Advocacy organizations |
| **2.2.1.2** | **Media engagement** | Promote awareness of Evolve Houston's activities, eMobility news and issues in the media and at complimentary events. | - Media outlets<br>- Complimentary events<br>- Advocacy organizations |
| **2.2.1.3** | **Legislation tracking** | Monitor legislation coming out of government, at all levels, to identify opportunities to promote Evolve Houston's initiatives. | - Government institutions<br>- Advocacy organizations |
| **2.2.2** | **Policy Development** | | |
| **2.2.2.1** | **Policy working groups** | Conduct working group sessions to develop recommendations for policy initiatives. | - Advocacy organizations<br>- Government institutions |
| **2.2.2.2** | **Advocacy partnerships** | Develop partnerships with aligned advocacy organizations and collaborate on shared objectives. | - Advocacy organizations |
| **2.2.2.3** | **White paper development** | Develop whitepapers to present Evolve Houston's public policy views to inform the dialogue around eMobility. | - Research institutions<br>- Advocacy organizations<br>- Government institutions |
| **2.2.3** | **Community Organizing** | | |
| **2.2.3.1** | **Support letters** | Work with member companies to develop support letters for Evolve Houston initiatives | - Member companies<br>- Advocacy organizations |
| **2.3** | **Electricity Price** | | |
| **2.3.1** | **Price Security** | | |
| **2.3.1.1** | **Fixed-price charging programs for consumers** | Work with REPs and utilities to develop predictable charging rates for consumers. | - REPs<br>- Utilities |
| **2.3.2** | **Cost Efficiency** | | |
| **2.3.2.1** | **Managed charging through rate, technology, and other methods** | Develop managed charging programs to ensure that flexible charging loads can charge most economically. | - REPs<br>- Utilities<br>- EVSE service providers |

# ROADMAP ACTIONS (page 4 of 5)

| | | | |
|---|---|---|---|
| **2.3.2.2** | **Utility provisions to support nascent EV and EVSE programs** | Work with utilities to develop infrastructure and rate provisions to support EV and EVSE investments though infrastructure investments, rate relief, and others. | - Utilities<br>- Public utility commission<br>- Advocacy organizations |
| **3** | **Availability** | | |
| **3.1** | **Vehicles** | | |
| **3.1.1** | **EVs for Purchase** | | |
| **3.1.1.1** | **Network of "lighthouse" EV dealers** | Develop a network of EV dealers who are committed to selling EVs in the Greater Houston area. Include public recognition for dealers who excel. Educate consumers on EVs to help make the EV sales process more attractive to dealerships. | - Car dealerships |
| **3.1.1.2** | **Fleet vehicles catalogue** | Create and maintain a detailed catalogue of fleet vehicle options available in the region. | - Auto manufacturers<br>- Advocacy organizations |
| **3.1.1.3** | **Consumer EV shopping tools** | Deploy web-based tools that help consumer car buyers connect with EV options and make informed decisions about relative merits of EVs. Focus should be not only on assistance for EV shoppers, but also on making EV options visible to those shopping for a conventional vehicle. Leverage search engine optimization and social media. | - Dealerships |
| **3.1.2** | **EVs for Hire** | | |
| **3.1.2.1** | **Electric buses** | Promote the adoption of electric buses with METRO, school districts, and other bus fleet operators. | - METRO<br>- School districts<br>- Airports |
| **3.1.2.2** | **EV rideshare and carshare programs** | Work to develop incentives for EV rideshares and to attract EV carshare companies to the region. | - Rideshare companies<br>- Carshare companies<br>- Government institutions<br>- Utilities |
| **3.1.2.3** | **EV rental and subscription programs** | Increase the availability of EVs available for rent or subscription. | - Rental car companies<br>- Car subscription companies |
| **3.2** | **Infrastructure** | | |
| **3.2.1** | **Deployment** | | |
| **3.2.1.1** | **Public charging network** | Enable installation of ample charging infrastructure throughout the region. Work with adjacent regions to build out fast-charging for inter-city corridors. Explore options for various own/operate models for EV charging stations and charging stations at city-funded projects. | - Government institutions<br>- Utilities<br>- HGAC<br>- TxDOT<br>- EVSE providers |
| **3.2.1.2** | **Workplace and multi-unit dwelling chargers** | Promote widespread installation of workplace and multi-unit dwelling EV chargers. Gather data and track locations and other relevant data. Work with stakeholders to explore ownership models and incentives. Explore inclusion of charging stations at city-funded projects. | - Member companies<br>- Utilities<br>- EVSE providers<br>- Property managers<br>- Advocacy organizations |
| **3.2.1.3** | **Private EVSE** | Use incentives and other programs to enable the installation of private EVSE for fleet applications. | - Utilities<br>- Government institutions<br>- EVSE Providers<br>- Fleets |
| **3.2.2** | **Efficiency** | | |
| **3.2.2.1** | **EV-ready building codes** | Implement EV-ready building codes reduce the cost of charger installations in new facilities. | - Municipalities |
| **3.2.2.2** | **Streamlined permitting and utility process for EVSE** | Create city permitting and utility processes that are speedy and simple to navigate. | - Municipalities<br>- Utilities |

# ROADMAP ACTIONS (page 5 of 5)

| | | | |
|---|---|---|---|
| 3.2.2.3 | **Site hosting** | Develop site host opportunities by partnering with municipalities and businesses to create partners that will host sites for EVSE. Develop a "how to be a site host" resource to inform about specifications and best practices. Ensure that curbside policies are supportive of on-street charging. | - Municipalities<br>- Member companies |
| 3.2.3 | **Building Forward** | | |
| 3.2.3.1 | **Open standards and interoperability** | Encourage standards that ensure that charging stations are long-lived and highly utilized. | - EVSE providers<br>- Member companies<br>- Government institutions |
| 3.2.3.2 | **Demonstration Projects** | Develop demonstration projects and research for leading edge and next generation eMobility technologies. | - EVSE providers<br>- Auto manufacturers<br>- Research institutions |
| 3.3 | **Industry & Jobs** | | |
| 3.3.1 | **New Businesses** | | |
| 3.3.1.1 | **OEM relocation to region** | Recruit auto manufacturers to relocate EV value chain business to the region. | - Auto manufacturers |
| 3.3.1.2 | **eMobility startup development** | Develop EV startup community through partnerships with Station Houston and other accelerators. | - Startup accelerators |
| 3.3.2 | **Human Capital** | | |
| 3.3.2.1 | **EVSE construction and installation professionals** | Train and educate for construction and installations jobs. | - Colleges & universities<br>- High Schools<br>- Training centers |
| 3.3.2.2 | **EV/EVSE repair and maintenance professionals** | Train and educate for repair and maintenance jobs. | - Colleges & universities<br>- High Schools<br>- Training centers |
| 3.3.2.3 | **Fleet EV program management resources** | Train and educate for fleet conversion and EV fleet management jobs. | - Colleges & universities |

■ ■ ■

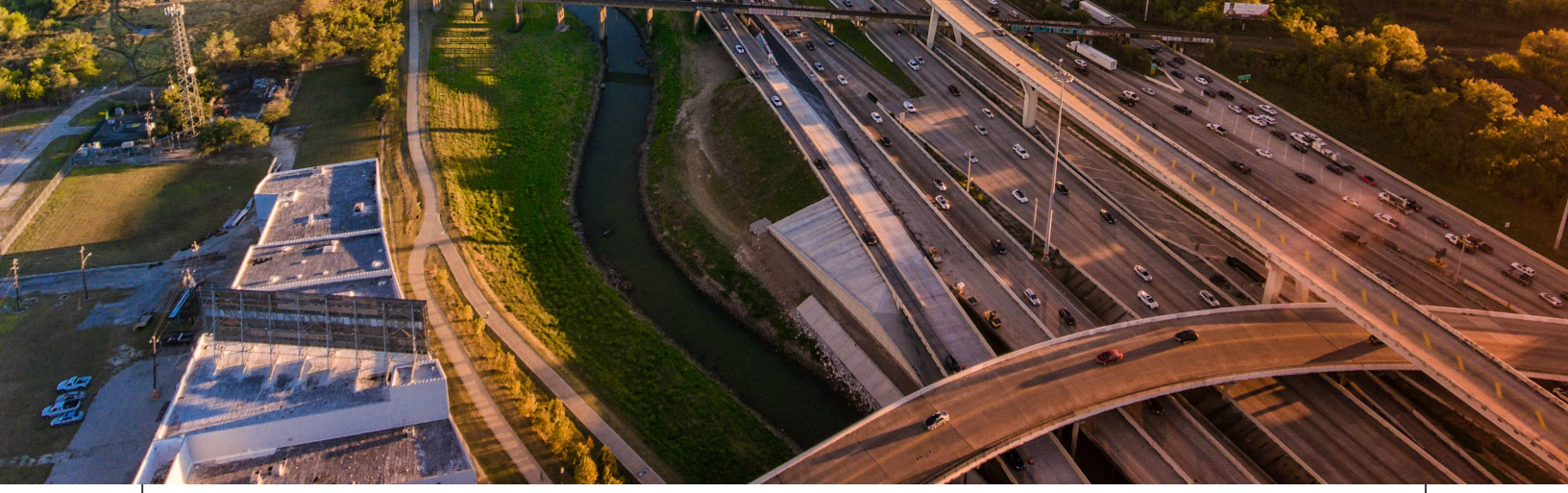
# THE CITY OF HOUSTON'S EV STRATEGY

The City of Houston has developed a regional strategy for vehicle electrification. Leading by example, the City is studying how to electrify its 12,000-vehicle fleet, replacing the EV fleet that was destroyed due to severe flooding during Hurricane Harvey, and working with Rice University on a Green Fleet Study.

Houston is also leveraging the Climate Mayors Electric Vehicle Purchasing Collaborative, which is making it easier for cities across the U.S. to purchase electric vehicles and charging equipment. Furthermore, in partnership with Evolve Houston, the City of Houston has been working to identify opportunities to access grant funding to purchase vehicles and charging infrastructure for pilot programs.

In addition to current work in-progress, the following items are recommended policies and programs that the City can implement to increase vehicle electrification.

| Recommendation | Impact | Lead |
|---|---|---|
| Electrify light duty, non-emergency fleet by 2025 (8,000 vehicles) | Medium | Administrative and Regulatory Affairs (ARA), Fleet Management Department (FMD) |
| Require new single, multifamily, and commercial buildings to be EV and solar-ready | High | Houston Public Works (HPW) |
| Expand public charging at libraries, multi-service centers, garages, parking lots, fire/police stations, and other facilities | High | General Services Department (GSD), FMD, ARA |
| Develop on-street EV parking and charging program | High | ARA, HPW |
| Increase electric vehicle and electric ground service equipment at Houston Airport System facilities | Medium | Houston Airport System (HAS) |
| Expand Green Fleet Share program outside downtown campus | Medium | FMD |
| Require EV infrastructure at City-funded housing projects | Medium | Housing & Community Development (HCDD), Resilience Office, Recovery Office |
| Offer pricing discounts for EVs at City parking spaces | Medium | ARA |
| Streamline/incentivize charging station permit process | High | HPW |
| Implement Houston's Climate Action Plan transportation recommendation to commission Evolve Houston to shift regional fleet to electric vehicle and alternative renewable fuels | High | ARA |



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## Individuals

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Andrew DeCandis
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Christine Economides
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Danita Park
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Lauren Gore
Laura Goldberg
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Marissa Aho
Mark Melton
Michael Conklin
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