
AECOM
POSITIONING FOR THE FUTURE
VEHICLE ELECTRIFICATION
LEARN MORE ↘

WHY AECOM

Successful electrification strategies that connect cities, utilities, transit agencies, and technology partners.

Convergence of new business models and technologies creates opportunities and challenges.

- ☑ A leader in emerging electrification technologies that enables the connection between the modern utility grid and transportation.
- ☑ Unique experience in both energy and transportation modeling, planning, and design to analyze and accelerate transportation electrification.
- ☑ Ability to identify impacts, select technologies, and capture opportunities in support of electric vehicle (EV) adoption.
- ☑ Strong understanding of the opportunities and challenges for electrification of cities, utilities, and transit agencies.

OVERVIEW

The advancements in vehicle technology have created a market where growth is imminent. In less than a decade, EVs battery costs have dropped over 80 percent per kilowatt hour, creating a more accessible market of not only light duty vehicles, but also medium, heavy, and transit vehicles. New charging technologies have also been developed that can provide immense amounts of energy to charge batteries in just minutes. Emerging technologies are advancing how renewable energy, transportation electrification, and distributed energy resources can all be harnessed to reinvent energy management.

Throughout the last decade, there has been a focus on EVs and how and when there would be significant growth in their adoption. Cities want the benefits EVs can bring to help them meet sustainability and air quality goals, improve the health of their communities, and even potentially reduce the life cycle cost of their own fleets. Utilities recognize that EV adoption is the pathway to grid modernization, as transportation is set to become their biggest customer and transportation agencies are trying to develop best practices for planning and design of infrastructure required to support these new vehicles.

The push for transportation electrification is happening now with cities searching for strategies to accelerate adoption of EVs and regulatory agencies passing mandates and proposals to support those efforts.

For example, in California in 2018, the California Public Utility Commission approved plans to allow major state utilities to spend over $750 million on EV infrastructure and rebates that would accelerate the adoption of EVs, with a heavy focus on medium and heavy duty vehicles. The California Air Resource Board also passed a regulation that would require all transit buses in California to be zero-emissions by 2040.

The examples of legislation show how cities and states are striving to accelerate adoption of EVs.

Despite all the benefits of adoption of EVs, there are significant challenges that cities, utilities, and transportation agencies will face with this new technology adoption.

Understanding and planning strategies to provide the infrastructure to support EVs will be critical and developing an ecosystem that can leverage opportunities of the technology will be important for the growth and scalability of transportation electrification.

The transportation-energy nexus is a new challenge for infrastructure owners and operators, but with this challenge comes many opportunities for agencies to improve their aging infrastructure, share resources and assets with other agencies with similar goals, and find strategies to reduce life cycle costs of their operations.

ELECTRIFICATION FUTURE

TRANSPORTATION ELECTRIFICATION IS MORE THAN JUST ABOUT VEHICLES, IT WILL IMPACT OUR ENTIRE BUILT ENVIRONMENT.

CITIES

- Availability of electric charging infrastructure
- EV microgrid integration
- Policy and regulations to accelerate electrification
- Planning for resilience and sustainability

UTILITIES

- New rate tariffs and incentives which accelerate EV adoption
- Support for large EV fleet owners
- Strategizing infrastructure improvements to support EV growth

TRANSIT AGENCIES

- Electrifying public transit
- Aligning with agency initiatives and mandates
- Integrated infrastructure solutions

AECOM ELECTRIFICATION CAPABILITIES

SMART ENERGY

/ Electrification Policies
/ Energy and Transportation Modeling and Design
/ Energy Management
/ Energy System Modeling
/ Fleet Modernization Strategies
/ Financing and Deployment
/ Integrated Smart Infrastructure Planning
/ Market and Financial Feasibility Analysis
/ Microgrids
/ Resilience Strategies
/ Smart Energy Programs for Utilities

INNOVATION

BUSINESS PLANNING

AECOM has the experience, skills, and tools to complete electrification business planning under multiple scenarios. For example, AECOM supported the City of Minneapolis Public Works Department (City) and the Fleet Services Division in performing a study on the replacement of the currently used City-wide fleet of internal combustion engine vehicles with EV fleet technology based on the anticipated costs and environmental benefits. The study assessed multiple different approaches that the City could take in the transition to an EV fleet of vehicles, which can be chosen based on the availability of funds to procure an EV fleet within the current purchasing model of vehicle replacement utilized by the City's Fleet Services Division.

In addition to supporting cities and transit agencies, AECOM has worked with utilities to study electrification impacts on grid assets. This information can help utilities make educated decisions regarding capital improvements and future needs.

INFRASTRUCTURE & TECHNOLOGY

AECOM, in collaboration with our technology partners, is developing pilot projects for static and dynamic wireless charging of EVs and buses. As one example, AECOM is working with the Illinois State Toll Highway Authority and examining how to install dynamic wireless EV charging along I-294 as the agency embarks on a $4 billion project to widen and rebuild a 22-mile portion of the interstate. As EVs drive over the charging equipment, electricity would transfer to a receiver on the bottom of their frames and wirelessly charge their batteries. AECOM is also assisting the Colorado Department of Transportation through their RoadX program to deploy a similar technology on a stretch of road near Denver International Airport.

AECOM can assess and deploy new and emerging technologies in support of electrification. These technologies create opportunities for transit agencies, cities, and utilities to reconfigure their existing infrastructure and operations to maximize immediate electrification opportunities and benefits.

Dynamic wireless charging allows transportation agencies to charge their fleets while vehicles are in motion.

DISTRIBUTIVE ENERGY RESOURCES

While connected to electric vehicle supply equipment (EVSE), EVs can serve as distributed energy resources, providing storage and demand response services to the grid. This allows for integration of EV strategies with other energy goals, such as deployment of renewable energy, modernization, and grid resilience. For example, EVSE connected within a microgrid can reduce charging during high demand periods and increase charging during periods of excess renewable generation.

AECOM can support development of vehicle-grid integration (VGI) strategies which facilitate use of EVs as distributed energy resources. Both utilities and fleet charging operators can use VGI to optimize demand, costs, or greenhouse gas emissions.

CITIES

By 2050, approximately 70 percent of the world's population will live, commute, and work in urban areas. Between now and then, cities and suburbs will undergo significant transformations to become more sustainable and resilient with a focus on decarbonization.

The rapid proliferation of EVs creates a series of challenges and opportunities for cities. Limited interoperability and digitalization of infrastructure can make broad customer engagement challenging. EV charging could create local constraints and stability problems on power networks and reduce the environmental benefits of electrification. Cities require solutions that are sustainable, affordable, secure and inclusive, and integrated with customer-centric infrastructure and services.

AECOM has robust experience in energy and transportation modeling, planning, and design to understand and accelerate transportation electrification. We have supported cities in the development of management, analysis, modeling, and engineering solutions necessary to support integrated electrification policies, planning, financing, and deployment. Our project experience includes market and financial feasibility analysis, integrated smart infrastructure planning, resilience strategies, energy system modeling, and fleet modernization strategies.

AECOM's partnership with cities and utilities allows us to identify programs, strategies, and policies that support:

- ☑ Improved customer awareness through outreach and education campaigns.
- ☑ Provide customer incentives to manage charging load and lower customer energy bills.
- ☑ Make targeted investments to support charging infrastructure.

UTILITIES

Utilities are facing growing challenges as customers are rapidly shifting to an electrified transportation system. Increased energy needs and changing consumption patterns will have impacts at all levels on the electric grid, including transmission, distribution, and supply. While few instances of EVs from clustered charging exist today, future growth may substantially impact the distribution system. As the electrification of the transportation sector evolves beyond traditional models of individual ownership of light duty vehicles to heavy duty EV fleet applications, issues could become even more amplified.

At the same time, EVs present a growing market for electric utilities and will present new ways in which the utility can interact with customers including:

- Rate tariffs which encourage adoption of EVs.
- Incentives, planning, and support for locating EV charging infrastructure, particularly for DC Fast Charging.
- Support for large commercial customers or fleet vehicle operators to enable large scale charging.

Utilities will need to balance increased penetration of EV charging with other priorities and challenges. The AECOM team has worked with utilities on diverse smart energy topics and can advise on how these new and emerging technologies can complement EV strategies. For example, ensuring EV adoption enhances efforts around renewable energy and grid resilience (microgrids).

AECOM's expertise in modeling energy use can help utilities navigate the challenges of an increasingly electrified transportation system. AECOM also has deep experience in developing smart energy programs for utilities, which can be leveraged to create EV solutions that support other initiatives including increased distributed generation, renewable energy targets, and increased grid resilience.

AECOM is able to leverage its deep experience in modeling energy and EV penetration to support utility infrastructure planning decisions. AECOM's energy policy team can support benchmarking of incentive, rate tariff, and other programs and advise on industry best practices.

Approximately
74%
of U.S. utilities have already started planning for transportation electrification

TRANSIT AGENCIES

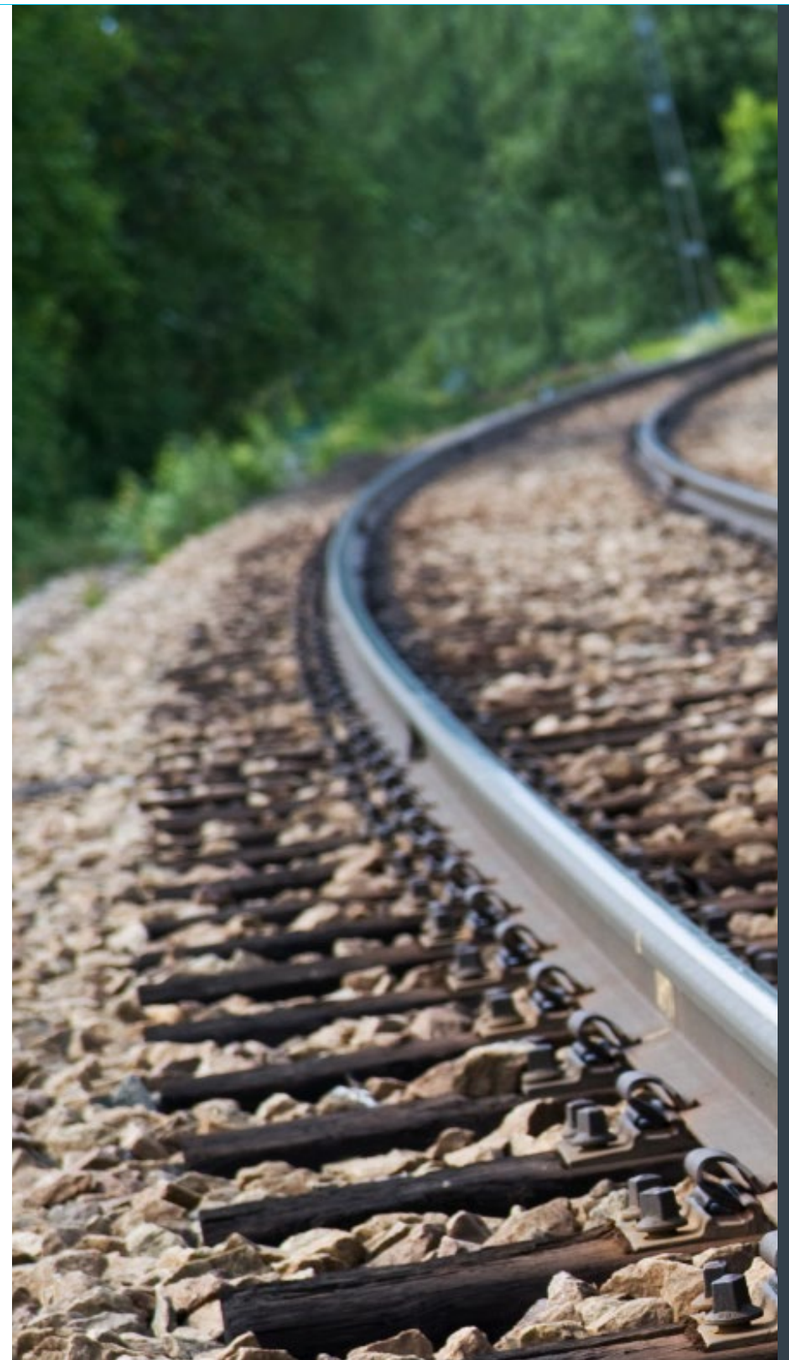
Transit agencies across the U.S. are embracing electrification and shifting their fleets from internal combustion engines to EVs and buses. With these changes come numerous challenges around procurement, routing, and charging. Buses and charging infrastructure will need to be selected and deployed to meet the needs of existing and future route conditions. Municipal and transit fleet facilities will need to be upgraded to support EV and bus charging. Maintenance operations, route schedules, and operations budgets will also need to be aligned with the needs of an electrified fleet.

At the same time, the shift towards electrification presents an opportunity for transit agencies to meet sustainability and carbon emissions reductions goals.

An electrified fleet can help agencies realize reduced operating expenses and reduce space needed for fueling stations.

The AECOM team can help agencies understand and quantify these co-benefits and ensure EV technologies selected will support existing mandates and goals.

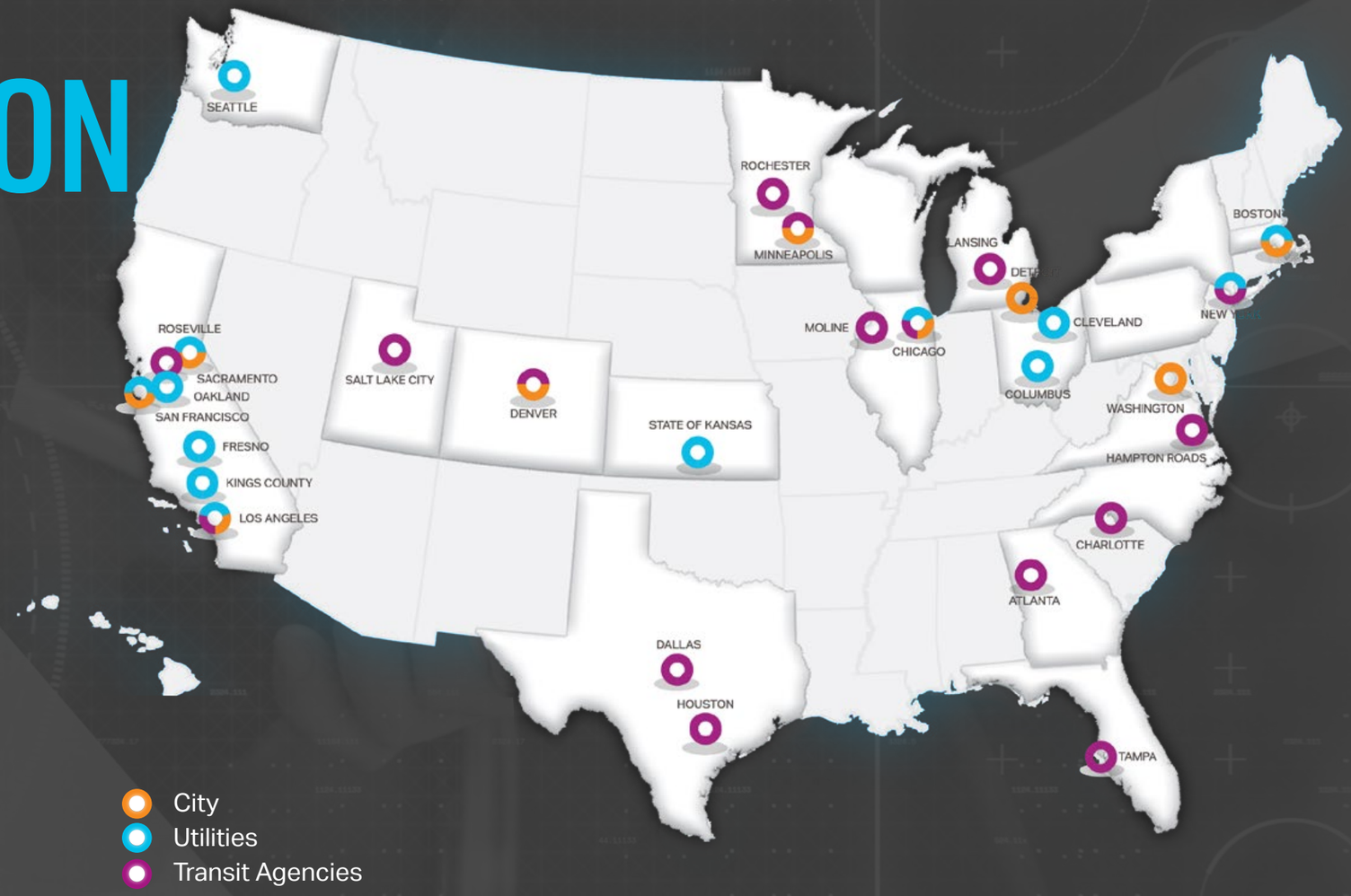
AECOM has deep expertise in developing electrification implementation plans for transit agencies. We have supported agencies throughout the U.S. with the transportation planning, financial analysis, and engineering solutions needed to create robust EV strategies. The AECOM team can also provide analysis and planning for future maintenance, training, financial, and infrastructure needs.



At AECOM, we have advanced electrification by forming partnerships between utilities and transit agencies to overcome high switching costs of vehicles and infrastructure investments.

AECOM ELECTRIFICATION EXPERIENCE

Our team has worked with citites, utilities and transit agencies Connecting mutual efforts to better prepare for and accelerate transportation electrification goals.



EXPERIENCE

AECOM is a leader in mobility solutions and recognizes the direct and growing connection between the modern utility grid and vehicle electrification. We have performed vehicle electrification feasibility studies and infrastructure assessments for clients across the U.S. and globally including the Colorado Department of Transportation, Ohio Clean Fuels, and Highways England. We are uniquely qualified to assist the cities and utilities in assessing the growing demand for plug-in EVs and the opportunities and challenges that the demand provides to your system and your communities.

Client	Project Details	Energy Master Planning	Fleet Management	Forecasting	Grid Impacts	Location Planning	Sustainability Mgt	Facility Design	Vehicle Engineering (Procurement)
Boston Planning and Development Agency Boston, MA	Developed City's Smart Utilities Vision comprised of smart transportation with autonomous EVs, smart transportation management, and vehicle to grid initiatives.	✓	✓	✓	✓	✓	✓	✓	✓
City of Minneapolis Minneapolis, MN	Assessment study on the replacement of internal combustion engine vehicles to EV fleet technology and identified steps in transitioning to EVs.	✓	✓	✓	✓	✓	✓	✓	✓
City of Roseville Roseville, CA	Assessment of growing plug-in EV demand and charging services on Roseville Electric Utility.	✓	✓	✓	✓	✓	✓	✓	✓
Clean Fuels Ohio, Cleveland/Columbus, OH	Developed implementation plan for community readiness for EV charging infrastructure.	✓	✓	✓	✓	✓	✓	✓	
Colorado Department of Transportation Denver, CO	Electrified roadway pilot project study bringing formative technologies to enhance Colorado's transportation system. A one-mile pilot project to install roadway induction coils for EVs to wirelessly charge while in-motion.		✓		✓	✓	✓	✓	
Commonwealth Edison Chicago, IL	Development of integrated resilience performance metrics for microgrid and related grid modernizations.	✓		✓	✓	✓		✓	
Confidential Client San Francisco, CA	Program management services for the installation of 7,500 EV charging ports over a three-year period.	✓	✓			✓		✓	✓
Detroit Sustainability Action Agenda, Detroit, MI	Facilitated stakeholder engagement to support development of an EV infrastructure strategy for the City.	✓	✓	✓	✓		✓		
King County Metro Seattle, WA	Selected site and design of bus base to accommodate approximately 300 buses to support their zero-emission bus (ZEB) technology deployment and commercialization.	✓	✓	✓	✓		✓	✓	✓
Illinois State Toll Highway Authority, Downers Grove, IL	Led a study and pilot of merging charging technology that will be installed in the Illinois Tollway to support medium and heavy EVs in the future.	✓	✓	✓	✓		✓	✓	
Pepco Holdings, Inc., DE, MD, NJ and Washington, D.C.	Program management services for the implementation of EV service equipment.	✓	✓	✓	✓	✓	✓	✓	✓
New York Power Authority, New York, NY	Design, construction, project management, and commissioning of EV charging stations at JFK International Airport.	✓	✓	✓	✓	✓	✓	✓	✓
Washington Metropolitan Area Transit Authority Washington D.C.	Provided consulting services to perform an Electric Bus Alternative Analysis. This analysis serves as a "road map" to determine the viability and plan to move towards a Battery Electric Bus (BEB) fleet.		✓	✓		✓	✓	✓	✓

BOSTON PLANNING & DEVELOPMENT AGENCY
BOSTON SMART UTILITIES PLANNING

Boston, Massachusetts

AECOM was selected by the Boston Planning & Development Agency to develop the City's Smart Utilities Vision. This Vision defined smart city technology opportunities, best practices, and strategies for potential redevelopment of a portion of Dorchester Avenue. Technologies and strategies were conceptually designed to model the cost and benefits of smart city technologies compared to standard utility and planning practices.

The Boston Smart Utilities Vision was a collaborative effort between City government and utility companies that will offer a new model for integrated planning among energy, transit, water, and communications utilities. By improving coordination among utilities, the project aims to make these services in urban neighborhoods more affordable, resilient, equitable, and sustainable.

CLIENT BENEFITS

- Smart city technology identification and evaluation
- Conceptual planning and engineering analysis
- Preliminary cost estimating
- Qualitative and quantitative cost/benefit analysis
- Triple Bottom Line modeling

CITY OF MINNEAPOLIS STUDY

Minneapolis, Minnesota

AECOM supported the City of Minneapolis Public Works Department and the Fleet Services Division in performing a study on the replacement of the currently used City-wide fleet of internal combustion engine vehicles with EV fleet technology based on the anticipated costs and environmental benefits.

CLIENT BENEFITS

The study assessed multiple different approaches that the City could take in the transition to an EV fleet of vehicles, which can be chosen based on the availability of funds to procure an EV fleet within the current purchasing model of vehicle replacement utilized by the City's Fleet Services Division. AECOM also identified next steps that can be taken by the City to prepare for a transition to EVs.

These include performing a more detailed assessment to measure vehicle operations in cold winter months to determine if EVs can perform on a single charge during heavy usage of vehicle heaters and operation in cold climate conditions.

Other steps include monitoring the automotive industry and its progress in making EVs as an affordable option to internal combustion engine vehicles.

CITY OF ROSEVILLE
ASSESSMENT OF GROWING PLUG-IN EV DEMAND AND CHARGING SERVICES

Roseville, California

The AECOM team assisted the utility in accessing business strategies and distribution/operational plans for expanding customer demand for plug-in electric vehicle (PEV) charging services in the City of Roseville. This study will be used to create an electric utility business plan for the utility's response to customer PEV demand. Ideally, this plan will provide information that will be used to direct utility operations, business policies, and customer program development that will support customer expectations and preferences, facilitating the utilization of PEVs in the City of Roseville.

The study will assess various scenarios and recommend operational and business practices that may be adopted by the utility.

CLIENT BENEFITS

AECOM completed an evidence-based projection of PEV and PEV charging technology considering established policies, market drivers, PEV availability, and anticipated technological advances from 2018-2028. The resulting information, in combination with City-specific data, was then used to model PEV uptake at the utility transformer level.

The model outputs include PEV system peak demand impacts, system consumption impacts, CO_2 impacts, feeder peak demand impacts, and demand management impacts. With this information, the City can properly serve and manage PEV charging load and support the development of PEV charging infrastructure.

CLEAN FUELS OHIO
COMMUNITY READINESS FOR EV AND CHARGING INFRASTRUCTURE

Cleveland and Columbus, Ohio

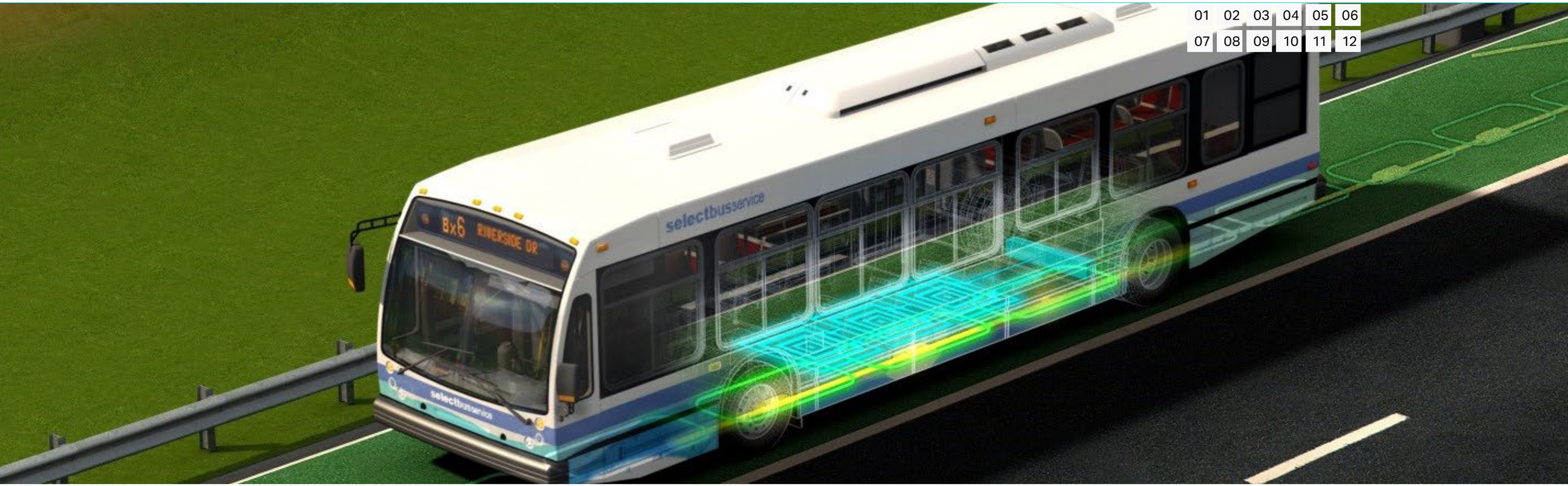
AECOM developed an implementation plan for EVs in Columbus, Cleveland, and along the I-71 corridor.

The project was designed to seamlessly integrate all of Ohio's EV readiness activities and stakeholders to produce a replicable, ready-to-implement deployment plan for PEVs, charging infrastructure, safety training, consumer education, marketing, and associated policy solutions including zoning, code, permitting, inspection, and other incentives.

As the project lead, AECOM also integrated information from more than 20 project partners including local utilities, educational and research institutions, local units of government, state agencies, and metropolitan planning councils.

CLIENT BENEFITS

- Reduced carbon emissions utilizing cleaner, greener, more renewable electric grid to power transportation. Grid-rechargeable cars will be utilized to attain the end goal of zero-emissions and ensure fuel price stability.
- Ensures that electricity generation will be even more renewable, cleaner, diversified, distributed, redundant, and secure.



COLORADO DEPARTMENT OF TRANSPORTATION (CDOT)

CDOT ELECTRIFIED ROADWAY PILOT STUDY (ROADX PROGRAM)

Denver, Colorado

AECOM conducted the study to develop a pilot project in Colorado that will be scaled and extended to serve both electric freight trucks and eventually include light duty vehicles to further promote EV adoption. The technology for the inductive charging would be installed in a lane of traffic to allow for EVs to wirelessly charge while in motion. The technology, while still being developed, would be tested to better quantify the efficiency of the system as well as the performance in varying conditions.

CLIENT BENEFITS

- A one-mile pilot project to install in the roadway induction coils, which will charge EVs.
- CDOT is the first Department of Transportation in the U.S. providing access to real-world conditions to test this technology.

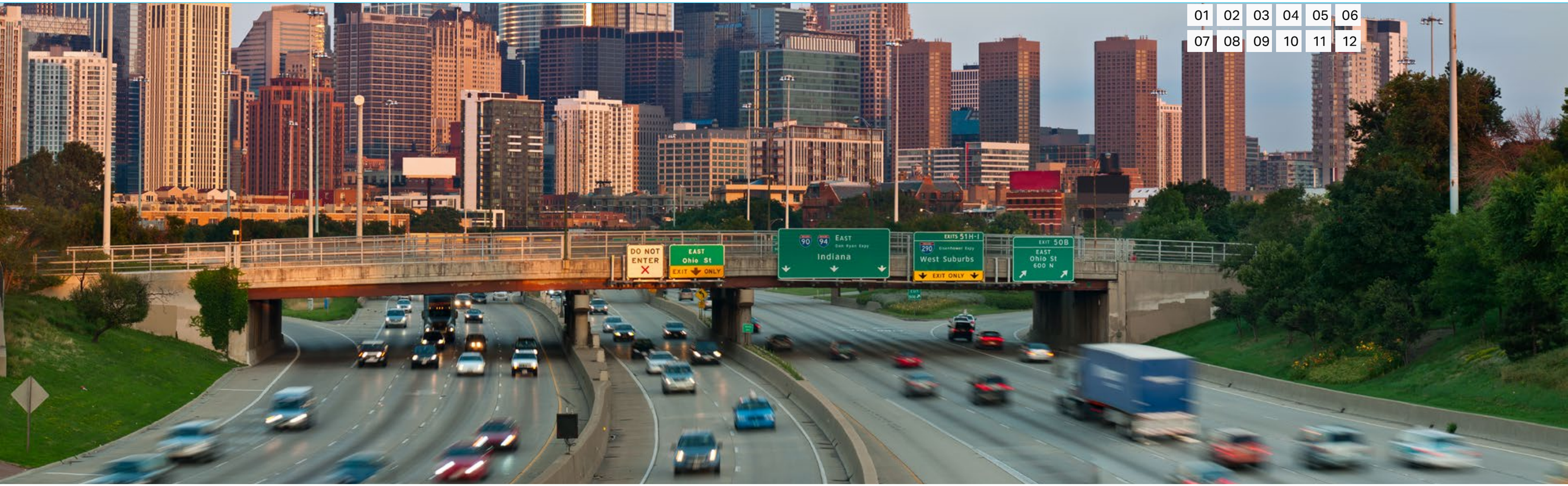
KING COUNTY METRO
ZERO-EMISSION BUS TECHNOLOGY

Seattle, Washington

AECOM is assisting King County in selecting the site and designing the eighth bus base to serve its growing system. As the agency plans to convert their entire fleet to ZEB technology by 2040, AECOM is supporting the county in meeting its plan to convert their entire fleet to ZEBs, and is leading the identification and acquisition of a site(s) for a new bus maintenance and operations facility to accommodate approximately 300 buses for King County Metro.

CLIENT BENEFITS

- Experienced multi-disciplinary team members
- Comprehensive cost estimates across all soft costs, equipment
- Capital costs for new facility
- Facility design



ILLINOIS STATE TOLL HIGHWAY AUTHORITY
STRATEGIC PLAN - EV CHARGING

Downers Grove, Illinois

AECOM assisted the Illinois State Toll Highway Authority in developing a strategic vision and implementation plan to deliver EV charging options to customers within the I-294 Central Corridor. Key elements of the plan were a review of existing and future technologies available, a market demand study projecting future charging utilization trends, and the impacts of smart powered lanes on utility resources and load forecasting. At the conclusion of the study phase, pilot projects were identified for installation in 2019.

Based on the results of the market demand study and pilot projects, options for full-scale implementation of smart powered lanes will be recommended in 2022.

CLIENT BENEFITS

- Project management
- Current and future charging technologies projects, including PEVs, static wireless, and dynamic wireless charging
- PEV charging utilization trends and projections
- Coordination with local utility
- Assessment of PEVs impact on distribution grid and utility power resources

COMMONWEALTH EDISON
MICROGRID AND SMART CITY SUPPORT

Chicago, Illinois

AECOM is helping ComEd evaluate development of integrated resilience performance metrics for the microgrid and related grid modernization and smart city improvements. The metrics analysis focuses on defining the measurable and deliverable resilience benefits of grid modernization initiatives such as the Bronzeville microgrid system and includes the electrical system, critical infrastructure, and community resilience.

Community of the Future smart city support includes development and implementation of strategies for stakeholder outreach and engagement related to ComEd's Community of the Future, smart city, grid modernization, and microgrid initiatives.

Outreach approaches consider both general awareness and engagement for the development of specific technology applications associated with smart city investments.

AECOM is assisting ComEd with planning for comprehensive modernization of urban street light systems to achieve energy savings, implement smart city service improvements, increase revenue generation opportunities, and support City sustainability and resilience goals.

CLIENT BENEFITS

- Smart city program management and stakeholder engagement
- Developed microgrid performance metrics
- Best practices analysis
- Smart street light deployment modeling and optimization planning

NEW YORK POWER AUTHORITY
JFK INTERNATIONAL AIRPORT EV CHARGING INFRASTRUCTURE (EVCI)

New York, New York

AECOM is providing services for the installation of EV charging stations at JetBlue Terminal 5 at JFK International Airport under the New York Power Authority's expedited implementation master services agreement.

The project consists of delivering a complete, reliable, and fully functioning EVCI system at JFK airport including new (22) 4-port charging stations, (16) 2-port charging stations, conduit and wiring, 120 safety bollards, and 120 cable retractors.

CLIENT BENEFITS

- Project management, construction management, and administration services
- Constructability and design reviews
- Cost estimating, scheduling, and contract packaging
- Procurement, construction management, logistics, commissioning, and activation

CONFIDENTIAL CLIENT
EV CHARGE NETWORK PROGRAM SERVICES

San Francisco, California

AECOM provided program management services by assisting the client to achieve objectives specific to the Electric Vehicles Charge Network (EVCN) program. These services include planning, analysis, and project controls, which consist of scheduling, cost estimating, contract administration, and document control services. Objectives include the installation of 7,500 EV charging ports over a three-year period.

These goals also included the installation of 10-20 ports per site per month in 2018; increasing to 20-30 per month in 2019 and 2020. AECOM's focus is on attaining project scope, cost, and schedule goals; identifying gaps; and supporting internal reporting requirements for each project.

CLIENT BENEFITS

- Unifier to streamline existing document control systems
- Gap analysis resulting in improvements for a successful EVCN program
- Established a baseline schedule for contractors
- Developed costs system for validation of project costs that ensured accountability

WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY

ELECTRIC BUS ALTERNATIVE ANALYSIS BATTERY ELECTRIC BUSES

Washington, D.C.

Washington Metropolitan Area Transit Authority (WMATA) is seeking consulting services to perform an Electric Bus Alternative Analysis. The Battery Electric Buses (BEBs) have vastly different performances then diesel buses depending upon everything from local temperature, topography, length of routes, maintenance needs, and operator habits. This analysis will serve as a "road map" to determine the viability and plan to move towards a BEB fleet.

This analysis will be comprehensive and determine planning, maintenance, training, financial, infrastructure, environmental considerations as well as the future fleet make-up. This analysis is intended to address these issues in relation to the WMATA service area. Based on recommendations from this analysis, a pilot fleet will be procured. If the pilot is a success, WMATA will determine an implementation strategy for BEBs.

CLIENT BENEFITS

- Investigate the placement of charging infrastructure for the BEB routes, fleet, and power grid capabilities.
- Provide analysis of existing bus storage and maintenance facility capabilities and requirements to house BEBs. This should include power grid requirements, space needs, and equipment upgrades.
- Consideration of fast-charging stations on the route and overnight in-depot charging stations at bus garages.
- Recommendations and strategies to encourage utilities to design rates that support BEBs. This includes analysis of existing rate conditions with electrical utility providers. Review should include with and without demand charges.

THE DETROIT SUSTAINABILITY ACTION AGENDA
EV INFRASTRUCTURE STRATEGY

Detroit, Michigan

The AECOM team, as a part of its work developing the Detroit Sustainability Action Agenda, facilitated a stakeholder engagement to support development of an EV infrastructure strategy for the City. AECOM engaged City departments, transportation authorities, and the electric utility in a series of workshops to identify obstacles to EV infrastructure development and the resources and involvement required to overcome those obstacles. As a result, the City was able to identify the roles of government, local utilities, and third-parties in the operation and maintenance of EV infrastructure as well as suitable venues for this infrastructure and the necessary upgrades to existing infrastructures to support EVs. This approach will allow the City to develop an implementation strategy specifically tailored to best serve Detroiters and generate widespread participation in an EV program.

YOU HAVE BIG CHALLENGES WE HAVE BIGGER SOLUTIONS

NAMED ONE OF *FORTUNE* WORLD'S MOST ADMIRED COMPANIES FOR THE SEVENTH CONSECUTIVE YEAR

FOR MORE INFORMATION

William S. Haas, LEED AP
Director
Smart Energy Market Sector
D 312-373-7672
M 312-316-9279
william.haas@aecom.com

VISIT AECOM.COM