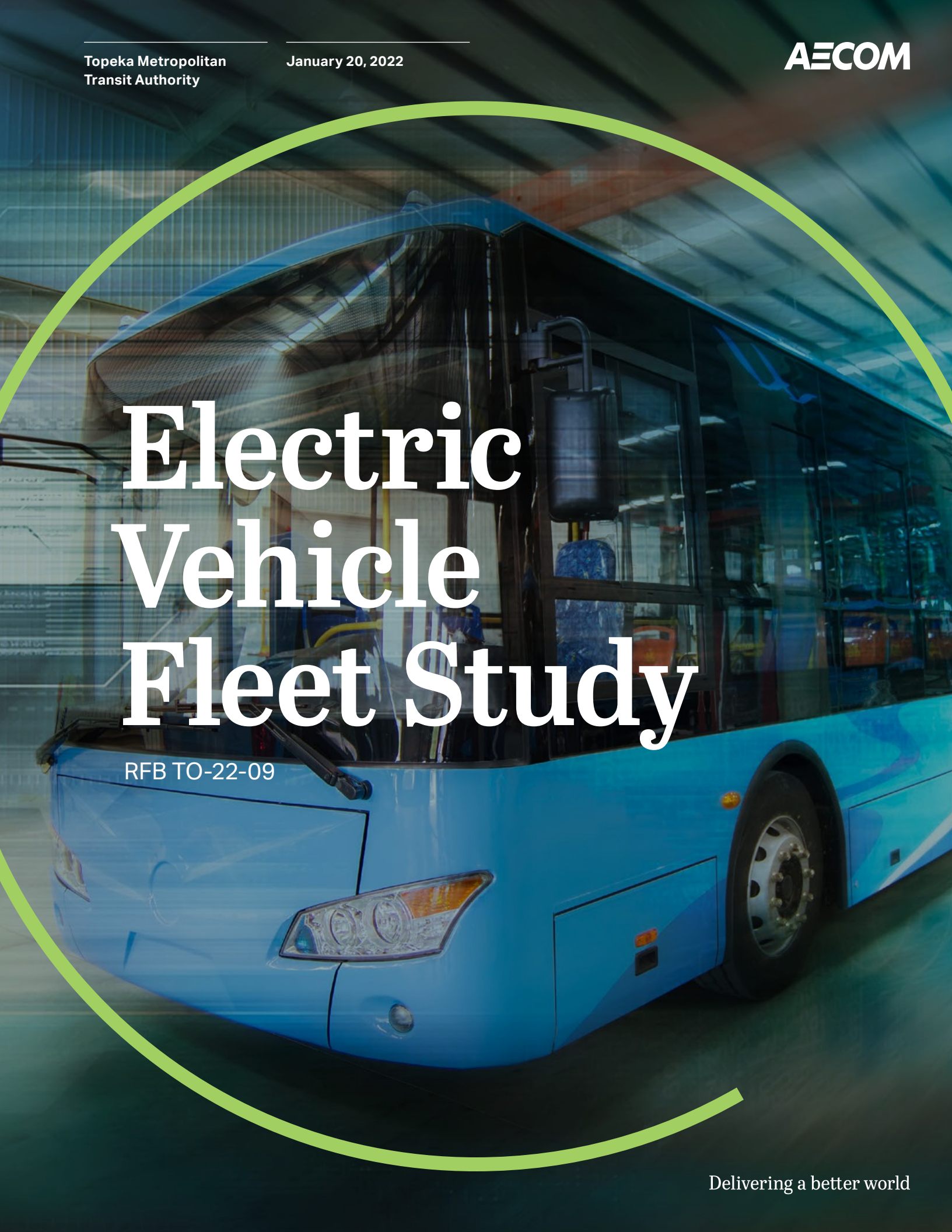
Topeka Metropolitan Transit Authority

January 20, 2022

AECOM



Electric Vehicle Fleet Study

RFB TO-22-09

Delivering a better world

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January 20, 2022

Mr. Richard Appelhanz
Topeka Metropolitan Transit Authority
201 North Kansas Avenue
Topeka, KS 66603
rappelhanz@topekametro.org

RE: Request for Bids TO-22-09, Electric Vehicle Fleet Study

Dear Mr. Appelhanz and Members of the Selection Committee,

Topeka Metro provides a critical mobility service for the community. The agency has been looking at new and innovative transportation options to deliver the service in the future. After a successful Low No Emission Vehicle Program grant in 2019, the agency secured funding for the purchase of three battery electric vehicles (BEVs). Topeka Metro will be introducing the electric buses to the fleet starting in 2023 and looking for strategies for implementation of the buses and the EV infrastructure. AECOM is ready and committed to bring our expertise with electric vehicles and innovative mobility solutions with transit agencies around the country to be your partner as you introduce electric vehicles to your fleet.

AECOM and our project manager, Andrew Ittigson, are very familiar with Topeka Metro and the overall routing and operations of the system. Over the past eight years we have led service planning efforts, a fare analysis, a bus maintenance facility relocation study, and assisted with the successful Low No grant. This understanding of your system and agency will allow us to hit the ground running with planning for the future of EV vehicles.

AECOM and our partner, Evenergi, have extensive experience with electric bus analysis, and we understand all the complexities of planning a fleet transition. Through our work in Los Angeles, Denver, Ann Arbor, MI, Washington DC, and other regions, our transportation, financial planning, and energy specialists can guide Topeka Metro through this complicated process and help you avoid common, costly pitfalls along the way.

On behalf of our team, we would like to thank you for the opportunity to submit this proposal, and we look forward to your positive response. If you require further information, you can reach Andrew Ittigson at 510.552.6899 or Lindsey Sousa at 303.376.2926.

Yours sincerely,

AECOM Technical Services, Inc.

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Introduction

The AECOM / Evenergi Team

The AECOM/Evenergi team proposed for this project is made up of a small, focused and nimble group of experts who have worked together on similar projects in the past. Limiting the number of people in a project, and ensuring that those people have a wealth of experience from previous electric bus studies and deployments, allows AECOM to keep project costs down and complete scheduled tasks within the allotted time frame.

For the Topeka Metro Electric Vehicle Fleet Study, AECOM proposes the following seven team members to carry out project activities:

Andrew Ittigson is a transit planner based in Dallas who has worked with Topeka Metro staff over the past eight years on a variety of projects. As project manager, he'll point our team in the right direction, keep us apprised of Topeka Metro's business practices and procedures, and serve as the main point of contact for the agency and the final reviewer of deliverables before they are submitted.

Patrick Gough, AICP, is a transit planner with 18 years of experience who will lead day-to-day activities and technical work as deputy project manager. He will serve as an additional point of contact for Topeka Metro, coordinate project team work, conduct research and analysis, and write and edit project deliverables.

Alexis Hedges will serve as the project's chief analyst for zero-emission bus technologies. Though only in the profession for 5 years, Alexis has already amassed an impressive amount of experience as an analyst for more than a dozen electric bus projects around North America. Her electric bus modeling experience and background in transport economics will be an asset to the project. Alexis has been working alongside Patrick on the WMATA electric bus transition program.

Ryan Winn will fill an important role in the project as the task lead for policy. Ryan will research and write about electric vehicle regulations, laws, and policies – in both Topeka and the State of Kansas – that affect transit electrification. He will prepare materials about potential risks and challenges facing Topeka Metro as it moves forward into the construction of charging stations and scaling up its electric fleet. Ryan is currently investigating municipal EV policies and options with Patrick as part of an electric vehicle study for Anne Arundel County, Maryland.

Krystal Oldread is a transit operations planner who specializes in bus scheduling and runcutting, on-board bus systems and integration, and depot-related issues. She will be relied upon to advise on scheduling questions, bus storage and parking, and traffic flows through the facility, based on our analysis of infrastructure needs at the Topeka Metro depot. Krystal and Patrick are working together on the VTrans electric bus study for the State of Vermont.

And, finally, **Steve Hall, PE,** is an electrical engineer who is Patrick's counterpart in AECOM's Energy line; their work has overlapped on at least seven electric bus projects so far they have worked together on seven projects related to vehicle electrification. Steve is an authority on analyzing electrical needs at facilities and coordinating with utilities to provide upgrades that support electric bus deployments. He will be a key player in the infrastructure and facility planning piece of the project, owing to his in-depth understanding of utilities, microgrids, solar power generation and energy storage, and the siting and installation of charging infrastructure.

AECOM is joined in the project by **Evenergi**, a company that provides modeling software and fleet transition consulting to agencies exploring transit electrification. **Sasha Pejcic** will provide electric vehicle financial analysis and total-cost-of-ownership estimates for Topeka Metro. He will also use his 10 years of experience in electric bus deployments to advise the team on questions of funding sources, manufacturers of vehicles and charging infrastructure, supply chains, and the training of operators and maintenance crews.

How Our Proposal is Organized

- **Part 1** contains the AECOM team's Project Understanding and Approach to carrying out the work. To explain how we see this study unfolding, we've grouped the questions listed in the scope into categories, and then based our work plan on those categories plus the "bidder responsibilities". The result is six tasks that cover the analysis required to get Topeka Metro to the next level of understanding about transitioning to an electric fleet in both the short term and long term.
- **Part 2** describes the Experience and Qualifications of the AECOM team from previous electric bus projects, including those for WMATA, VTrans in Vermont, LA DOT, and many others. The breadth of our work covers small and large agencies, transit fleets that operate in a variety of environments, and projects that emphasize impacts to service, facilities, and electrical infrastructure. One of the advantages of choosing AECOM is that, as one of the largest infrastructure companies in the U.S., we can avail ourselves of resources in engineering, planning, architecture, transportation economics, and a host of other disciplines. On occasions when our project team might not know the answer to a question posed by Topeka Metro staff, we're an email or phone call away from getting that answer from one of our colleagues.
  Following the section about our companies' previous experience in the field of transit electrification, we present our Organizational Chart and Resumes for the seven key staff in the combined AECOM / Evenergi team.
- **Part 3** contains our cover sheet, price quote, and certifications.

01. Project Understanding and Approach

AECOM proposes six tasks to address the many questions Topeka Metro has, and will continue to have, as it looks to implement the first three BEVs in 2023.. These tasks are discussed in detail below.

1. Project Management
2. Existing Conditions
3. Regulations, Laws, Rules, and Policies
4. Implementation Strategy
5. Financial Analysis
6. Final Report

We developed these tasks based on our reading of the scope of work, which is best understood by grouping questions and issues together into categories, while also taking into consideration the Bidder Responsibilities portion of the scope.

Category 1: Impacts to the Topeka Metro Facility

- *What is the impact of adding electric buses to the existing Topeka Metro fleet?*
- *What is the impact of adding just 3 electric buses to the Topeka Metro fleet?*
- *Where and how many electric bus charging stations should be deployed to service an all-electric bus Topeka Metro fleet?*
- *What infrastructure, supplies, and labor are required to both introduce and maintain electric buses into the Topeka Metro fleet? (Layouts at current facilities/properties.)*
- *Please provide changes necessary to Topeka Metro's current operations (building facility,* staging, fueling and cleaning processes, maintenance garage arrangement and repair processes, station processes, station location and staging etc.) for the following scenarios below [etc.]
- *What can be done for the initial three electric buses to allow for an easier transition to additional electric buses added at a later date?*

When looking at the impact of adding electric buses to the fleet, or three electric buses (currently being acquired via an FTA Low-No grant), the main issues that AECOM will explore are 1) siting the chargers within the existing Topeka Metro facility; 2) determining the electrical capacity of the facility and upgrades that will be needed to provide electricity to the chargers; 3) helping the agency understand any physical and operational changes that must be made at the depot to accommodate charging infrastructure 4) and assisting with planning and scheduling of the vehicles in the current system.

Our analysis will look at a variety of charging scenarios (depot only at night, depot only at all times of the day, in-route opportunity charging, or a mix of approaches), what kind of chargers are to be used (plug-ins only, overhead conductive, or a combination of the two), and what kind of vehicles are to be acquired with what battery capacities. We will look at scenarios of charging at the bus maintenance facility as well potential in route charging at key layover locations such as Quincy Street Station or secondary hubs in other locations where several routes meet such as the Walmart West. This approach, while also learning all we can about the existing fleet, will help AECOM to determine the range of electric buses, and therefore how many charging stations will be required for a 100% electric fleet.

In an ideal world, that would be a 1:1 replacement ratio. But most agencies are finding that, due to

the range limitations of electric buses, compared to diesel or hybrid buses, they will have to expand their fleet size, reduce service levels, incorporate in-route chargers, or find additional workarounds. None of these options are very palatable, so AECOM's goal will be to help minimize the pain of a transition to zero-emission buses by putting a fine point on how many chargers are needed at the depot (or elsewhere in Topeka) and recommending where and how they should be placed. We will also estimate the electrical requirements of those chargers and determine how many transformers will be needed, and what provisions should be made for resilience (e.g. battery energy storage units, the potential for solar power generation, etc.).

Further, many agencies know that they want to go electric, but don't have a full understanding of the impacts on training, labor needs, supply chains and spares, IT considerations, smart charging systems, performance monitoring software, and other critical items. AECOM has extensive experience in not just planning and scheduling for the inclusion of electric buses in a fleet, but also what happens between the time they are ordered and the time they arrive at the garage.

For example, we can provide advice on companies that do "Charging as a Service", many of which offer turnkey solutions for electric bus fleet and manage the maintenance of vehicles and equipment, while taking the guesswork out of estimating electricity costs. We can also suggest a charge management system to help Topeka Metro schedule when and how long each vehicle is to be charged, to help save money on electricity costs and ensure that each vehicle leaves the depot with a full state of charge. And while manufacturers provide performance monitoring hardware and software, as well as training modules and information on spares and supplies, AECOM will identify the limitations of these and recommend ways to augment systems in a way that will keep operations running smoothly at the garage.

And finally, to the last bullet point above, AECOM's extensive knowledge about vehicle and charger manufacturers, charging types, and the state of the electric bus industry in general will help ensure that the vehicles and charging infrastructure acquired by Topeka Metro will be interoperable with each other. This will make it easier as the agency scales up and will probably need to procure from multiple manufacturers – all the pieces will have to fit together in perpetuity.

Category 2: Impacts to the Topeka Metro Fleet and Fixed-Route Service

- *How should Topeka Metro implement electric buses on its routes?*
- *How should Topeka Metro schedule electric bus charging?*
- *At what point would Topeka Metro need to make operational changes when adding electric buses to the Topeka Metro fleet? (Example: Implementation of 1/4 routes, 1/2 routes, etc.)*
- *How many extra electric buses are needed as runs are transferred to BEVs?*
- *At which point (if any) an on-route charger makes sense to extend runs that can be performed by an electric bus vs. having to purchase a higher number of buses to do so?*

These questions indicate that Topeka Metro understands the range limitation of electric buses and the impacts it can have on providing service. Our approach to answering these questions will be to do a route and block analysis – the fundamental building blocks of planning an electric bus fleet.

AECOM uses a software program called Autonomie, created by Argonne National Laboratories, to understand the energy needs of an electric bus if it were to operate in an existing scheduled block on an existing route in

the Topeka Metro system. It works by entering a set of assumptions about vehicle size, battery capacities, rate of degradation, operating environments (e.g. cold weather), how the bus cabin is to be heated (on-board HVAC or auxiliary diesel heat), expected kWh per mile, and other criteria. Then, information about the routes and blocks in the system is entered, such as total miles per block, average speed of the route, max loads, and so on.

The output of this process is a robust understanding of which routes and blocks would be easy to be served by an electric bus, which would be difficult, and which would be in the middle depending on weather, age of the battery, and other variables.

With a route and block analysis, AECOM will be able to advise Topeka Metro on which routes and blocks should be prioritized for electric bus. In previous projects, we've been able to predict that a transit agency would be able to comfortably operate as much as 90 percent of their runs with electric buses, which comes as a relief to an agency with the goal of making a full transition. Other agencies have had various outcomes: one system with many long blocks (over 12 hours) and a number of rural routes that covered 300 miles a day realized they could only replace about 50 percent of its fleet with electric buses and still provide the same coverage and service.

Moreover, with an accurate route and block analysis, AECOM will be able to provide recommendations for workarounds, for the percentage of runs that would be difficult to operate with electric buses. One solution is to re-work the schedule to incorporate more midday breaks, so that a bus can return to base for charging before going back out for PM service. Another scheduling solution would see shorter runs – in cases where ridership is very low early in the morning or late at night, blocks could be truncated. Because these options would be inconvenient for transit-dependent riders, an alternative would be to expand the fleet so that, in some cases, two electric buses would do the work of one conventional bus. Of course, this would be an expensive solution, and one that could impact available space at the depot.

A way around these issues is installing one or more overhead conductive chargers in strategic locations around Topeka. (One obvious choice to explore would be Quincy Street Station) Overhead conductive chargers have a charge rate of up to 500 kW, meaning they can charge a bus in 5 or 10 minutes, as opposed to plug-in chargers, which can take hours to fully charge a bus. Having such a charger in place at one or more layover locations in Topeka would allow buses to receive an opportunity charge while laying over, and keep them running longer during the service day without fear of running out of battery power. As part of this task AECOM will develop a schedule for the service which will include the routing and work assignments.

AECOM can't provide answers to the questions above until we do a route and block analysis, so one of our goals in the Existing Conditions task will be to collect the most complete data set possible from Topeka Metro and then perform the analysis and make service recommendations as per Task 4: Implementation Strategy.

Category 3: Long-Term Considerations of a Full Fleet Transition to Electric Bus

- *This study needs to go beyond the Total Cost of Ownership of a single electric bus vs. a diesel bus. This is looking at larger impacts across Topeka Metro operations, planning and scheduling. What does the transition towards these higher levels of electric runs look like?*
- *Provide a transition plan for Topeka Metro that addresses what operational, maintenance, and infrastructure changes would be needed at various level of fleet electrification.*
- *Topeka Metro wants to evaluate the "big picture" of what is necessary to provide an equivalent level of service to that which is currently offered, rather than what is required to operate an electrified fleet of similar size to what is currently operated.*

Understandably, Topeka Metro wants to go a bit deeper than a high-level feasibility study. Transit agencies often get into trouble when they start out with a handful or a dozen electric buses, then find themselves in a situation where they don't have room for more charging infrastructure, they're paying high electric bills, or the challenges of scaling up are more than they bargained for.

A Transition Plan is definitely the way to go. In fact, the FTA – as of December 2021 – now requires such a plan if a transit agency wants to apply for federal funds to buy zero-emission buses. AECOM has done roll-out plans and long-range planning for full fleet transitions to electric bus for other agencies in the past, and will rely on the expertise of our team to develop a realistic timeline for implementation. This timeline will be based on current and expected procurement schedules, our knowledge about industry trends and the production capacity of manufacturers, and other factors.

In addition to total cost of ownership, AECOM will also provide an assessment of the ripple effects of transit electrification on bus operations and schedules. As mentioned, our team has staff members who were once themselves bus operators and supervisors. Their in-depth understanding of garage-level activities and systems and of the Topeka Metro system will be important as we make long-range recommendations for the transition. Some ideas are simply unworkable when applied to the real world of making service day after day. Our solutions will seek to avoid common pitfalls.

Lastly, we fully understand that a transition to zero-emission buses is about more than just taking out one bus and replacing it with another, one at a time until the old fleet is completely decommissioned. It's about ensuring that service levels stay consistent, so that bus riders in Topeka won't notice any difference in the frequency, reliability, or spans of service the agency provides. Even as they will likely notice the cleaner, quieter, and smoother ride of an electric bus.

Project Tasks

Task 1: Project Management

The project will begin with a kickoff meeting that addresses communication between Topeka Metro and the project team, specific team member roles, the project schedule, invoicing, and so on. During this meeting, we will get further clarity on scope items in order to develop a work plan within a week after the meeting.

As part of finalizing the project schedule, we will also establish follow-up meetings with Topeka Metro – how often they should take place and which dates and times work for all involved.

A determination will be made later, in consultation with Topeka Metro, about the extent to which project team meetings will be in person or via teleconference, given the continuing hazards of the pandemic.

Task 2: Existing Conditions

While not specified in the scope, AECOM proposes an existing conditions task to establish the current fleet composition, as well as the electrical capacity and availability of physical space at the Topeka Metro bus facility.

With the latest block sheets, route profiles, and other essential service and operations data, we will be able to conduct our route and block analysis, which will inform many of the recommendations that come out of the study – in terms of service and fleet planning as well as the charging infrastructure that should be acquired to maintain that service.

In addition, AECOM will request as-built drawings of the facility along with a single-line drawing to analyze the amount of available space and power distribution of the bus depot. If Topeka Metro doesn't have these drawings on hand, AECOM will – in coordination with agency staff – conduct a site visit to the facility to gather this information and take photos. If this is a required step in the process, AECOM will add a small direct cost line to the overall project cost.

AECOM would also like to speak with Topeka Metro staff about coordination done to this point with local utilities. Our experience has been that utilities will often pay for the electrical upgrades needed at a depot, because they know that providing power for electric buses will generate significant revenue for the utility in the future. Utilities can also be persuaded to create a special rate class for electric buses, so that the agency can save money on electricity costs.

(Note that Topeka Metro's paratransit service is excluded from this study for two reasons. One, mobility on-demand transit is difficult to plan and model for electric vehicles. Analytical tools work much more reliably for fixed-route service. And two, while manufacturers are currently focusing primarily on electric buses, electric vans and cutaways – such as the kind used in paratransit service – are behind the curve. Some models are available, but generally it's more difficult to replace existing vans and cutaways with EV equivalents. This will change in the future, given the rapid evolution of the industry; but, at this time, Topeka Metro would be better served by prioritizing electric buses.)

Task 3: Regulations, Laws, Rules, and Policies

Task 3 was created specifically to address Bidder Responsibility #1: Internal and Electric Vehicle Regulations, Laws, Rules, and Policies.

Gathering this information will largely be a desktop exercise; however, AECOM staff will send emails and make phone calls as needed to Topeka Metro staff, City of Topeka officials, and other stakeholders, to assemble a brief memo on laws, policies, and practices that may affect the implementation of electric buses and charging infrastructure.

For other agencies, AECOM has prepared similar memos – and much of the information about potential barriers to implementation is universal. At the same time, our team will key on local regulations and ordinances (zoning, permitting, etc.) that are unique to Topeka and the State of Kansas.

Task 4: Implementation Strategy

The items in the Implementation Strategy portion of the study will help fulfill the requirements of Bidder Responsibility #2: Electric Vehicle Implementation Strategies.

This task will involve three separate but related issues: 1) conceptual drawings, 2) a state-of-the-industry assessment, and 3) guidelines for installation.

As part of an implementation strategy, we will develop conceptual drawings of the depot to illustrate optimal locations for charging infrastructure, as well as where electric buses will be parked in relation to existing diesel buses. If major changes are indicated for the depot layout, an analysis of traffic flow through the site will also be performed. Similarly, if any existing structures would need to be relocated, our team will show potential new locations for them in the conceptual drawings.

Second, AECOM will develop a brief state-of-the-industry presentation for Topeka Metro that covers charging types, charging scenarios, and manufacturers of electric buses and chargers. The presentation will also include potential vendors for Charging-as-a-Service, smart charging / charge management systems, performance monitoring systems, and other useful products and services. AECOM will want to confer with Topeka Metro on best practices for implementing an electric bus fleet; the definition of this can be determined ahead of the project kickoff meeting. And finally, AECOM will advise on ways to work with local companies to develop charging stations away from the depot, in the event that opportunity charging structures cannot be installed on City of Topeka property.

Third, most of the training modules, much of the maintenance, and the installation of electric bus chargers comes from the equipment manufacturers. Training for first responders (on

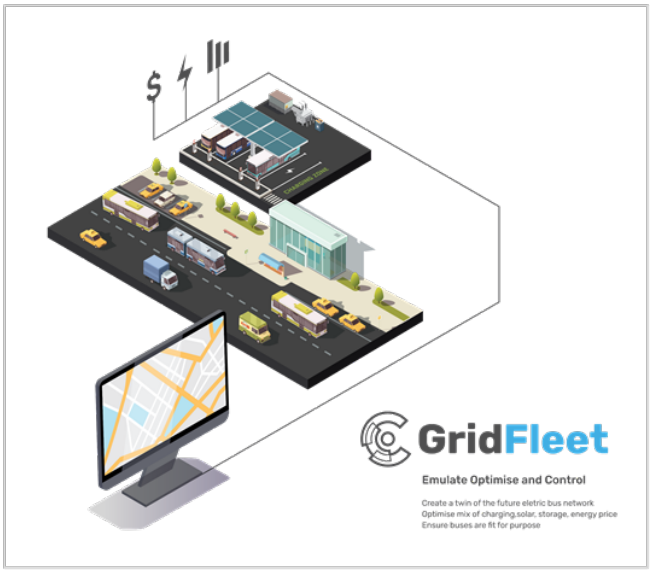
high-voltage systems) and bus operators also is initiated by vehicle manufacturers. Topeka Metro will find, during the solicitation process, that manufacturers will not leave the agency to assemble the pieces or train staff on their own; indeed, language on extended warranties, repairs, training, installation, and IT integration can all be written into the vehicle and charger specs. Part of AECOM's development of implementation strategy will be to lay out these features in detail, so that Topeka Metro will know what to expect during the procurement process and later during installation and commissioning.

Task 5: Financial Analysis

This task fulfills Bidder Responsibility #3: Electric Vehicle Financial Analysis.

To provide accurate system-wide cost estimates of electrification, and to fully address the issues outlined in Topeka Metro's RFB, the AECOM team will complete a robust quantitative analysis. Our quantitative analysis will be completed in three phases: simulation, optimization, and sensitivity analysis.

Using Evenergi's GridFleet™ software platform, our team will conduct an iterative process of modeling various scenarios to identify the optimal outcome for Topeka Metro. GridFleet™ is viewed as one of the most detailed and accurate ways to evaluate suitability for the transition to zero-emission vehicles. Through this analysis, we will be able to accurately and confidently address



the issues identified by Topeka Metro such as which routes/blocks Topeka Metro should deploy its three battery-electric buses on, where and how many charging stations should be deployed and at what point should Topeka Metro schedule charging, etc.

Evenergi's core services and its products are geared toward providing the most accurate, cost-effective and rapid analysis of all aspects of an electric vehicle fleet study. Results in two markets have seen the modeled results being within 1.8 percent of actual results in the field. The following table identifies the core features of the software package. **The key aspects relevant to this assignment are highlighted in bold.**

Key Features of Evenergi's GridFleet™ software
Any vehicle type - passenger, light and heavy commercial, **bus fleets**
Any fuel type – battery electric, fuel cell electric, natural gas, diesel, trolley
» **Different brands of vehicles with detailed specifications are accounted for including, but not limited to: passenger capacity, heating/cooling specifications, passenger loading, battery capacity, battery state of health/degradation and many other detailed inputs)**
» Different fuel types
Model multiple charging infrastructure, typology and refueling types:
» **Plug-in charging, in-depot pantograph charging and en-route charging**
» **Model any combination of on-route, terminal and home-base charging**
» **Ability to run the entire network as one system to identify opportunities for shared layover charging between several locations.**

Key Features of Evenergi's GridFleet™ software

Dynamic year-by-year analysis:

- **Ability to test multiple approaches to fleet transition. For example, using existing fleet replacement plans, accelerated, all upfront and others.**
- **Consider impact of changing technology costs into the future on fleet replacement**
- **Trigger points for grid or depot infrastructure upgrades**
- **Technology improvement curves that account for long-term efficiencies from betterment**

Route modeling - multi-physics detail:

- **Topography**
- **Regenerative braking**
- **Vehicle loading**
- **Climate and local weather conditions (rain, snow, ice)**
- **Driver behavior**
- **Start/stop**
- **Traffic**
- **Other impediments**

Detailed depot energy profiles

- In depot simulation - zones, lanes, First-in, First-Out (FIFO), Last-in, First-Out (LIFO) arrangements
- Uncontrolled charging profiles
- Controlled charging profiles - including sequential charging profiles
- Produce energy bills based on different charging profiles
- Test sensitivity around different electricity tariff structures
- Simulate random equipment failures within facility to determine impact to transit agency-pull out

Total cost of ownership module

- **Energy use by time of day**
- **Maintenance cost assumptions**
- **Battery replacement assumptions**
- **Technology improvement curves**
- **Depot infrastructure capital costs - on depot energy infrastructure with dynamic trigger points**
- **Depot - utility upstream infrastructure upgrades**
- **On-route location - infrastructure costs**
- **Fuel/electricity price indexing**
- **Local generation (e.g. depot solar) impact on depot energy costs**
- **Different financing models**

Emissions module

- CO2 emissions
- NOx emissions
- Particulate matter model

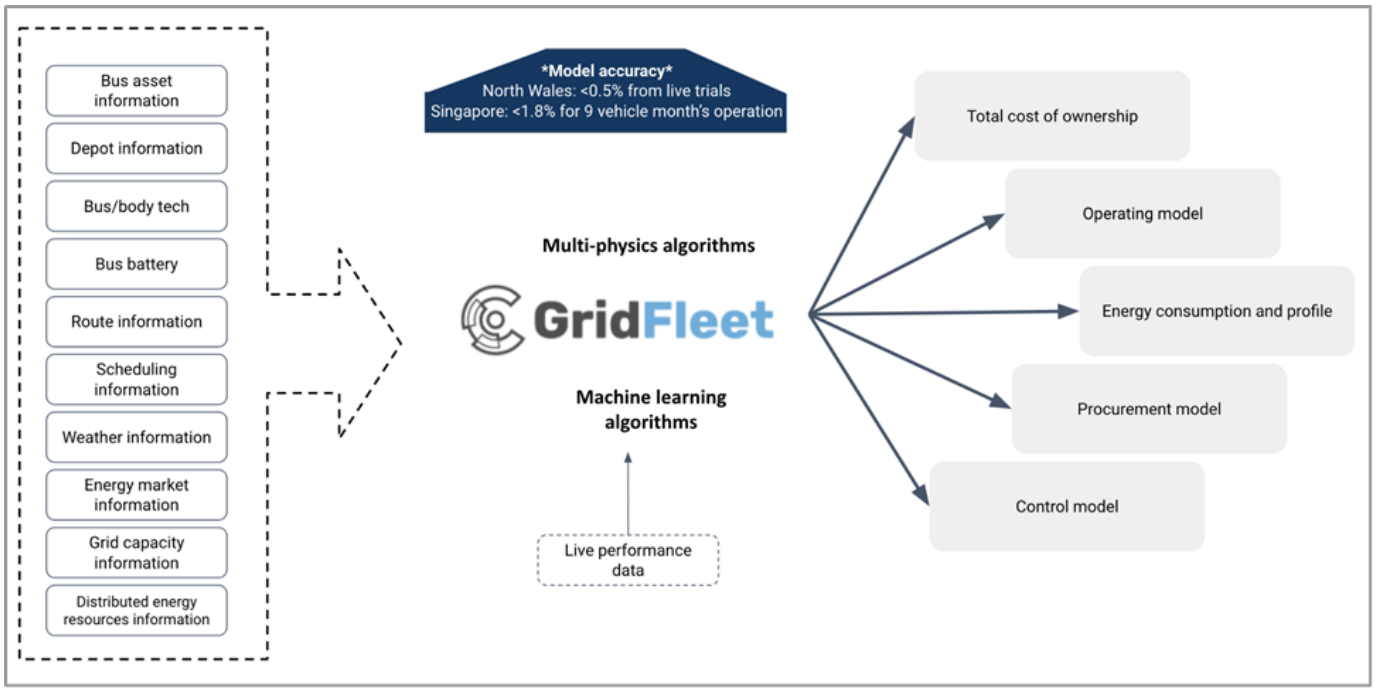
Key Features of Evenergi's GridFleet™ software
On-site energy generation model » Optional modeling to analyze the impact of solar, battery storage and other forms of on-site generation to offset electricity costs or grid upgrades » Analysis of backup generator requirements » Optimization for energy mix with lowest cost of energy
Battery degradation model » **Analyze the degradation of batteries over time based on actual running conditions** » **Forward-plan replacement costs** » **Identify schedule optimizations and charging strategies to improve battery life**
Integration with common scheduling software (Hastus, Trapeze) and protocols (GTFS, etc.) » **Import data from most popular scheduling systems to create a digital twin of the fleet** » **Flexibility to customize and import new data formats** » **Ability to model new or planned routes that may not be mapped or in public domain**
Integration with common telematics platforms (GeoTab, GreenRoad, etc.)
Data available on-going via web-platform with a level of self-management
Model and analyze in-service, deadhead and peak vehicle requirements » **Understand the impacts of a zero emissions fleet on operating costs** » **Optimize for the overall lowest cost solution, encompassing all trade-offs**

While Topeka Metro is not requesting predictive energy modeling as a deliverable, we strongly recommend this analysis be conducted. The outputs of this analysis will answer the questions posed in the RFB with greater accuracy and with empirical data. This analysis has been included in our approach.

GridFleet™ is a multi-physics model that considers vehicle performance and specifications, route topography/elevation, passenger loading, climatic factors (heat and cold) and many other co-dependent variables to simulate bus fleets. These predictive energy simulations are then used to feed our total cost of ownership (TCO) module to provide Topeka Metro an accurate financial picture of a full fleet transition to Battery Electric Buses (BEVs).

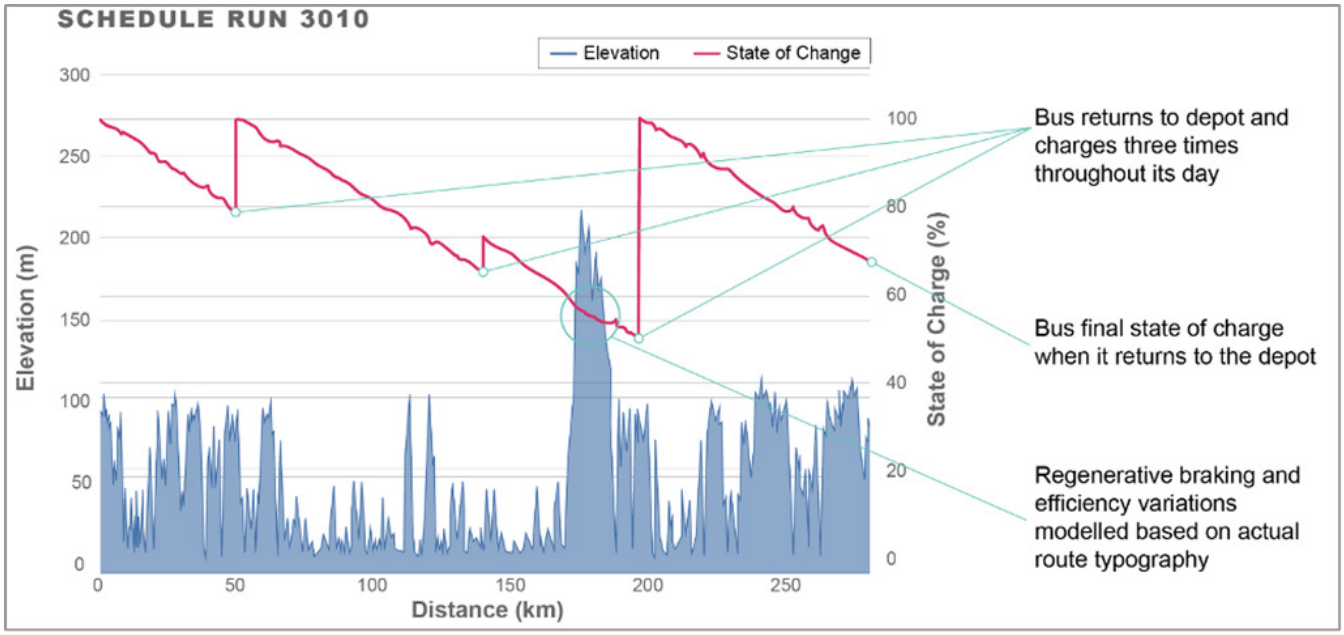
Working closely with Topeka Metro, the key steps in our simulation process include:

1. Data requests and data cleaning
2. First-pass simulation process
3. Reviewing initial data and checking for anomalies
4. Confirming base assumptions for the underlying model
5. Simulating the full fleet to determine final full-fleet transition state
6. Confirming scenarios
7. An optimization process with full total cost of ownership and energy demand profile as outputs
8. Running optimizations around scenarios
9. Confirming our final candidate options

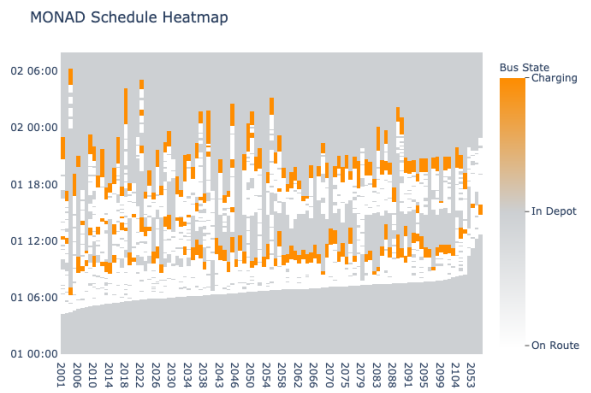


GridFleet™ will be used to create a virtualized map of every route/block/run in Topeka's service area. We are able to import run sheets directly from common scheduling platforms (e.g. Hastus, Trapeze, Optibus, etc.) or from raw GTFS files, and then simulate your blocks/routes/runs with different drive trains. We are able to identify common layover points across multiple routes, blocks and runs, as well as the actual amount of time available for on-route charging to inform the decision of whether to invest in on-route charging infrastructure, given both capital and operating cost considerations.

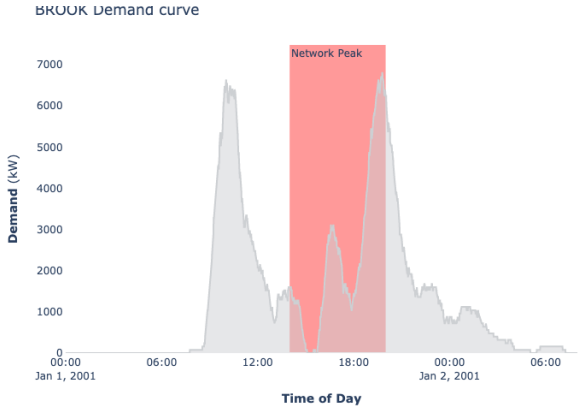
The diagram below shows sample output from the model using real schedule data. In this case, it is for a battery-electric bus run, and shows the bus state of charge throughout the course of the day, including effects of passenger load, climate, regenerative braking and topography. In-depot or on-route locations can be specified as places for vehicles to charge or refuel and the model calculates how much energy is delivered based on the time available, charger rating and the energy required to perform the next scheduled route or run.



The sample outputs below illustrate how the model is used to simulate an entire facility, with the energy requirements and driving patterns of every bus being aggregated to form an electrical load profile. This information is key in determining the depot and upstream infrastructure upgrades (such as new transformers or utility enhancements) that are required, as well as ongoing energy costs.



Depot heatmap showing the state of all vehicles throughout the course of a day (charging, on route, in depot)



Resultant load profile due to modeled bus schedule, bus and charger type.

Optimization Process

Once your operating, maintenance and storage facility is set up in GridFleet™, iterating through scenarios is simple and fast creating powerful scenario and sensitivity analysis capability. These optimizations can be used to:

1. Determine the right location of charging - depot, on-route and layover
2. Determine the optimal charger rating and technology (trickle-charge or high-speed fast charge)
3. Optimize charging control strategies to minimize energy consumption
4. Calculate total cost of ownership for battery electric buses including infrastructure, supplies, labor, and charging stations. In addition, account for all costs including those beyond the material costs of the buses and charging infrastructure including, but not limited to, facility modifications, staffing, maintenance infrastructural and tooling, and other needs to replace diesel buses with electric buses in day-to-day operations.
5. Plan infrastructure staging to defer capital costs
6. Evaluate business cases for local generation (solar) and battery storage
7. Predict the impact that scheduling decisions will have on battery degradation
8. Assess the impacts of different asset replacement schedules (e.g. accelerated versus fleet replacement plan)
9. Understand the sensitivity of financials to key drivers such as energy prices, residual values, technology price reduction curves

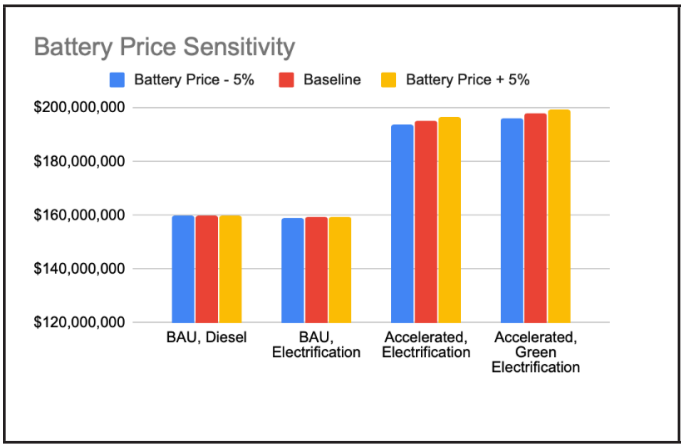
For these optimizations, the output of total cost of ownership for the full fleet will be presented on a Net Present Value basis, allowing for base year comparison, along with a recommendation of best fleet 'fit' for Topeka Metro, given prevailing service conditions.

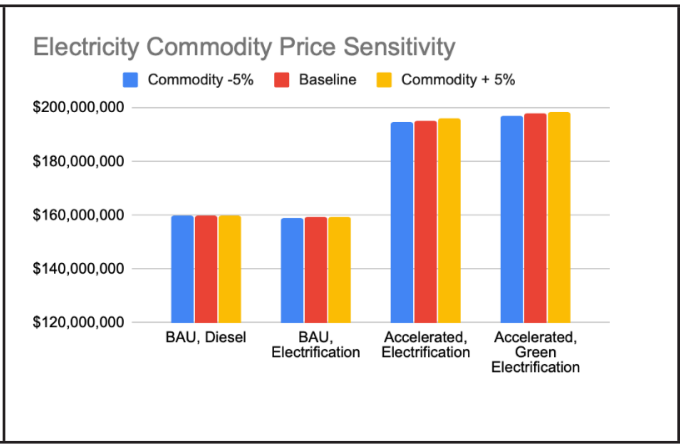
Sensitivity Analysis

The market for BEVs is rapidly changing. As the technology continues to evolve, we are uncertain how long-term pricing will unfold. As a proxy, when compressed natural gas buses were introduced to the market in the early 90's, promises were made by OEMs that the buses would be cheaper as the technology matured; unfortunately, those cost savings never really materialized. While there is currently aggressive pricing to promote BEV

uptake, it is unclear how the pricing for the BEVs and associated componentry will be impacted in the future with greater demand.

As such, resulting scenario analysis from the simulation and optimization phases will produce final scenarios that can be synthesized with situational analysis to produce a clear decision making framework for Topeka Metro. To capture the unknowns, we will conduct sensitivity analysis within GridFleet™ that enables a risk based approach to decision making under uncertainty.





Simulation, Optimization, and Sensitivity Analysis

The key deliverables for this process are:

- Data model set-up
- Financial analysis
- Operational analysis to determine BEV 'fit' for Topeka Metro system wide
- Optimizations to determine key candidate scenarios for modeling
- Modeling of candidate scenarios review and sensitivity analysis

The outputs of our analysis will be:

- Fully costed options (capex and opex) and related total cost of ownership models
- Load profiles for your depot and implications for upstream grid upgrades
- BEV 'fit' outputs and heatmaps

Review of Potential Funding Sources

Funding the transition to zero-emission buses is a vital concern for all transit agencies eager to make the switch. The AECOM team will provide a fulsome review of the possible avenues for applicable funding incentives and other competitive funding sources available to Topeka Metro.

During the study, we will compile a table of funding incentives and sources that Topeka Metro can pursue. Some of the funding sources we will consider include, but are not limited to:

- The Low Carbon Fuel Standard, where agencies using fuel and fuel blend stocks with carbon intensity below the established threshold receive credit incentives, with additional incentives for electric/ hydrogen powered charging stations
- 5307/5309/5311 Funds
- Opportunities for leasing vehicles and/or electric bus batteries, where some suppliers have leasing programs available
- FTA Low or No Emission Vehicle Program (Low-No)
- FTA Bus & Bus Facilities
- FTA Tribal Transit
- NHTSA Autonomous Funds

- USDOT BUILD (formerly TIGER)
- DOT Autonomous Program
- Beneficiary Mitigation Plans for Volkswagen Settlement Funding
- Community Air Protection Programs (CAPP)
- Carl Moyer Funding
- District DMV (AB923 & AB2766)
- AB617 Protections through New Select CAP Investments
- Electric Program Investment Charge (EPIC)
- Transit and Intercity Rail Program (TIRCP), which applies to both urban/intercity and BRT

Going beyond traditional sources of grants and other funding, our team advocates for a review of the public private partnerships in solving fiscal challenges. One example is charging infrastructure leasebacks where public utilities (such as Duke Energy in North Carolina) purchase and own electric bus charging infrastructure and lease-back the infrastructure cost to the agency through per kW/h rates. While this solution is not for every transit agency, there could be a role for innovative public-private partnerships to bridge the funding gap in your community. If of interest to Topeka Metro, our proposed work plan will include a high-level review of public private partnerships as well.

Task 6: Final Report

While AECOM will share information and materials for each task with Topeka Metro throughout the project, the main deliverable fill be a report that ties all the pieces together into a cohesive document.

The nature of this report will be technical, but we will include a concise executive summary in plain language for the benefit of Topeka's decision-makers and non-transportation industry readers.

Two iterations of this document will be produced: draft and final. AECOM will submit the draft report, allow sufficient time for Topeka Metro staff to provide comments and questions, prepare a comment sheet to adjudicate those comments and questions, and submit a final document that incorporates the suggested revisions as agreed upon.

The draft and final report will be submitted in both Word and PDF versions, with appendices.

02. Experience & Qualifications

AECOM Transportation Electrification: Accelerating the Future of Cities, Utilities, and Fleets

A massive change is underway across our cities, fleets, and utilities that will bring social, environmental, and economic change through the deployment of new transportation technologies. To realize the benefits of this transition, much depends on the speed at which we can integrate transportation electrification technology into the world's infrastructure today.

AECOM is a fully integrated organization delivering comprehensive services for our zero emissions future. Our technical experts in transportation and energy create innovative solutions for our public and private clients that address the world's environmental and technological ecosystems.

Our Delivery Priorities

- **Technology:** Using effective charging, energy, or vehicle technology for the situation.
- **Best Value:** Optimizing charging strategies to deliver cost savings and efficiencies.
- **Scalability:** Applying lessons learned and best practices from pilot studies to deliver successful transitions at scale.
- **Innovation:** Realizing how fleets can innovatively accelerate transportation electrification benefits.
- **Resilience:** Planning for a system's ability to respond to and recover from disruptions.
- **Sustainability:** Optimizing the environmental potential of electric vehicles.

Delivering Solutions Across the Transition

AECOM's breadth and depth of experience allows our teams to support all aspects of the electrification transition. We partner with cities, utilities, and fleet and infrastructure owners to provide a full suite of services and delivery models as transportation shifts to electric.

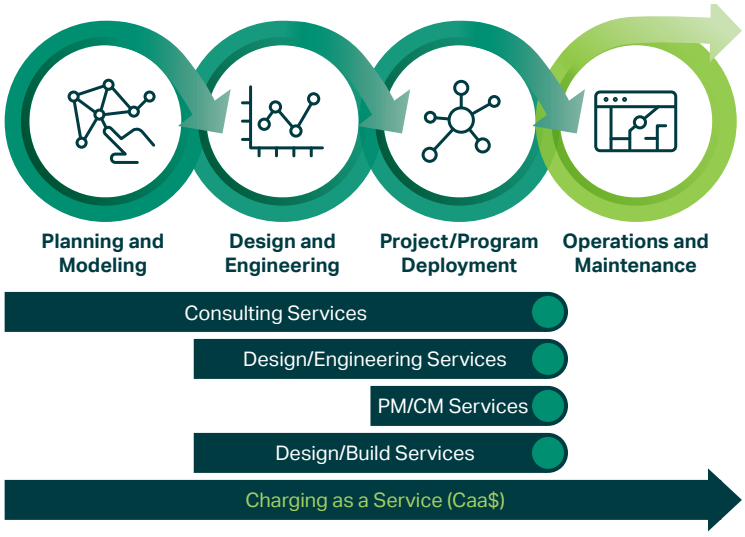
We are a leader in the transportation and energy sectors, partnering with clients as they prepare and deploy transportation electrification infrastructure. AECOM's transportation electrification practice leverages our global expertise to realize the social, economic, and environmental benefits of this emerging industry.

▶ ABOUT AECOM

AECOM is the world's premier infrastructure consulting firm, delivering professional services throughout the project lifecycle – from planning, design and engineering to program and construction management. On projects spanning transportation, buildings, water, energy, and the environment, our public- and private-sector clients trust us to solve their most complex challenges. Our teams are driven by a common purpose to deliver a better world through our unrivaled technical expertise and innovation, a culture of equity, diversity and inclusion, and a commitment to environmental, social and governance priorities.

Our firm is composed of award-winning professionals. When you work with our dedicated, local staff, you also have access to our national and global network of knowledge and resources. We are committed to helping our clients find innovative and cost-effective solutions to their transportation needs.

Our Services and Innovations



As fleets move to convert their vehicles, *Charging as a Service* can be an innovative delivery model for charging infrastructure that can reduce risk for fleet owners while still focusing on optimizing operational costs.

Unlike any other firm in the marketplace, we are delivering comprehensive and innovative support for the transition to electrified transportation:

- Technology Assessments, Feasibility Studies, and Pilots
- Fleet Conversion Studies and Strategies
- Utility Infrastructure Management, Planning, and Design
- Financing Strategy and Alternative Delivery
- Charging Facility Infrastructure Planning and Design
- Electrification Planning, Modeling, and Forecasting
- Program Design and Implementation

Transportation electrification will change the way we think, plan, and design for the infrastructure of the future. AECOM is developing tools and business models (such as charging-as-a-service) and is applying innovative solutions to how we plan, design, finance, and deploy critical transportation and energy infrastructure to drive our zero-emission future.

We have led **more than 80 projects** supporting cities, utilities, and fleet owners in transportation electrification efforts.

Partnered with the American Public Transportation Association to modify the **industry standard** bus specification to include better electric bus technology.

We have supported **more than 20 transit agencies** in their fleet electrification efforts.

Electric Vehicle Charging Infrastructure System at JFK International Airport Terminal 5 project received **ACEC NY 2021 Diamond Award.**

Our Subconsultant: Evenergi Corporation

Evenergi will lead the electric vehicle financial analysis, and provide support for other phases, including predictive energy modeling.

Founded in 2017, Evenergi is currently working with the Ann Arbor Area Transportation Authority, King County Metro, and Duke Energy on their zero emission vehicle transitions. Internationally, Evenergi has worked with some of the largest transit agencies across the world including Transport for New South Wales in Australia, First Bus in the UK and Singapore Land Transport Authority. They are currently leading the largest fleet transition plan in the Southern Hemisphere, a 20,000-vehicle transition plan for the Australian government.

Evenergi brings specific capabilities relevant to this project including:

- Bringing together extensive knowledge of vehicle and fleet electrification with energy and grid expertise, providing holistic and evidence-based solutions for clients in straightforward language
- Detailed and scientific peer reviewed data and process - with industry-trusted numbers
- Automated platforms that accelerate the ability to iterate outcomes after customer feedback without additional cost
- Broad connections through EV industry – OEMs, equipment suppliers and utilities
- Deep understanding of transit operations and the impacts Zero Emission Buses have to 'business as usual'

Everengi's team and technology helps transit agencies optimize solutions to the specific challenges identified by Topeka Metro, including:

- Identifying what routes or blocks to deploy zero emission buses (ZEBs)
- Prioritizing ZEB deployment based on technical limitations, based on social and environmental justice factors / disadvantaged communities
- Minimizing system-wide capital and operational expenditure
- Determining how and when to embrace new technologies
- Minimizing infrastructure upgrades
- Determining when to relocate operating, storage and maintenance facilities
- Evaluating in-depot versus on-route charging
- Determining optimal vehicle selection and battery pack sizing
- Choosing types of chargers or refueling technology to use
- Optimizing scheduling and garage configurations
- Charging strategies that can help optimize energy usage and minimize charging cost

Evenergi has built software and capabilities to solve these problems in a way that is completely agnostic to technologies or vendors. The firm will provide unbiased advice focused on the project's specific political, technical, social, environmental and economic factors.

Where We Have Delivered

The table below shows a small portion of the transportation electrification projects that AECOM has led in the past few years. These projects have included analyses of emissions savings, capital and infrastructure needs, impacts to transit system operations and scheduling, and the capital and operating costs of transitioning to zero-emission fleets.

AECOM's Recent Transportation Electrication Projects

Project Name	Client	Location	Financial Analysis	Operational and Scheduling Impacts	Capital and Infrastructure Needs	Emissions Considerations
* Electric Bus Alternatives Assessment and Test & Evaluation	WMATA	Washington, DC	⚡	⚡	⚡	⚡
* Bus Electrification Project Management	LADOT	Los Angeles, CA		⚡	⚡	
* Vermont Transit Battery-Electric Bus Transition Plan	VTrans	Vermont	⚡	⚡	⚡	⚡
RTD Bus Fleet Electrification	RTD	Denver, CO	⚡	⚡	⚡	
Zero-Emission Bus Technology and New Electric Bus Base Facility	King County Metro	Seattle, WA			⚡	
Bus Electrification Program	Chapel Hill Transit	Chapel Hill, NC		⚡	⚡	
Zero Bus Emissions Pilot Program	MTS	San Diego, CA	⚡	⚡	⚡	
EV Fleet Conversion Study	AA DPW	Anne Arundel County, MD	⚡		⚡	
Zero Emissions Bus Study	AC Transit	Oakland, CA			⚡	
Zero-Emission Bus Transition Plan	Metro Transit	Twin Cities, MN		⚡	⚡	
Minneapolis Electric Vehicle Study	City of Minneapolis	Minneapolis, MN			⚡	⚡
Assessment of Growing Plug-In Electric Vehicle Demand and Charging Services	City of Roseville	Roseville, CA	⚡	⚡		⚡
AGV Battery Exchange Building	Port of Long Beach	Long Beach, CA		⚡	⚡	
Yuba-Sutter Transit Battery Electric Bus Feasibility Study	Yuba-Sutter Transit Authority	Marysville, CA		⚡	⚡	
SolTrans BEB Feasibility Study	Solano Co. Transit Authority	Vallejo, CA	⚡	⚡	⚡	

**Project description and client reference included in following pages*

LADOT Bus Electrification Project Management

Client
Los Angeles Department of Transportation

Location
Los Angeles, CA

Reference
Kari Derderian
Division Head
213.928.9741
kari.derderian@lacity.org

Work Completion
Phase 1: August 2020
Phase 2: Began Fall 2020

Fee value
$450K (Phase 1)

Project Description

In late 2019, Los Angeles Department of Transportation (LADOT) asked AECOM to provide project management, planning, and design efforts to convert their existing five bus facilities to support their fleet conversion to battery electric buses. This bus fleet is anticipated to be one of the earliest fully converted electric bus fleets in the nation and requires coordination across city departments and with two different utilities.

Phase 1 of the project was to provide overall guidance and planning on the fleet conversion, and specifically provide an outline of required infrastructure needs as well as construction budget and schedule that would accommodate for the purchase of electric buses, which began in late 2020. This planning effort also included study and strategy for battery storage options, preliminary construction staging plans to support on-going operations of existing buses during construction, and coordination with Los Angeles Department of Water and Power (LADWP) and Southern California Edison (SCE), the utility provider for the facilities.

AECOM also provided design services for two of the bus facilities that included design and approval of required electrical infrastructure upgrades to support future bus chargers. This effort included providing design drawings, specification and estimates for these facilities, that were coordinated, reviewed and approved by LADWP, SCE, and Los Angeles City Department of Building Services (LADBS). AECOM is also support LADOT on exploring alternative delivery strategies to expedite charger installation buses that may arrive prior to construction of the full facility retrofit.

Phase 2, which started in late 2020, includes the electrical design upgrades for the remaining three LADOT facilities, site distribution design for the five facilities that will provide layout changes for each bus facilities, coordination and approval of all designs by LADWP, SCE, and LADBS, and charger layout planning and design to support the fully converted fleet of buses.

AECOM Staff: Steve Hall

Vermont Transit Battery-Electric Bus Transition Plan

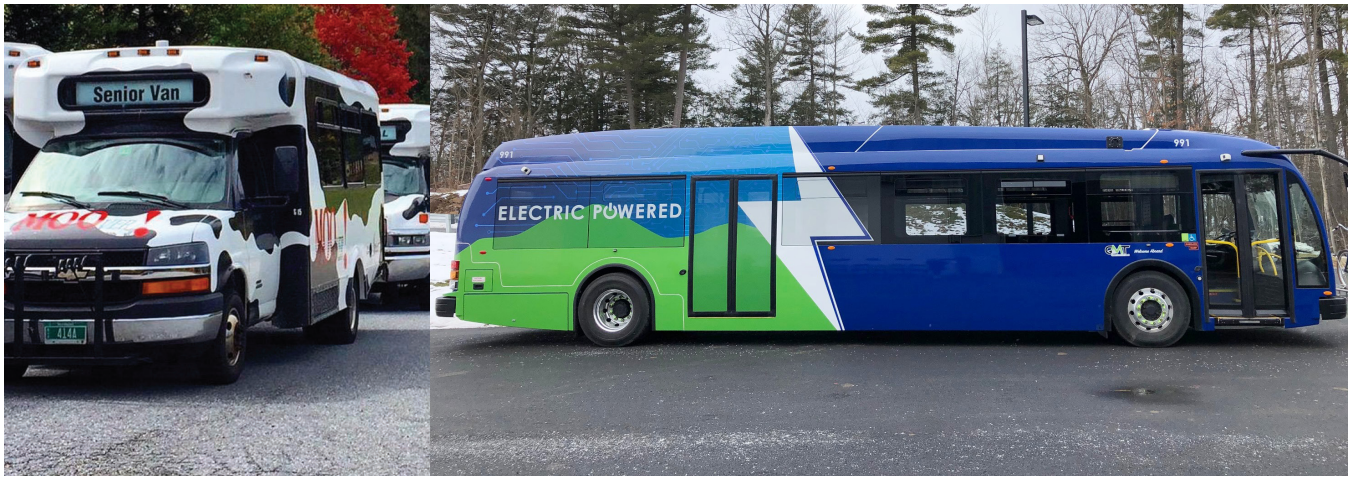
Client
VTrans, State of Vermont

Location
Vermont

Reference
Ross MacDonald
Public Transit Manager
802.522.7120
Ross.macdonald@vermont.gov

Work Completion
December 2021

Fee Value
$50K



Project Description

The State of Vermont Agency of Transportation (VTrans) selected AECOM to complete a plan for the transition of the state's 400-vehicle transit fleet to electric vehicles over the next 20 years.

Among the more challenging elements of the study is the fact that the majority of Vermont's transit vehicles are not standard buses, but rather vans and cutaways – a vehicle type that has been underserved thus far by electric bus manufacturers.

In addition, the project requires AECOM to coordinate with seven transit agencies in the state of Vermont, all of which are amenable to the idea of transit electrification, but which have varying degrees of knowledge about this emerging technology.

AECOM services as part of this project include:

- Stakeholder engagement – Reaching out to the seven transit agencies in Vermont to understand their needs and preferences with regard to transit electrification.
- State of the industry memo – A high-level review of vehicle and charging technologies, along with a summary of transit agencies in North America that are pursuing electric bus.
- Existing condition assessment – An accounting of the vehicles and facilities for the transit agencies in Vermont.
- Energy needs analysis – A review of bus facilities in the state to determine electrical capacity and potential upgrade requirements.
- Route and block analysis – To determine energy requirements for electric bus batteries to serve each transit route and block in the state.
- Procurement, IT, training summary
- Schedule for fleet transition – Long-range timeline
- Finance/economics memo – Capital cost estimates and potential grant sources
- Summary Report

AECOM Staff: Patrick Gough, Steve Hall, Krystal Oldread

WMATA Electric Bus Alternatives Assessment and Test & Evaluation

Client
Washington Metropolitan Area Transit Authority (WMATA)

Location
Washington, DC

Reference
Darin Welt
Senior Program Manager
202.962.1835
drwelt@wmata.com

Work Completion
Phase 1: July 2020
Phase 2: August 2020 - July 2023

Fee Value
$600,000 (Phase 1)
$950,000 (Phase 2)

Project Description

In early 2019, the Washington Metropolitan Area Transit Authority (WMATA) asked AECOM to lead a study into electric bus technologies and determine the steps involved in preparing a test and evaluation of electric bus vehicles and charging infrastructure.

Phase 1 of the study investigated the available vehicles, batteries, and charging equipment typically used with electric bus programs; how WMATA would obtain the energy to charge the vehicles; which Metrobus garages, routes, and operating blocks would be suitable for an electric bus test and evaluation; and other issues essential to an electric bus program. AECOM also highlighted case studies of other agencies that have piloted and implemented electric buses as part of the initial phase.

The main deliverable for Phase 1 was a summary report that contained the purpose and context of the study; an assessment of the existing Metrobus system, services, and bus maintenance/storage facilities; a summary of electric bus vehicle makers, battery types and ranges, and charging types and manufacturers; an analysis of utilities, rates, and electrical infrastructure at Metrobus garages; a description of the process for selecting garages, routes, and blocks for the test and evaluation program; a cost model and benefit-cost analysis; and notes on how to approach suppliers during procurement.

Phase 2 includes the procurement and permitting of electric buses and chargers, design and implementation tasks, and later the test and evaluation of 12 electric buses on several Metrobus routes. The goal of the program is to monitor the performance of the electric buses and chargers, evaluate their performance against a set of criteria, and recommend a long-term strategy for the full conversion of the Metrobus fleet over the next two decades. Phase 2 will also advise Metro staff on the training of bus drivers and maintenance crews on the safe operation of electric buses.

Staff: Patrick Gough, Steve Hall, Alexis Hedges

Bus Propulsion Study

Client
Ann Arbor Area Transportation Authority (AAATA)/TheRide

Location
Ann Arbor, MI

Evenergi Services Provided
ZEB Advisory BetterFleet

Work Completion
February 2022

Project Description

AAATA/TheRide operates the public transit system for the greater Ann Arbor-Ypsilanti area. For more than 50 years, AAATA/TheRide has provided reliable, safe, affordable transportation services to the community.

AAATA/TheRide has retained Evenergi to conduct an impartial review of bus propulsion technologies. The outcome of the study seeks a balanced review of propulsion options available in the marketplace evaluating benefits, downfalls, risks, and costs to AAATA/TheRide. Our scope includes reviewing Battery Electric Buses, Hydrogen Fuel Cell Electric Buses, Trolley Buses and Compressed Natural Gas for their applicability in Ann Arbor.

Our scope of work includes documenting the existing situation and benefits, an assessment of all propulsion technologies (ZEB and ICE), infrastructure planning, financial planning (capital and operations) and emissions modeling.

Evenergi is using BetterFleet™ to undertake predictive modeling and analysis. To complete our work, we are:

1. Completing a global best practice review of other transit agencies that have transitioned to zero emission buses;
2. Completing a risk assessment and risk register of transitioning to zero emission bus technologies, along with risk mitigation strategies where warranted;
3. Modeling AAATA's routes and blocks to determine the pass/fail rates of various ZEB technologies to identify their ability to electrify the agency's service;
4. Modeling the state of charge impacts based on agreed worst case scenarios, such as route detours, high passenger loading and temperature extremes (extreme cold in Michigan particularly);
5. Completing emissions modeling to determine how greenhouse gases are reduced by a switch to zero emission bus technologies.

The project is ongoing, with completion expected in February 2022. Preliminary modeling shows that only 60% of AAATA's service can be electrified using battery electric buses with depot-only charging; that success rate increases to 95% with hydrogen fuel cell electric buses.

Interim Base Electrification - Predictive Analysis and Modeling

Client
King County Metro (KCM)

Evenergi Services Provided
ZEB Advisory BetterFleet

Work Completion
April 2022

Location
Seattle, WA

Project Description

King County Metro (KCM) is the Puget Sound region's largest public transportation agency and 8th largest in the United States. Metro provides bus, paratransit, vanpool, and water taxi services, and operates Seattle Streetcar, Sound Transit Link light rail, and Sound Transit Express bus service. King County is committed to providing safe, equitable, and sustainable mobility, and prioritizing service where needs are greatest. KCM has emerged as an early leader in adopting and piloting Zero Emission Bus technologies.

KCM has retained Evenergi to conduct predictive energy modeling and in-depot simulation for its to be constructed Interim Base, home to 124 pantograph-only battery electric buses (64 artics, 60 forty-foots).

KCM is commencing a detailed depot design phase utilizing pantograph down chargers. The process involves reviewing alternative designs to understand the most efficient approach to charging on the site now and into the future (including a potential autonomous future).

The objective of our work is to provide a framework that establishes the optimal combination of depot layouts, charger speeds and charger types which most benefits KCM. Optimal is defined as the balance between the following factors:

- Buses have sufficient charge at all times to meet schedules
- That capital investment in charging infrastructure is minimized
- Space in the depot is optimized
- Flexible enough to deal with extreme days and unplanned events (ie bus breakdown)

Evenergi is using BetterFleet™ to undertake predictive modeling and analysis. To complete our work, we are:

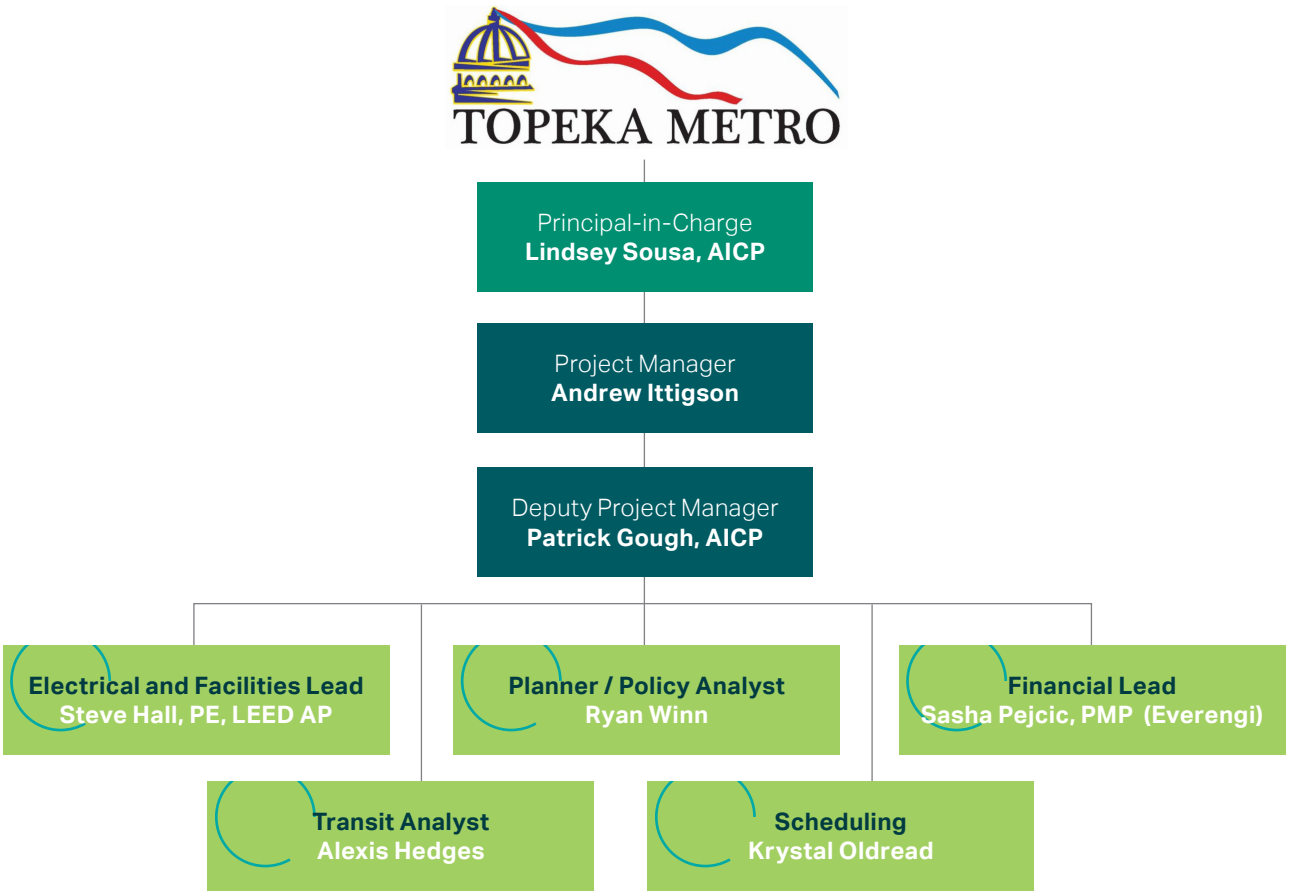
1. Modeling the state of charge of buses as they enter depot, based on-route energy requirements modeling;
2. Modeling the state of charge as buses leave the depot , with expectations of the energy required to complete the next assigned block;
3. Modeling the state of charge impacts based on agreed worst case scenarios, such as route detours, high passenger loading and temperature extremes;
4. Modeling the movement of buses as they enter the depot into pre-agreed "zones" each of which may consist of a number of "lanes" or "spaces";
5. Assigning specific buses to specific zones based on business rules such as bus type, e.g. "articulated" or "rigid" or chargepoint compatibility;
6. Considering time allocations when buses are potentially unavailable for charging, including cleaning, washing and general service line activities;
7. Modeling scenarios with or without hostlers moving buses, to understand the costs and impact of lane "blocking" being resolved with additional human resources.

An interesting aspect of the study, Evenergi is developing a new module of its BetterFleet software for KCM that will simulate in-depot charging ensuring that BEBs can meet their block assignments with the state of charge achieved by depot charging with a first in, first-out strategy. This project is ongoing, with expected completion in April 2022.

Proposed Project Team

As introduced on page 1, we have hand-selected a project team with specific technical expertise to enable successful project delivery. Complete resumes for each of our identified staff members can be found in the pages that follow.

Organizational Chart



Andrew Ittigson

Project Manager

AECOM

Qualifications

- MS, Community and Regional Planning, Transportation, University of Texas, Austin
- BA, History, University of Texas, Austin
- Certified Project Manager

Years of Experience

- With AECOM: 11
- With Others: 7

Professional Associations

- Board of Directors, Greater Dallas Planning Council (GDPC)
- Board of Directors, Southwest Medical District Transportation Best Practices Advisory Committee
- Board of Directors (past), Southwest Area Transit Association (SWTA
-

Andrew is a highly experienced project manager and planner specializing in service and operations planning for bus, streetcar, and light rail. He has managed Comprehensive Operations Analyses, Transit Development Plans, bus rapid transit, and innovative mobility studies throughout the United States. He brings 17+ years of experience working on all facets of transit planning including service evaluation, microtransit planning, route network design, implementation, and public outreach.

Project Experience

Service Planning Support (Microtransit and Downtown Transit Center), Dallas Area Rapid Transit (DART), Dallas, TX. As project manager, provide support for the Service Planning Department on projects ranging from regional community outreach to planning for mobility on demand zones and microtransit. Recently completed an assessment of the relocation of the West End Downtown Transit Center to multiple locations in downtown Dallas. A key focus is to incorporate bus, rail and micromobility while allowing for transit-oriented development opportunities.

Transit Planning On-Call Planning Services, Topeka Metro, Topeka, KS. As project manager, leading the service and operations planning efforts for a 4-year on-call services contract. Led the service planning effort which introduced a cost-neutral system re-design with more direct routing with fewer route deviations and loops in neighborhoods. The plan included Topeka's first mobility on-demand zone. The plan focused on increased ridership and productivity and for Metro to begin defining and tracking service goals, objectives, and service standards. The work included a fare analysis and a transit center site plan.

General Planning Consultant, DART, Dallas, TX. Program manager for five year $22M contract. Responsible for conducting all of DART's capital and rail planning program including environmental clearance, preliminary engineering, system planning, and optimization and assorted other planning related activities. Andrew managed tasks related to bus stop improvements, environmental planning for streetcar, downtown light rail service alignments, and light rail station improvements.

Andrew Ittigson (cont.)

Saint George to Zion National Park Electric Vehicle Study, Utah Department of Transportation (UDOT), Saint George, UT. Led the service planning for a new electric bus express route from St. George to Zion National Park. The service would provide workforce trips for the residents in the region and direct connections to Zion for tourists staying in St. George. The project included three service scenarios and a full EV infrastructure and charging plan.

Comprehensive Operations Analysis (COA), Suburban Mobility Authority for Regional Transportation (SMART), Detroit, MI. Project manager for the first COA for the three-county regional transit agency in Detroit. The focus of the plan was to implement more direct routing, improved frequencies and system optimization with the introduction of new service delivery options including a microtransit pilot in four zones. The COA recommendations were implemented in January 2021.

Project Connect Long Range Transit Plan, Capital Metro, Austin, TX. Task lead for development and evaluation of alternatives for high-capacity transit solutions in the central core of Austin and throughout the region. Developed phased evaluation process and criteria for 30+ alternative corridor alignments including all high-capacity modes such as BRT, LRT, streetcar, and commuter service. The Phase 1 evaluation included an assessment of conceptual cost estimates, frequency of service, guideway, demographics, land use, reliability and community input. This effort included an assessment of existing transit services, identification of transportation issues and opportunities, peer analysis, PEL feasibility, development of Purpose and Need Statement, and development of the evaluation process.

Five-Year Transit Plan and Twenty-Year Transit Vision, Northern Arizona Intergovernmental Public Transportation Authority (NAIPTA), Flagstaff, AZ. Task lead for comprehensive analysis of the local transit agency's (Mountain Line) bus system. Project includes recommendations for a cost-neutral service scenario and a long-range 20-year vision adding scenarios that take into account additional resources. The plan will inform the agency for next steps to secure funding for future service expansion and includes a robust public outreach effort focused on equity.

Southern Dallas County Transit Plan, North Central Texas Council of Governments (NCTCOG). Project manager for comprehensive evaluation of the mobility needs in Southern Dallas County. The project team developed a strategic implementation plan focused on transit service options, internal and regional connections, innovative mobility services and goods movement in the study area and the inland port. Near-term implementation and funding strategies are part of the recommendations.

Central Oklahoma Commuter Corridors Study (Central OKgo!), ACOG, Oklahoma City, OK. Project manager for service and operations planning for the Commuter Corridors Alternative Analysis for development of commuter transit corridors in central Oklahoma. The team developed, mapped and screened 20+ transit alignments in three separate corridors (Midwest City/Tinker AFB, Norman and Edmond). This effort included an assessment of existing facilities, identification of transportation issues and opportunities, development of potential alignments, and several iterations of mapping and geographic analysis. Approximately 10 alignments and 20 modal alternatives were advanced for detailed alternative assessment.

Waco BRT Feasibility Study, Waco Transit System, Waco, TX. Led the service planning for assessment of the first BRT corridor in Waco. Evaluated the service alternatives and provided overall recommendations for the BRT routing and the existing bus network to improve the overall system. The project included an assessment of existing bus service, corridor analysis, development of potential alignments, and ongoing public and stakeholder outreach.

Patrick A. Gough, AICP

Deputy Project Manager

AECOM

Qualifications

- MA, Urban and Environmental Planning, Univ. of Virginia
- BA, English, George Mason University
- Continuing Education: National Transit Institute:
  - National Environmental Policy Act (NEPA)
  - Bus Rapid Transit Case Studies
  - Transit Vehicle Noise/ Vibration Assessment

Years of Experience

- With AECOM: 17
- With Others: 1

Registrations

- American Institute of Certified Planners, APA

Patrick is a transportation planner and project manager. He brings 18 years of experience in the planning and implementation of transportation projects and is part of AECOM's national transportation electrification campaign – a multi-disciplinary group that provides support and thought leadership on electric bus and transit decarbonization projects throughout North America.

Patrick's specialties include electric bus technologies and strategies, transit service and operations planning, bus rapid transit, and public and stakeholder engagement. He has served as project manager or deputy project manager on more than 30 transit studies, and his work as part of AECOM's transportation group has helped bring new and restructured transit services to tens of thousands of riders across the U.S. and Canada.

Project Experience

Battery-Electric Bus Alternatives Assessment and Test & Evaluation Program, WMATA – Washington, DC. Project manager for a Washington Metropolitan Area Transit Authority study to convert its Metrobus fleet to zero-emission vehicles by 2045. Phase 1 was a 12-month alternatives assessment that reviewed available technologies, case studies, finance options, procurement issues, energy and infrastructure needs, and electrical and space capacity at facilities. The summary report proposed a Metrobus garage, manufacturers, vehicle and battery types, routes and blocks, performance criteria, and other plans to begin a one-year test and evaluation period. Phase 2 covers design and implementation issues along with a year-long test period, culminating in a long-range strategy and recommendations to convert the fleet over the next 20 years.

EV Fleet Conversion Study, Anne Arundel County, MD. Task lead for a two-phase project to convert the County's fleet to electric vehicles over the next two decades. In Phase 1, the team is reviewing available light-duty EV technologies, potential charging locations, and policies that can be put in place to facilitate the long-range transition of the fleet. In Phase 2, the team will undertake a benefit-cost analysis and provide concept drawings for the installation of charging units at select facilities.

Patrick A. Gough, AICP (cont.)

Vermont Transit (VTrans) Battery-Electric Bus Transition Plan. Technical lead on a project to help VTrans develop plans for the transition of 400 transit vehicles in the state to zero-emission propulsion over the next 30 years. The work is being done in cooperation with seven transit agencies in the state. It includes stakeholder outreach and technical memoranda on the following topics: state of the industry, existing conditions, energy and utilities, route and block analysis and service plan, procurement and training, a schedule for fleet transitions, and grants and finance options. The study will conclude with a summary report and recommendations.

Sustainability Action Plan, WMATA, Washington, DC. Deputy project manager on a task to create an agency-wide action plan for WMATA to be more sustainable in its operations and business practices over the coming years. Handling the coordination of tasks among our energy line colleagues and technical team members, serving as the lead on transportation issues and in the quality review of documents, and assisting the PM and WMATA project team in advancing the project.

Dundas Street Bus Rapid Transit, Metrolinx and the City of Mississauga, Ontario. Task lead for transit planning on this project that will see the development of a BRT system between Hamilton and Toronto along with construction of a dedicated transitway in Mississauga. Provided service plan elements in a tech memo that covered alignment concepts, stop locations, service spans and frequencies, expected cycle times, number of vehicles required, capital costs, and more.

Annual Metrobus Line Performance Report, WMATA, Washington, DC. Project Advisor for an effort to create a performance summary and report card for each Metrobus line and route pattern in the WMATA network. The report will help streamline the data analysis process and aid in yearly service planning decision-making. Tasks in the first phase of the project included an initial report, a dashboard that allows WMATA staff to see and understand route performance data in real-time, and a user's guide that WMATA can use to develop annual reports in future years. Currently the team is refining the report template, user's guide, and data integration process.

On-Board Bus Camera Enforcement Project, WMATA, Washington, DC. Project manager for a demonstration of camera technologies that automatically capture license plate numbers and issue citations to unauthorized vehicles in bus-only lanes and bus stop zones. Project will include recommendations to WMATA for the procurement and implementation of on-board bus camera enforcement hardware and software. The purpose of the project is to improve bus travel times and maintain headway separation by enforcing existing traffic laws.

Metro Transit Fleet, Facility, and Service Preliminary Assessment / Zero-Emission Bus Transition Plan, Minneapolis, MN. Deputy project manager and technical lead for a seven-month study to establish guiding principles and assessment criteria for the large-scale deployment of electric buses. Work includes milestone goals for the short-, medium-, and long-range transition to zero-emission buses; service design strategies; estimates of fleet requirements to maintain service; and an analysis of the space and electrical requirements for installing electric bus infrastructure at facilities.

Chapel Hill Transit, Bus Electrification Program for NSBRT – Chapel Hill, NC. Technical lead for a study to transition CHT's current fleet to electric bus on the North-South Bus Rapid Transit project and other future BRT lines. Project tasks include an existing conditions review, utility coordination, exploration of the viability of hydrogen fuel cell buses, and assessing town-owned land adjacent to CHT's existing bus depot, to determine the feasibility of expanding the site for the purpose of installing and storing electric bus equipment and vehicles.

Steven Hall, PE, LEED AP

Electrical and Facilities Lead

AECOM

Qualifications

- BS, Electrical Engineering, Marquette University, 2004

Years of Experience

- With AECOM: 13
- With Others: 3

Registrations/ Certifications

- Professional Engineer (electrical), Illinois
- LEED Accredited Professional

Steven is a project manager in AECOM's energy business line with a focus on transportation electrification. A registered professional electrical engineer, Steven's background encompasses all aspects of project delivery, from planning and strategy development, design development, utility coordination, through project construction. He has worked with many types of charging infrastructure technologies, including wireless inductive charging systems, and is an industry advocate for the development of new charging systems, including dynamic wireless power transfer.

Project Experience

New York Power Authority, Engineering Support for e-Mobility Program, New York, NY. Engineering manager responsible for performing site evaluation and feasibility studies for DCFC installations, performing design reviews, and evaluating EV bid documents. Work also includes construction services tasks including inspections at both public and bus fleet DCFC installations.

Los Angeles Department of Transportation (LADOT), Electrification of Transit Facilities, Los Angeles, CA. Senior Electrical engineer responsible for leading the conversion of the entire LADOT fleet of 520 buses. The project includes utility coordination to support up to 8MW of new service feeds at five facilities and complete electrical site design to support the bus charging infrastructure.

Utah Department of Transportation, Saint George to Zion NP Transit, Utah County, UT. Senior electrical engineer responsible for developing infrastructure design for new transit service to Zion National Park, including concept design for multiple charging strategies including depot-only and fast-charging alternatives. Work included utility coordination and infrastructure design for the charging alternative selected.

WMATA, Battery Electric Bus Program Phase 2, Washington, DC. Senior electrical engineer supporting Phase 2 implementation, including charging infrastructure review, utility coordination to determine preferred point of interconnection, and development of electrical design drawings.

Steven Hall, PE, LEED AP (cont.)

City of Berkeley, Energy Assurance Microgrid, Berkeley, CA. Senior electrical engineer responsible for oversight of the planning, design, and development of an energy assurance microgrid for the city's downtown area. Led team that also includes the Lawrence Berkeley National Laboratory. Initial work under the assignment was focused on system configuration and feasibility and support of the city's efforts to secure grant funding from the California Energy Commission.

Fresno County Council of Governments, Electrification Readiness Plan, Fresno, CA. Project manager responsible for developing an electrification readiness plan to identify FCOG's PEV infrastructure needs, including local stakeholder outreach, a public outreach plan and developing a technical analysis for siting charging infrastructure.

Kings County Association of Governments, Electric Vehicle Readiness Plan, King County, CA. Senior electrical engineer responsible for developing an electric vehicle readiness plan to identify KCAG's PEV infrastructure needs, including local stakeholder outreach, a public outreach plan and developing a technical analysis for siting charging infrastructure.

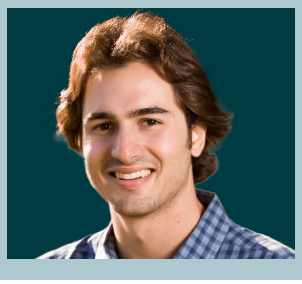
Illinois Tollway Highway Authority, Electric Vehicle Strategic Vision, Chicago, IL. Senior electrical engineer responsible for developing a strategic vision and implementation plan for the Tollway's I-294 Central Corridor. The initial phase included a technology background and market study evaluating plug-in chargers, Level 2 chargers, static wireless charging, and dynamic wireless power transfer technologies. The second phase includes two pilot installations of DWPT in the roadway.

City of Roseville, Plug-in Electric Vehicle Consultant, Roseville, CA. Senior electrical engineer for the project to assess and forecast the impacts of growing plug-in electric vehicle demand and charging services on the city's electric utility. Optimizing the benefits of vehicle electrification, charging infrastructure, and grid technologies while identifying and tracking multiple variables including technical, contractual, and regulatory requirements. In addition, business planning and program management tools were implemented for competitive PEV charging services to allow for seamless grid integration.

Commonwealth Edison, Community of the Future – Smart City Program Support, Chicago, IL. Senior electrical engineer responsible for evaluating various technologies in support of the development of a microgrid in the Bronzeville neighborhood.

City of Chicago, Department of Water, James W Jardine Water Purification Plant - Medium Voltage Improvements Phase 2, Chicago, IL. Deputy project manager for replacement of the existing 4,160-volt switchgear and 480-volt electrical distribution equipment, and the addition of standby power generation at the Jardine Water Purification Plant. This project also provided upgrading and expansion of the plant's SCADA system for automatic control of the new generators and main switchgear. The standby power generation included five 4,160-volt, 2,500-kilowatt diesel engine generators and paralleling switchgear as well as load matching and source transfer controls for generation and multiple ComEd services. Upgraded the existing security system including intrusion detection, fence perimeter detectors, video surveillance, and chlorine emergency paging to accommodate new work areas throughout the plant.

Kansas City Water Services Department, Waldo Pump Station Rehabilitation, Kansas City, MO. Lead electrical engineer responsible for the rehabilitation of an 80-mgd pump station. The project included replacement of indoor and outdoor switchgear, six medium voltage motors, two variable frequency drives, and a new SCADA system.



Ryan Winn

Planner / Policy Analyst

AECOM

Qualifications

- Masters Urban and Regional Planning (MURP), University of California, Los Angeles
- BS, Civil and Environmental Engineering, Cornell University

Years of Experience

- With AECOM: 11
- With Others: 0

Certifications

- Rautenberg New Leader's Program
- Toastmasters International, Competent Communicator

Ryan is a mobility planner with 11 years' experience on various transportation and mobility projects. He has been involved in corridor planning studies, alternatives analysis, technical studies, environmental mitigation monitoring, and project management. His recent experiences focus on planning for emerging mobility trends in curb and asset management, congestion pricing, tolling, electrification of transit and municipal fleets, and connected and automated vehicles. Ryan manages small to mid-size projects and leads tasks on varying size projects. His experience and education provide him a diverse set of technical skills to deliver various planning studies and infrastructure projects.

Project Experience

Study of Transitioning the County's Public Works Fleet to Electric Vehicles, Anne Arundel County, MD. Transportation planner and task lead responsible for policy analysis of transitioning Department of Public Works municipal light duty vehicle fleet to electric vehicles. Policies look at localities that provide EVs to employees to charge at home, paying for electricity, use by public of city- or county-owned chargers, and pricing policies for public use chargers.

Bus Electrification Fleet Study, Denver Regional Transportation District, Denver, CO. Transportation planner responsible for putting together state of the industry report and a policy and funding background report regarding recommendations for electric bus deployment, including best practices for propulsion, vehicle, infrastructure, and systems technology. Policy and funding report describes all available funding sources at local, state, and federal levels as well as near-term opportunities and potential partnerships for innovative financing. Supporting initial operations planning to determine best routes to electrify based on operating characteristics, vehicle energy loads, and battery sizes.

National Automated Bus Consortium, Los Angeles, CA and Nationwide. Transit analyst and project manager for two of the twelve transit agencies in an AECOM-led consortium to accelerate the deployment of full-size automated buses. Duties include analysis of existing bus routes suitable for conversion to automated fleets, including considerations of electric vehicle charging infrastructure. Additional consortium efforts included identifying

Ryan Winn (cont.)

candidate routes for automated bus deployment, developing bus specifications, and assisting agencies with operating plans.

Electric Vehicle Study, City of Minneapolis, MN. Conducted research on state of the alternative fuel vehicle industry including a literature review that detailed various municipal EV fleet types implemented around the world, from light duty to heavy duty and special utility vehicles. Literature review included U.S. case studies for various alternative fuel vehicles and associated charging infrastructure. Minneapolis Electric Vehicle Fleet Study included interviews with applicable municipal staff on vehicle needs, maintenance, and costing decisions to determine recommendations for fleet conversion in aggressive, moderate, and conservative scenarios.

Regional, Multimodal Curbside Asset Management Services & Mobility Wallet, District Department of Transportation, Washington DC. Transportation planner responsible for data and technology integration needs assessment for two similar projects. These documents examined current and emerging market needs while evaluating product offerings of various vendors to assist DDOT in developing solicitation documents for two new systems: a revolutionary curbside asset management and a mobility as a service/mobility wallet contract. Additional contractual support was provided in research, scoping, and cost estimating of curbside asset management services. .

Dallas-Fort Worth Airport Master Plan, Dallas, TX. Transportation planner responsible for documenting potential technology improvements to be considered in the Technology and Innovation chapter of the updated DFW Master Plan. Improvements considered on both landside and airside in the near and long term that can help airport operations reduce energy consumption and save costs while improving the traveler experience.

I-15 Express Lanes, Utah Department of Transportation. Transportation planner and technical advisor for various activities related to UDOT I-15 Express Lanes. Activities include developing a concept of operations for adding automatic license plate recognition to the existing Express Lanes, developing violations process and associated policies to enable license plate recognition, evaluating occupancy declaration pilot project, and developed an annual performance report documenting usage and financial information for the fiscal year.

Flex Zones Curb Management, AECOM, Los Angeles, CA. Co-project team lead responsible for submission to an internal innovation challenge reaching the semi-finals on building a digital curb space management system. Project is continuing to be pursued internally to build a software and hardware system solution for public and private sectors clients to manage curb space in real-time reflective of current parking and loading demands.

Sasha Pejcic, PMP

Financial Lead

EVENERGI

Qualifications

- Transit Mid-Manager Seminar, ENO Center for Transportation, Transit Leadership, San Diego, California, 2018
- Project Management Certificate, Ryerson University, Toronto, Ontario, Canada, 2009
- BA Economics – Finance Specialization & Applied Studies – Human Resources Management Specialization, Co-Op Program, University of Waterloo, Waterloo, Ontario, Canada, 2003

Years of Experience

- With Evenergi: <1 Year
- With Others: 19

Registrations/ Certifications

- Project Management Professional (PMP)® #1306473, Project Management Institute

As a management consultant, Sasha supports transit agencies, fleet operators and other related industries (utilities, equipment suppliers, etc.) with the transition to zero emission vehicles, both battery electric and hydrogen fuel cell. Sasha also works with transit agencies to rationalize their services to grow ridership, improve customer satisfaction, and maximize cost efficiencies. Sasha has successfully led a 100+ portfolio of diverse transit projects, including 30+ in the zero-emission bus and vehicle space.

A demonstrated leader in transit, Sasha is an ENO Center for Transportation alumnus. He proudly serves on the Board of Directors for the Ontario Public Transit Association (OPTA), serves on the Zero Emission Bus Task Force for the California Transit Association, and is involved with numerous industry committees of APTA, CUTA and CTA. He is a thought leader in ZEBs and has authoured blogs and articles for Metro Magazine on the integration and transition to a ZEB fleet. Additionally, he recently authored a chapter on ZEBs for best-selling book, The Future of Public Transportation. Sasha was named one of Mass Transit's Top 40 Under 40 in 2018. Prior to joining Evenergi, Sasha served as the global bus lead and transit advisory lead for Stantec.

Project Experience

King County Metro, Interim Base Predictive Energy Modeling, Seattle WA. King County Metro (KCM) has retained Evenergi to conduct predictive energy modeling for its to be constructed Interim Base, home to 124 pantograph-only battery electric buses (64 artics, 60 forty-foots). Acting as project manager, Sasha is leading the team responsible for all energy modeling. An interesting aspect of the study, Evenergi is developing a new module of its BetterFleet software for KCM that will simulate in-depot charging ensuring that BEBs can meet their block assignments with the state of charge achieved by depot charging with a first in, first-out strategy.

Sasha Pejcic, PMP (cont.)

Ann Arbor Area Transportation Authority - Bus Propulsion Study , Ann Arbor, MI. AAAA/TheRide has retained Evenergi to conduct an impartial review of bus propulsion technologies. Acting as project manager, the outcome of the study seeks a balanced review of propulsion options available in the marketplace evaluating benefits, downfalls, risks, and costs to AAATA/TheRide. Scope of work includes documenting the existing situation and benefits, an assessment of all propulsion technologies (ZEB and ICE), infrastructure planning, financial planning (capital and operations).

Gold Coast Transit District - Zero Emission Bus Rollout Plan, Oxnard, CA. As senior advisor, Sasha is currently supporting the development of an all encompassing ZEB rollout plan for GCTD which evaluates both battery electric buses and hydrogen fuel cell electric buses. Project includes identifying existing conditions evaluation, predictive energy modeling, needs and opportunities assessment, financial plan and implementation plan including phasing and timing for bus and infrastructure purchases.

CARTA - BEB Rollout Plan, Charleston, SC, Senior Advisor. Sasha is supporting the development of an all-encompassing BEB rollout plan for a fleet of 200 buses. Plan includes facilities requirements review, routing review, establishing power requirement needs, determining the optimal mix of battery electric buses, undertaking financial analysis and providing an implementation plan that transitions the agency to full BEB by 2030.

Fredericton Transit - Alternative Propulsion and Microtransit Study, Fredericton, NB, Senior Advisor. Evenergi has been retained by an engineering consultancy to support the completion of an alternative propulsion and microtransit study. The project uses Fredericton Transit's strategic plan as the foundation to review routing and develop a strategy. We are developing an alternative propulsion rollout plan that will identify the strategy, optimal timing and costs for Fredericton Transit to transition to a green fleet.

Calaveras Transit - Zero Emission Bus (ZEB) Rollout Plan , San Andreas, CA*. Sasha was principal-in-charge for the development of an all-encompassing ZEB rollout plan that is compliant with the California Air Resources Board (CARB) Innovative Clean Transit Regulation. The scope of work Sasha oversaw includes reviewing existing conditions, identifying needs and opportunities, financial planning, and developing a phased implementation plan to achieve CARB's 2040 goal (with prior firm).

Niagara Region Hydrogen Mobility Feasibility Study, Niagara Falls, ON*. Sasha was project manager for a study commissioned by the WEGO partners (Niagara Transit, Niagara Falls Parks Commission and Autra Power) to conduct a hydrogen propulsion feasibility study for the Niagara Region. Sasha led to completion in 4-weeks a scope of work included predictive energy modeling (determining kilograms of hydrogen needed to electrify the service), infrastructure requirements, site layout concepts and high-level costing (with prior firm).

Sacramento County - ZEB Rollout Plan and Short Range Transit Plan , Sacramento, CA*. Sasha was project manager for the development of an all-encompassing ZEB rollout plan. Plan includes facilities requirements review, routing review, establishing power requirement needs, determining the optimal mix of battery electric versus hydrogen fuel cell electric buses, undertaking financial analysis and providing an implementation plan that transitions the agency to full ZEB by 2040. In addition, completing a short range transit plan which will optimize routing and services in Sacramento County (with prior firm).

Alexis Hedges

Transit Analyst

AECOM

Qualifications

- BS, Environmental Economics and Management, University of Georgia

Years of Experience

- With AECOM: <1
- With Others: 4

Alexis provides technical and administrative support to clean transportation projects. She assists project engineers with bus modeling and simulation work, data collection, and cost analysis and estimation. She also assists project managers with reporting and other tasks.

Project Experience

Electric School Bus Planning and Transition, Albuquerque Public Schools, Albuquerque, NM. ZEB analyst responsible for developing an electrification transition plan for Albuquerque Public Schools' 385-school bus fleet. This plan will give APS the ability to determine the technology that will be needed to fit their operations and the operational changes that will need to made to fit the technology before APS begins the process of electrification. It will also give the school system the information needed to make purchasing and construction decisions.

Washington Metropolitan Area Transit Authority Low-No Electric Bus Deployment (Bus Test and Evaluation) ZEB Analyst. Alexis provided modeling and simulation efforts in evaluating the performance of and costs associated with the deployment of zero-emission buses. Worked with WMATA to deploy and incorporate two extended range battery-electric buses into the Metrobus fleet (with prior firm).

City of Albuquerque Zero Emission Bus Deployment Project, Albuquerque, NM. Provided project management and technical assistance services to the City of Albuquerque to deploy five battery electric buses and supporting charging infrastructure. Responsible for the day-to-day management of the deployment project including leading weekly calls, tracking and providing concurrence on project deliverables, and prepared quarterly reports required by FTA (with prior firm).

BC Transit ZEB Feasibility Technical Support, Victoria, BC, CA ZEB Analyst. Alexis provided technical support in assessing zero emission bus capabilities to support the development of a pilot deployment and transition plan for BC Transit's fleet.

Alexis Hedges (cont.)

Non-Bus Fleet Zero Emission Transition Costing Analysis, King County, WA. As ZEB analyst, Alexis assisted the project managers in their work with staff at King County to identify the costs associated with the County's zero-emission transition strategy as it relates to their non-bus fleet (with prior firm).

North County ZEB Transition Study, North County Transit District, Oceanside, CA. As ZEB analyst, Alexis provided technical support in assessing zero emission bus capabilities and the development of a transition timeline for adhering to the CARB Innovative Clean Transit Regulation. The project aided NCTD in the development of route, charge, and cost modeling for a full-fleet transition to zero-emission buses (with prior firm).

PANYNJ On-Airport Transportation Fleet Optimization Study, Port Authority of New York and New Jersey, New York, NY. As ZEB analyst, Alexis provided technical support for two projects to evaluate the feasibility of replacing Port Authority-operated diesel buses with battery electric buses at each of New York City's major airports. One project evaluated bus and charger technologies with a focus on minimizing the fleet size, while the other project provided support in improving utilization of the battery electric buses in PANYNJ's fleet through analysis and scheduling (with prior firm).

Zero Emission Bus Pilot Program, San Diego Metropolitan Transit System, San Diego, CA. As ZEB analyst, Alexis provided technical assistance to the project engineer in the modeling and simulation efforts to estimate the performance of a generic electric bus on San Diego's routes. The project included conducting a zero-emission bus feasibility assessment and developing a ZEB fleet transition plan to move MTS to a 100% zero-emission fleet (with prior firm).

Greater Bridgeport Transit Zero Emission Bus Deployment Project, Bridgeport, CT
ZEB Analyst | Ms. Hedges provided administrative and technical assistance to the project manager. She assisted the project engineer in modeling and simulation efforts in evaluating the costs associated with the deployment of zero-emission buses. The project included project management and technical assistance to Greater Bridgeport Transit (GBT) and the Connecticut Department of Transportation to deploy up to five battery electric Proterra Catalyst E2 buses and the supporting charging infrastructure (with prior firm).

Silver Line Zero Emission Bus Project, Massachusetts Bay Transportation Authority, Boston, MA. As ZEB analyst, Alexis provided administrative and technical assistance to the project manager. The project included project management and technical assistance services to MBTA to deploy five battery electric New Flyer Xcelsior XE60 heavy-duty, low-floor, 60-foot articulated buses and supporting charging infrastructure (with prior firm)..

Paratransit Idle Reduction Project, Utah Transit Authority, Salt Lake City, UT. As ZEB analyst, Alexis provided administrative assistance to the project manager with tasks including reporting and budget management. FTA's Bus Efficiency Enhancements Research and Demonstration Program provided funding to innovative research development, and demonstration projects targeting bus efficiency enhancements. The buses were deployed from 2017 to 2019 (with prior firm).

Krystal Oldread

Scheduling

AECOM

Qualifications

- MS, Civil Engineering (Transportation), University of Massachusetts
- MRP, Regional Planning, University of Massachusetts
- BA, Geography, University of Massachusetts
- BS, Natural Resource Studies, University of Massachusetts

Years of Experience

- With AECOM: 7
- With Others: 9

Certifications

- Certificate – Transit Management and Operations
- Certificate – Marine and Coastal Sciences
- Class B CDL with passenger and airbrakes

Krystal is a transportation planner providing support for transit operations analysis, performance metrics, bus routing and scheduling, data analysis, NTD processes, and runcut development. Krystal previously worked in the public sector for a transit agency. Most recently, Krystal was the Director of Operations and Planning for the Pioneer Valley Transit Authority (PVTA), and previously held positions as a supervisor, dispatcher, trainer, and bus operator.

Project Experience

Saint Joseph, Transit Service Development Plan, Saint Joseph, MO. AECOM conducted a transit development plan (TDP) for St. Joseph's service called The Ride. Their routes have remained relatively the same for the past eight years despite changes in travel patterns and new development. Work includes not only the TDP but implementation help in performing the runcut for the new service. Krystal is performing an assessment of the The Ride's current runcut and scheduling process to understand current practices, union requirements, and identify potential efficiencies. She will use this information as the foundation for the scheduling and runcut of the redesigned service. The runcut will be done in RouteMatch.

Detroit DOT, NTD Safety Reporting Assistance, Detroit, MI. As part of an on-call contract with the Detroit Department of Transportation (DDOT), AECOM assisted with their safety and security reporting. DDOT discovered that their previous safety manager had been underreporting events. Using an output from their internal incident report database Krystal created a decision tree and is analyzing over 4,000 incidents to flag as unreportable, major reportable, potential major needs further review, and minor. She is working with a team to gather the necessary information to complete the NTD major event forms and then will be working with DDOT to improve their service.

TARTA, Monthly NTD Submittals, Toledo, OH. AECOM was retained to evaluate the data collection process, develop corrective actions, and recalculate data for monthly submissions after TARTA discovered an internal reporting error. Krystal developed a spreadsheet and methodology to collect and synthesize data for reporting. Data was obtained and compiled from a variety of

Krystal Oldread (cont.)

sources as TARTA both directly operates and contracts out parts of their service, operates fixed route and demand response, has varying levels of service daily due to tripper school service and the COVID-19 pandemic, and uses Trapeze scheduling software which was not accurately set up to display what was in operations.

Massachusetts Regional Transit Authorities (RTAs), Comprehensive Regional Transit Plan Updates, Statewide, MA. AECOM was contracted by MassDOT to update all 15 of the state's regional transit plans. Krystal was a team lead overseeing the plan update for five of the regional transit authorities including the Pioneer Valley Transit Authority. The plans provide a comprehensive assessment of transit services and had robust public outreach in developing recommendations to improve service, operations, policy and practices.

Confidential Client, University Transit Plan, Boston, MA. AECOM assisted a Boston-area university that has their own bus system in evaluating service and vendor performance. As part of the study, Krystal evaluated the vehicle scheduling in Transloc to determine effectiveness and develop efficiencies, reviewed the contract for compliance, and analyzed layover practices. Recommendations were made to improve service and optimize revenue miles/hours through adjustments in crew scheduling practices.

Greensboro Transit Agency (GTA) ADA Operational Analysis, Greensboro, NC. AECOM conducted an operational analysis of GTA's ADA and demand response services to evaluate service delivery, financial performance, and eligibility processes. GTA utilizes Trapeze software to schedule, manage, dispatch and deploy trips. Krystal works with GTA and Trapeze to obtain the necessary data to conduct the analysis. This includes modifying existing reporting functions and developing new reports in order to obtain a comprehensive data set.

Palmetto Breeze Public Transit Plan, Hilton Head, SC. The Palmetto Breeze Transit Plan developed expanded transit options by implementing new fixed route service in Bluffton. For the recommended routes Krystal analyzed bus stop placement, developed route timing and timepoint structures, created public schedules, and developed the vehicle schedules in order to maximize the number of interlines and potential transfers amongst the three new routes.

Ben Franklin Transit Planning, On-Call Support, Richland, WA. This task of an on-call support involved assisting Ben Franklin Transit with implementing the recommendations in their Comprehensive Service Plan Study. Krystal was responsible for creating the runcut for the new service including vehicle blocking, crew scheduling, and rostering. She was also responsible for analyzing the effectiveness of the run cut and evaluating its efficiency at the two year mark.

MLTA, Route Efficiency & Vehicle Maximization Study, Morgantown, WV. Krystal developed recommendations for MLTA using two scenarios. The first was a set of recommendations to improve efficiency and still maintain a baseline level of service given impending funding cuts. The second assumes increased funds become available and is a set of recommendations to match the level of service to the growing demand for service in the region. Finally, Krystal was responsible for conducting an analysis to improve coordination between the WVU PRT system and MLTA.

03. Cover Sheet, Price Quote, Certifications

TOPEKA METRO

RFB TO-22-09
Electric Vehicle Fleet Study

COVER SHEET

Proposer Information

Company Name	AECOM Technical Services, Inc.
Address	13355 Noel Road, Suite 400
City, State, Zip	Dallas, TX 75240
Main Phone	972.788.1000

Contact Person Information

Name	Andrew Ittigson
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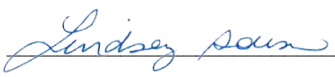
Signature 

Date: January 20, 2022

RFB TO-22-09
Electric Vehicle Fleet Study

PRICE QUOTE

Price to Complete Electric Vehicle Fleet Study $ See Tasks below

Additional Charges: (Tasks) $ See Task breakdown

Project Management - $4,240

Existing Conditions - $11,296

Regulations, Laws, Rules, Policies - $16,064

Implementation Strategies - $34,773

Financial Analysis - $33,707

Final Report - $9,775 Total $ 109,854

List all applicable charges on the price quote. Any charge other than those listed on the price quote will not be paid.

Topeka Metro is tax exempt. Do not include sales tax in your proposed price

RFB TO-22-09
Electric Vehicle Fleet Study

DISADVANTAGED BUSINESS ENTERPRISES (DBE) CERTIFICATION

This contract is subject to the requirements of Title 49, Code of Federal Regulations, Part 26, *Participation by Disadvantaged Business Enterprises in Department of Transportation Financial Assistance Programs*. The national goal for participation of Disadvantaged Business Enterprises (DBE) is 10%. Metro's overall 2019-2021 goal for DBE participation is 2.00%; the race neutral goal is 1.12%, and the race conscious goal is 0.88%. There is no contract goal for this procurement.

The contractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The contractor shall carry out applicable requirements of 49 CFR Part 26 in the award and administration of this DOT-assisted contract. Failure by the contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as Metro deems appropriate. Each subcontract the contractor signs with a subcontractor must include the assurance in this paragraph (see 49 CFR 26.13(b)).

The contractor is required to pay its subcontractors performing work related to this contract for satisfactory performance of that work no later than 30 days after the contractor's receipt of payment for that work from Metro.

The contractor may not hold retainage from its subcontractors.

The contractor must promptly notify Metro, whenever a DBE subcontractor performing work related to this contract is terminated or fails to complete its work, and must make good faith efforts to engage another DBE subcontractor to perform at least the same amount of work. The contractor may not terminate any DBE subcontractor and perform that work through its own forces or those of an affiliate without prior written consent of Metro.

Signature: Lindsey Sousa

Name and Title: Lindsey Sousa, AICP, Associate Vice President

Company Name: AECOM Technical Services, Inc.

Date: January 20, 2022

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FLY AMERICA CERTIFICATION

The Contractor agrees to comply with 49 U.S.C. 40118 (the "Fly America" Act) in accordance with the General Services Administration's regulations at 41 CFR Part 301-10, which provide that recipients and sub-recipients of Federal funds and their contractors are required to use U.S. Flag air carriers for U.S Government-financed international air travel and transportation of their personal effects or property, to the extent such service is available, unless travel by foreign air carrier is a matter of necessity, as defined by the Fly America Act. The Contractor shall submit, if a foreign air carrier was used, an appropriate certification or memorandum adequately explaining why service by a U.S. flag air carrier was not available or why it was necessary to use a foreign air carrier and shall, in any event, provide a certificate of compliance with the Fly America requirements. The Contractor agrees to include the requirements of this section in all subcontracts that may involve international air transportation.

Signature: Lindsey Sousa

Name and Title: Lindsey Sousa, AICP, Associate Vice President

Company Name: AECOM Technical Services, Inc.

Date: January 20, 2022

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LOBBYING CERTIFICATION

The undersigned contractor certifies, to the best of his or her knowledge and belief, that:

(1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan or cooperative agreement.

(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for making lobbying contacts to an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan or cooperative agreement, the undersigned shall complete and submit Standard Form LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions. See 49 CFR 20.100.

(3) The undersigned shall require that the language of this certification be included in the award documents for all sub-awards at all tiers (including subcontracts, sub-grants, and contracts under grants, loans, and cooperative agreements) and that all sub-recipients shall certify and disclose accordingly. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by 31 USC. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure. [Note: Pursuant to 31 USC 1352(c)(1)-(2)(A), any person who makes a prohibited expenditure or fails to file or amend a required certification or disclosure form shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such expenditure or failure. See 49 CFR 20.400.]

The undersigned contractor certifies or affirms the truthfulness and accuracy of each statement of its certification and disclosure, if any. In addition, the Contractor understands and agrees that the provisions of 31 USC 3801, et seq, apply to this certification and disclosure, if any.

Signature: Lindsey Sousa

Name and Title: Lindsey Sousa, AICP, Associate Vice President

Company Name: AECOM Technical Services, Inc.

Date: January 20, 2022

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NON-COLLUSION CERTIFICATION

This is my sworn statement to certify that this proposal was not made in the interest of or on behalf of any undisclosed entity. This proposal is not collusive.

This proposer has not been a party to any agreement or collusion in restraint of freedom of competition by agreement to bid a fixed price, to refrain from bidding, or otherwise. This proposer has not, directly or indirectly, by agreement, communication or conference with anyone, attempted to induce action prejudicial to the interest of Topeka Metropolitan Transit Authority, or of any proposer, or anyone else interested in the proposed contract.

Signature: Lindsey Sousa

Name and Title: Lindsey Sousa, AICP, Associate Vice President

Company Name: AECOM Technical Services, Inc.

Date: January 20, 2022

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SUSPENSION / DEBARMENT CERTIFICATION

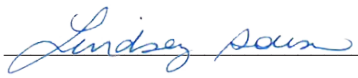
In regard to 2 CFR Parts 180 and 1200

In accordance with 2 CFR Parts 180 and 1200, the contractor is required to verify that none of its principals or affiliates:

1) is included on the federal government's suspended and debarred list;
2) is proposed for debarment, declared ineligible, voluntarily excluded or disqualified;
3) within three years preceding this proposal, has been convicted of or had a civil judgment rendered against them for (a) commission of fraud or criminal offense pertaining to performing a public transaction, (b) violation of any federal or state antitrust statute, or (c) embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements or receiving stolen property;
4) is indicted or charged by a governmental entity for any of the charges in 3) above; and
5) has had any public transaction terminated for cause or default within three years preceding this proposal.

The contractor is required to include this requirement in any subcontracts related to this contract.

By signing and submitting its proposal, the proposer certifies that the certification in this clause is a material representation of fact relied upon by Metro. If it is later determined that the proposer knowingly rendered an erroneous certification, in addition to remedies available to Metro, the Federal Government may pursue available remedies, including but not limited to suspension and/or debarment. The proposer agrees to verify that none of its principals or affiliates is included on the federal government's suspended and debarred list at any time throughout the period of this contract. The proposer further agrees to include a provision requiring the same compliance in its subcontracts related to this contract.

Signature: 

Name and Title: Lindsey Sousa, AICP, Associate Vice President

Company Name: AECOM Technical Services, Inc.

Date: January 20, 2022

About AECOM

AECOM is the world's trusted infrastructure consulting firm, delivering professional services throughout the project lifecycle – from planning, design and engineering to program and construction management. On projects spanning transportation, buildings, water, new energy and the environment, our public- and private-sector clients trust us to solve their most complex challenges. Our teams are driven by a common purpose to deliver a better world through our unrivaled technical expertise and innovation, a culture of equity, diversity and inclusion, and a commitment to environmental, social and governance priorities. AECOM is a Fortune 500 firm and its Professional Services business had revenue of $13.3 billion in fiscal year 2021. See how we are delivering sustainable legacies for generations to come at aecom.com and @AECOM.

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