Introduction

On Thursday, May 20, 2021 from 11:30 a.m. – 1:00 p.m., the El Dorado County Transportation Commission (EDCTC) and El Dorado Transit held a virtual Stakeholder Advisory Committee (SAC) meeting for the El Dorado Zero Emissions Bus Plan. The meeting served to introduce the plan, share why EDCTC and El Dorado Transit are currently developing the plan, present existing conditions, discuss preliminary fleet solutions, and provide next steps to stakeholder representatives.

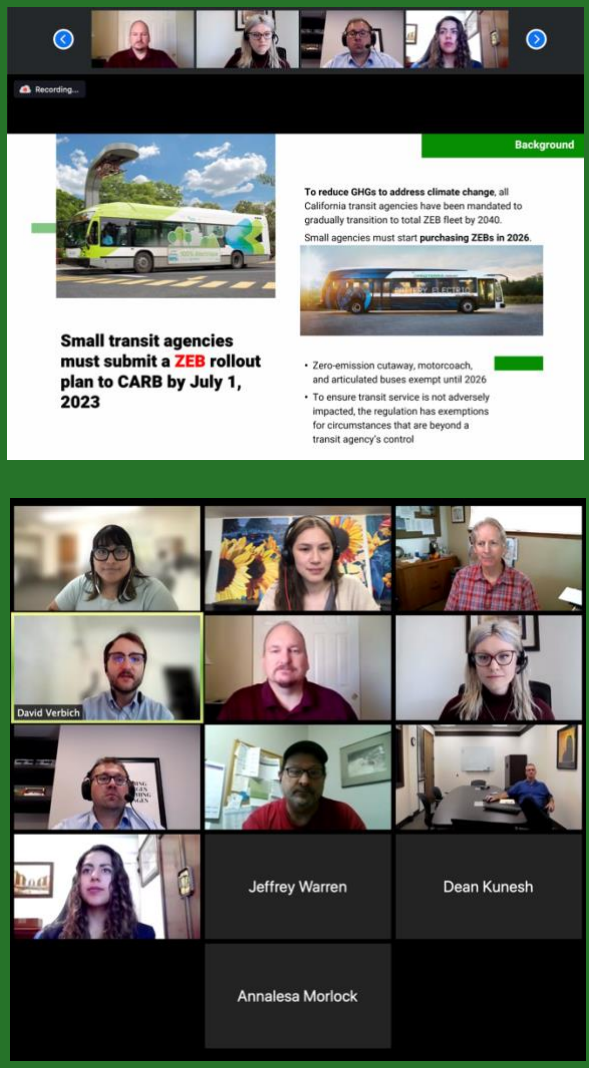
Below is a list of project team members who attended:

- Dan Bolster, EDCTC
- Brian James, El Dorado Transit
- Nicole Zhi Ling Porter, AIM Consulting
- Emely Candray, AIM Consulting
- David Verbich, Stantec
- Amanda McDaniel, Stantec
- Sasha Pejcic, Stantec
- Analy Castillo, Stantec

Ten stakeholder representatives from the following organizations and agencies attended the meeting:

- Coloma Lotus Advisory Committee
- El Dorado County
- El Dorado County Air Quality Management District
- Pacific Gas & Electric Company (PG&E)
- Shingle Springs Alliance

El Dorado County District 1 Supervisor John Hidahl was also in attendance.



Project team members and stakeholder representatives discussing the plan.

Project Overview

In 2018, the California Air Resources Board (CARB) adopted the Innovative Clean Transit (ICT) Regulation which mandates that all bus fleets convert to zero-emission buses by 2040. As part of this mandate, small transit operators must submit a Zero-Emission Bus (ZEB) Rollout Plan to CARB by July 2023.

El Dorado Transit assumes that transitioning to a 100% ZEB fleet will affect every aspect of its operations, this project will provide the agency with the tools necessary to successfully submit a ZEB Rollout Plan by July 1, 2023 and transition to a ZEB fleet by 2040.

Meeting Format & Presentation

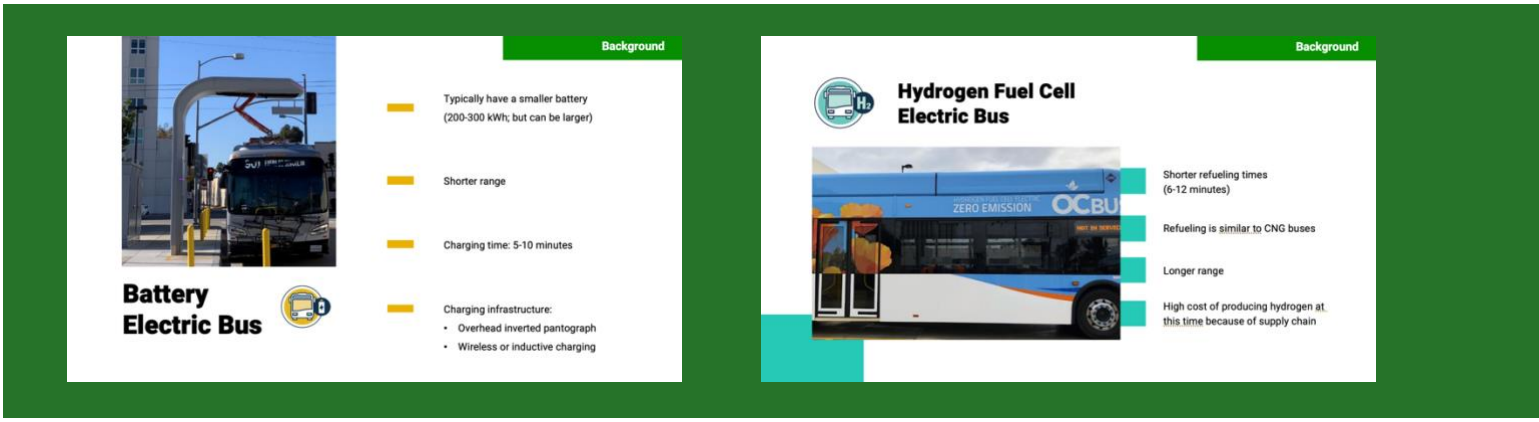
Nicole Zhi Ling Porter, Project Manager at AIM Consulting, began the meeting by welcoming attendees, thanking them for their participation, providing an overview of the meeting agenda, and introducing the project team. Dan Bolster, Senior Transportation Planner at EDCTC, then introduced the Zero Emissions Bus Fleet Conversion Plan and shared why EDCTC and El Dorado Transit are making this transition now. David Verbich, Transportation Associate at Stantec, then continued the meeting by presenting about the different zero-emission bus technologies, major findings from the existing conditions analysis, a site assessment of the existing transit center, preliminary fleet solutions, and community benefits of this transition to zero-emission buses.

After the presentation, the project team facilitated a large group discussion with the stakeholder participants. Stakeholders were encouraged to ask questions about any of the topics presented, and were also asked to respond to a series of discussion questions. After the stakeholder group discussion, Dan presented next steps for the project which include a virtual community meeting June 2021 and a second SAC meeting in the Fall of 2021. The project team will design site plans and identify needed transit facility modifications in June 2022, and then develop a needs and opportunities assessment by July 2022. EDCTC, El Dorado Transit, and the project team will ultimately develop a rollout plan by August 2022.

Meeting Presentation

To reduce greenhouse gas emissions to address climate change, all California transit agencies have been mandated by the California Air Resources Board (CARB) to gradually transition to total ZEB fleet by 2040. Small agencies, such as El Dorado Transit, must start purchasing ZEBs in 2026. This effort will plan for El Dorado Transit's use of alternative fuels to build climate preparedness and community sustainability, improve public health, and reduce regional greenhouse gas (GHG) emissions.

A zero-emission bus, or ZEB, is a bus technology that has zero-tailpipe emissions. There are two types of zero-emission bus technologies: battery electric buses (BEBs), and hydrogen fuel cell electric buses (FCEBs). Each of these bus technologies have unique features, limitations, and capabilities that provide different benefits and challenges. Battery electric buses (BEBs) typically have smaller batteries and shorter ranges, but only require 5-10 minutes to charge. Additionally, the charging infrastructure needed for BEBs includes an overhead inverted pantograph, and wireless or inductive charging. Comparatively, hydrogen fuel cell electric buses (FCEBs) have shorter refueling times and longer ranges. However, there is a high cost for producing hydrogen at this time and the charging infrastructure is more expensive as well.



The project team shared the following major findings from the existing conditions analysis: El Dorado Transit provides service to a large service area with dispersed destinations and a challenging topography; the current bus fleet has four different types of buses; the buses travel long distances, from 189-200 miles each; and while the current fleet has limited options for appropriate ZEB replacements, the technology is evolving rapidly and may impact future vehicle options for the agency.

After presenting a brief site assessment of the existing transit facility, the project team provided an overview of the ZEB fleet modeling process. The team uses modeling to predict the fuel economy or performance of ZEBs under El Dorado Transit's typical operating conditions. The results from this modeling help the team understand how much energy will be needed to move a zero-emission bus one mile. Then, using the mileage of each transit route, the team can estimate if zero-emission bus service is successful. If a bus still has 20% battery after traveling the entirety of a route, then it is successful.

At the time of this presentation, potential fleet solutions for El Dorado Transit were organized into three categories: local fixed-route service, commuter service, and on-demand response service. The team shared preliminary solution ideas for each of these categories, before discussing the different community benefits of transitioning to a zero-emission fleet and then transitioning to the stakeholder group discussion.

Stakeholder Feedback

Below is a summary of both the discussion and the comments received from meeting participants, organized by topic.

Topic #1: Do you have any thoughts or concerns regarding the different electric bus technology options?

Travel Range

- I am concerned about how far the zero-emission buses can travel without needing to be charged. Are the range estimates used in the modeling based upon fully charged batteries?

Electric Bus Batteries

- The battery degradation that takes place over time is one of my concerns. How often do the batteries for zero-emission buses need to be replaced?
- As far as I know, there is no nearby charging infrastructure. This infrastructure would need to be built in order to implement the zero-emission bus fleet.

Bus Modeling

- Did the modeling example use data from recent ridership numbers to determine the weight of a bus? Currently ridership is down due to COVID-19. The modeling should be based upon the weight of a full bus.

Bus Technologies

- It sounds like the hydrogen fuel cell buses do not have enough capacity to serve as our region's commuter buses yet. Do we know if these will be available in the next five years? If they do become available, I would think these are a better option for our region's bus fleet.

Costs

- My understanding is that the cost of these new bus technologies is high; will there be government subsidies for these types of vehicles?
- How much more energy will be needed from PG&E to operate a heavy-duty zero-emissions bus fleet? What is PG&E's forecast for the overall inflation of energy costs (per kilowatt)? Do we know what cost increases are anticipated in the near future?
- I'm interested in life-cycle costs of the zero-emission bus fleets. Has there been any analysis on the life-cycle costs for the electric bus batteries?

Topic #2: Should EDCTC and El Dorado Transit prioritize rolling out the electric bus fleet in specific neighborhoods or areas?

- One of my initial thoughts is that El Dorado Transit should try out the zero-emission buses on local fixed-routes that do not have to travel far distances, to see how they perform. The Diamond Springs route is a potential option.
- Do we have large electric battery charging infrastructure already placed? If yes, then a route near that infrastructure might work best.

Topic #3: Do you see yourself or your family / friends in the El Dorado region using on-demand transit ever or in the future?

- I think there will be a demand for this type of service in the region's more populated areas, including Placerville, South Lake Tahoe, and then eventually El Dorado Hills. However, I think people are more inclined to stay traveling in their personal vehicles, as they have been for many years. As the new generation of millennials begin to live in our region, I could see this evolving as they are more willing to take transit and see it as a viable transportation option.

Appendix

- Meeting Presentation
- Meeting Invite

El Dorado County Transit Authority

Zero Emission Bus Fleet Conversion Plan

el dorado county edctc TRANSPORTATION COMMISSION

EL DORADO TRANSIT

Agenda

- Welcome & Introductions
- Background
- Project Overview
- Existing Conditions
- Preliminary Fleet Solutions
- Group Discussion
- Next Steps

Background

To reduce GHGs to address climate change, all California transit agencies have been mandated to gradually transition to total ZEB fleet by 2040.

Small agencies must start **purchasing ZEBs in 2026**.

Small transit agencies must submit a ZEB rollout plan to CARB by July 1, 2023

- Zero-emission cutaway, motorcoach, and articulated buses exempt until 2026
- To ensure transit service is not adversely impacted, the regulation has exemptions for circumstances that are beyond a transit agency's control

More about the mandate

Required Components	Section Description
Section A	Transit agency information
Section B	Rollout plan general information
Section C	Technology portfolio
Section D	Current bus fleet composition and future bus purchases
Section E	Facilities and infrastructure modifications
Section F	Providing service in disadvantaged communities
Section G	Workforce training
Section H	Potential funding sources
Section I	Start-up and scale-up challenges

Innovative Clean Transit Regulation

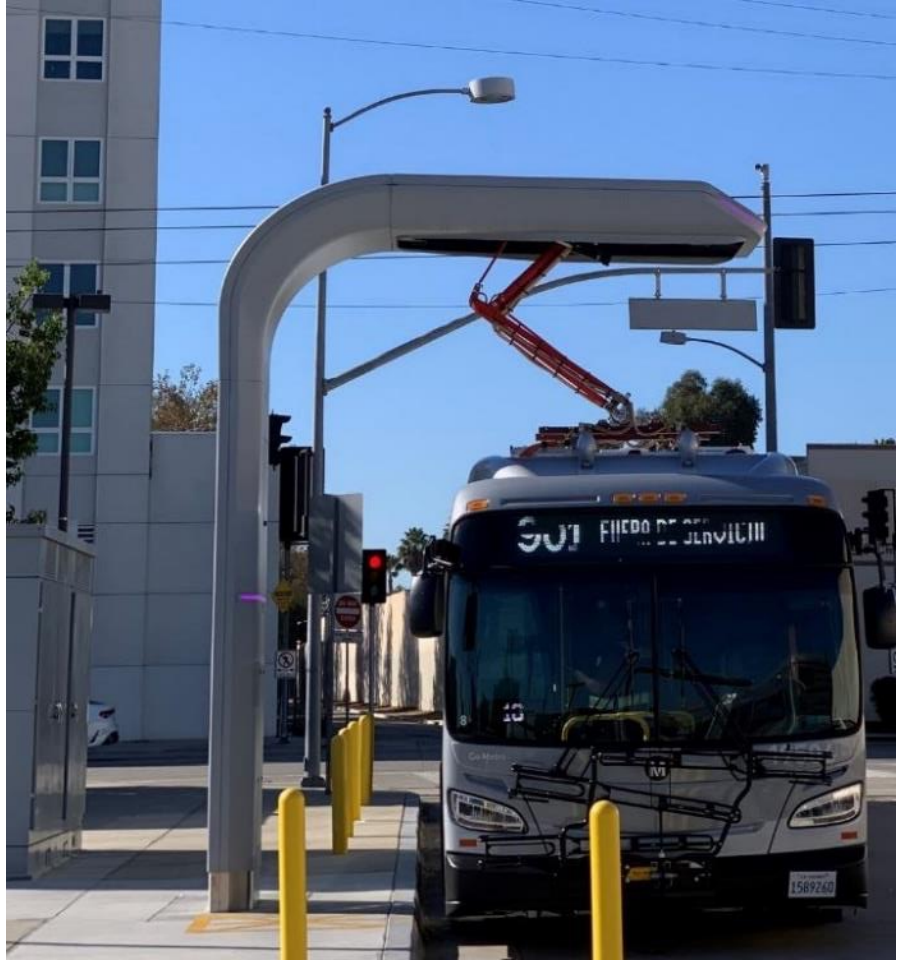
What is a Zero-Emission Bus?

Battery Electric Bus (BEB)

- Propulsion occurs from electricity directly stored in batteries
- Fueling occurs by recharging batteries

Hydrogen Fuel Cell-Electric Bus (FCEB)

- Propulsion occurs from hydrogen converted by fuel cells into electricity for propulsion
- Fueling occurs by refilling on-board hydrogen tank



Battery Electric Bus- On Route Charging

- Typically have a small battery (200-300 kWh; but can be larger)
- Short range between charges (~70-100 miles)
- Charging time: 5-10 minutes
- Charging infrastructure:
  - Overhead inverted pantograph
  - Wireless or inductive charging

Battery Electric Bus- In-depot charging

Large energy storage capacity (466-660 kWh)

Long range (~120-170 miles) on one charge

Charging time 2-6 hours

Charging infrastructure:

- Low power depot charger (<150 kW)
- High power depot charger (>300 kW)

Can be supplemented with on-street / on-route charging

Hydrogen Fuel Cell Electric Bus

- Shorter refueling times (6-12 minutes)
- Refueling is similar to CNG buses
- Longest range of ZEB (~200-300 mile)
- High cost of producing hydrogen at this time because of supply chain

What are some…?

Benefits

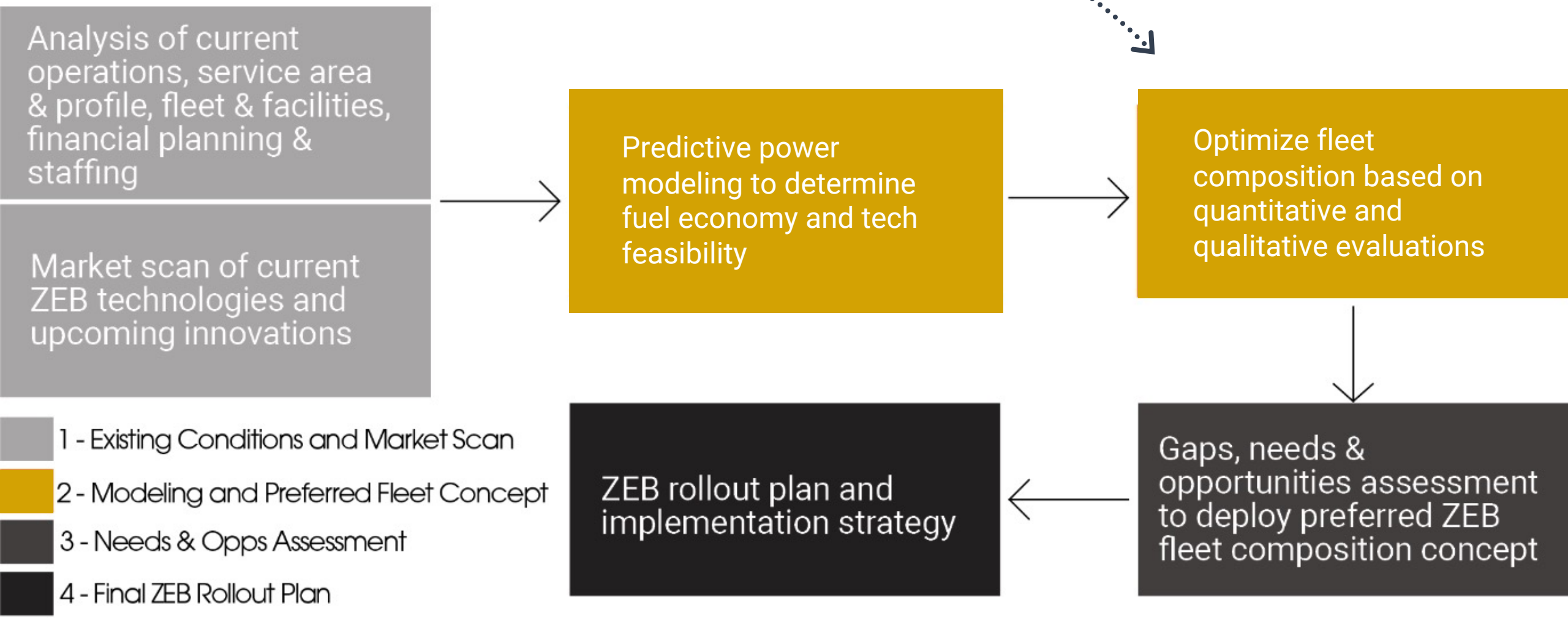
- Eliminates tailpipe GHG emissions
- Near silent ride for customers and operators
- Eliminates noxious fumes in the passenger cabin
- Smoother ride
- Fewer moving parts to maintain—more reliable vehicles

Challenges or drawbacks

- Double-to-triple the cost of current vehicles
- Requires costly infrastructure upgrades
- Need to train mechanics and operators on new technologies
- Will require coordination with public utilities
- May impact operational parameters to deliver scheduled service (range anxiety)

Project Overview

We are here


Analysis of current operations, service area & profile, fleet & facilities, financial planning & staffing
Market scan of current ZEB technologies and upcoming innovations
Predictive power modeling to determine fuel economy and tech feasibility
Optimize fleet composition based on quantitative and qualitative evaluations
Gaps, needs & opportunities assessment to deploy preferred ZEB fleet composition concept
ZEB rollout plan and implementation strategy
1 - Existing Conditions and Market Scan
2 - Modeling and Preferred Fleet Concept
3 - Needs & Opps Assessment
4 - Final ZEB Rollout Plan

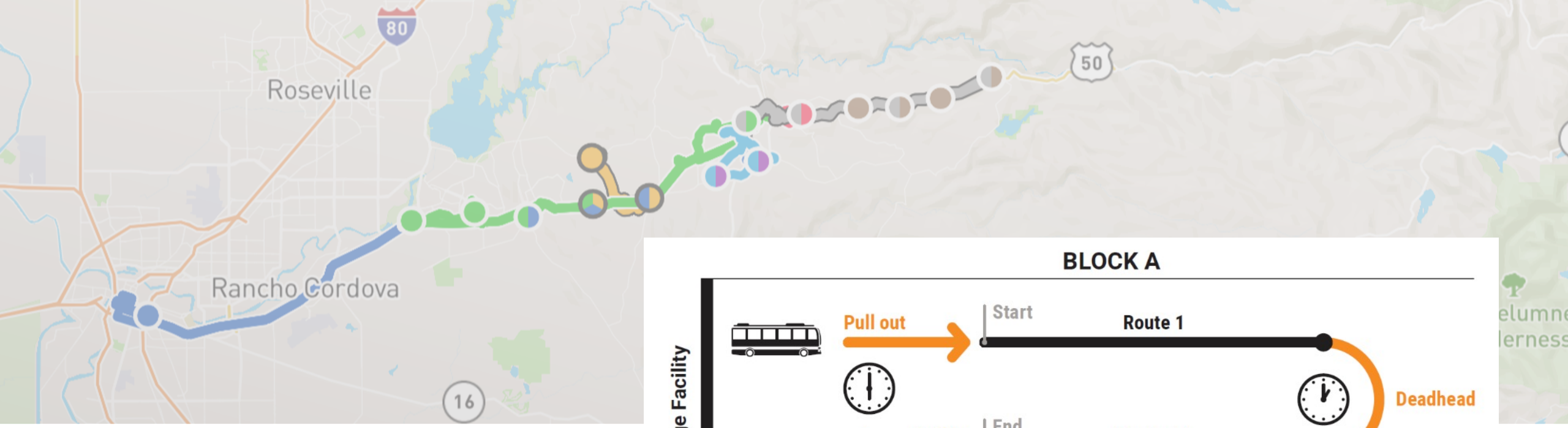
Existing Conditions

MAJOR FINDINGS

Large service area (1,551 sq mi) with dispersed destinations & a challenging topography

Diverse fleet – 4 types of ‘buses’

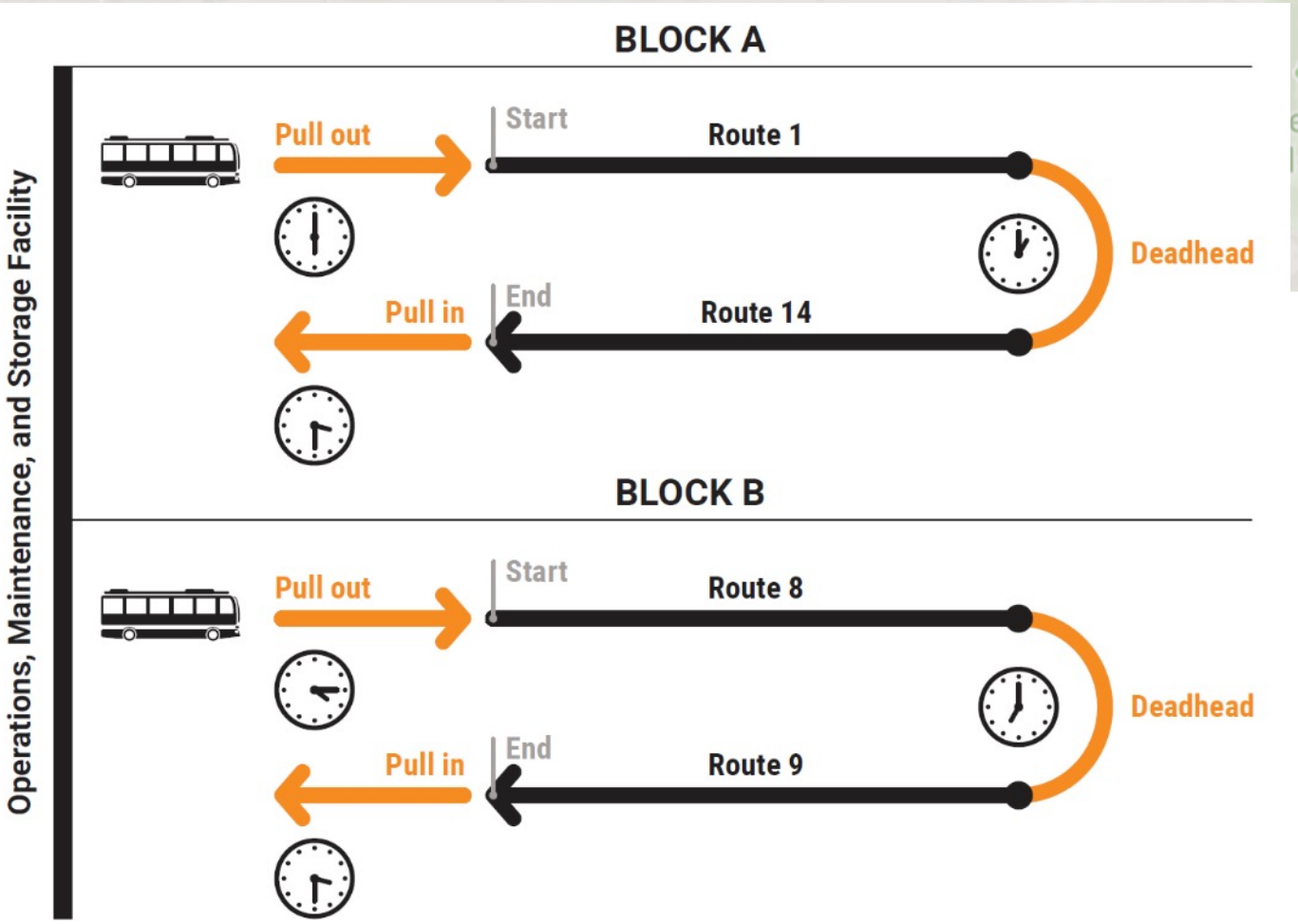
61% of vehicles complete more than **one block** on weekdays



What's a block??

A block is everything a bus does between the time it **pulls out** of a facility and **pulls in.**

It's a series of trips and deadheading (not in service, getting to the start of a route, etc.).



MAJOR FINDINGS

Vehicles travel long distances:

- Motor coaches: average **189 miles per vehicle**
- 35-ft. buses: average **200 miles per vehicle**

Demand response vehicle mileage varies widely; minivans tend to travel longer distances than cutaways

Fleet has **limited options for ZE replacement currently**

Technology is evolving rapidly, and options will look different in the coming years

Current Fleet & Considerations

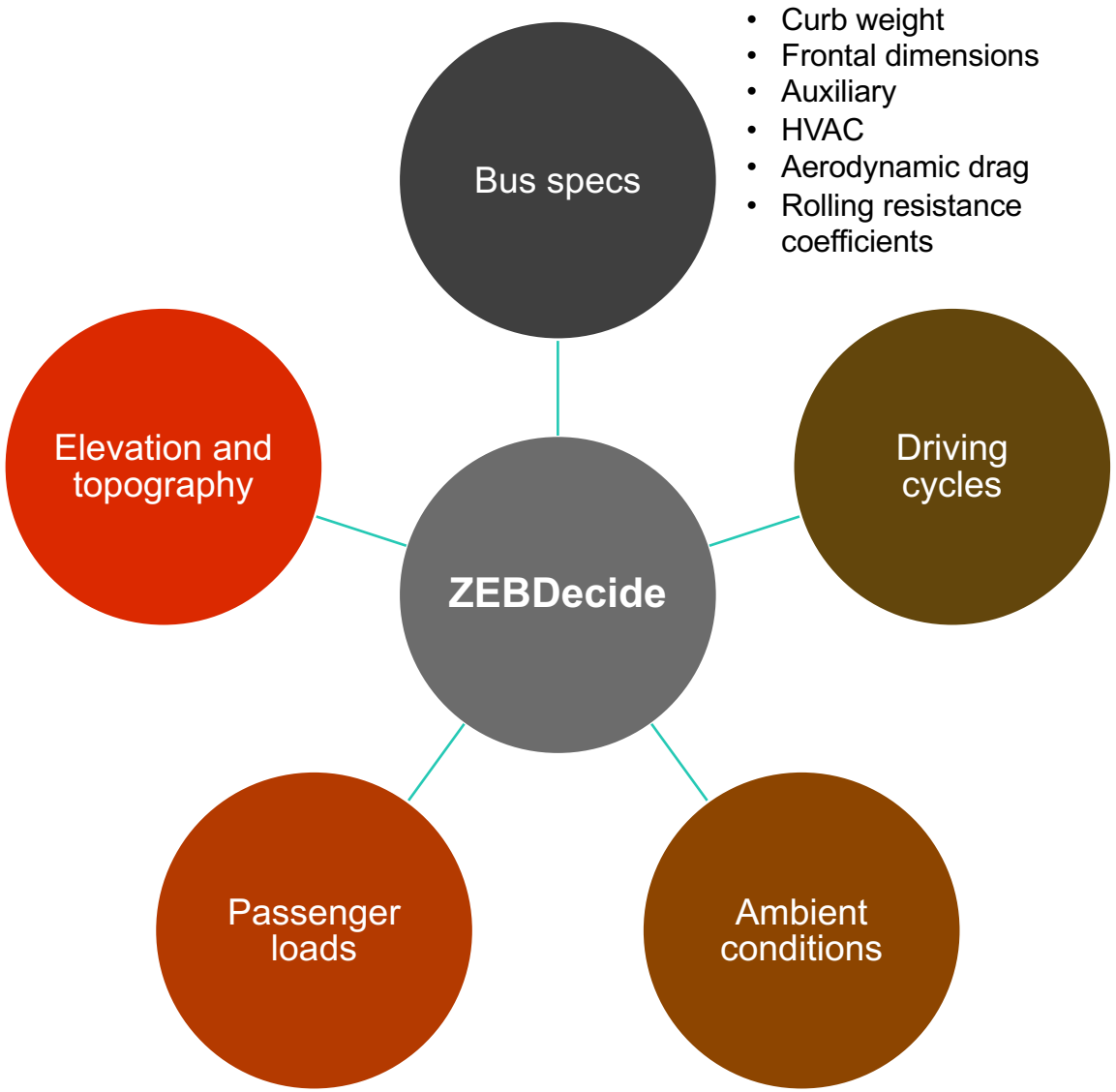
Type of vehicle	Services	Current technology	Quantity	Est. unit cost	ZEB options	ZEB cost est.
35-ft heavy duty bus	Local fixed-route	Diesel	12	$500K	BEB **No FCEB options in 35-ft.*	$700-800K
45-ft commuter coach	Commuter services	Diesel	16	$600K	BEB **No FCEB options*	$800K-1.5M
Cutaways	Contracted DR and NEMT	Unleaded gasoline	13	$100K	BEB **No FCEB options*	$90K+
Minivans	DAR, Paratransit	Unleaded gasoline	10	$67-75K	Potentially Ford Transit ZE	NA

Site Assessment

Limited space, but some potential room in the parking lot

Fueling occurs offsite

Adjacent to PG&E



- We use **modeling to predict the fuel economy** (or performance) of ZEBs under typical operating conditions of El Dorado Transit
- With the modeling results, we get a sense of the **energy in takes to move a bus one mile**
- Then, using the mileage of each block, we can **estimate if service is successful–**whether at the end of service, 20% of the battery is still “full” (like a tank of gas)

At a glance:

For local routes, **1/7 (~14%)** is successful in the modeling

For commuter service, **6/11 (~55%**) is successful in the modeling

For demand response:

- **10%** of van service is successful
- **15%** of cutaway service is successful

Potential Solutions:
Fixed-route, Local

Solution	Description
Solution 1	Spilt blocks + increase vehicles in service (10 BEB vs. 7)
Solution 2	On-route charging
Solution 3	Adopt 40-ft BEBs with bigger batteries (660 kWh) + increase vehicles in service (8 BEBs vs. 7)
Solution 4	Adopt 40-ft FCEBs

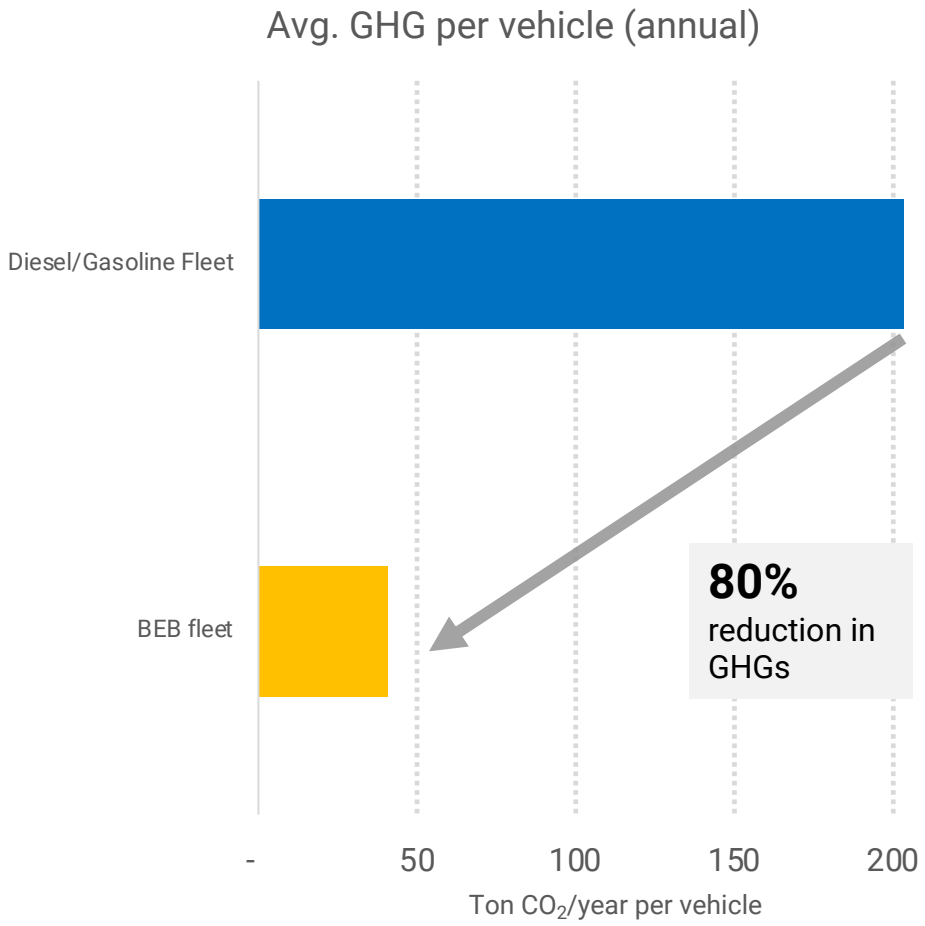
Potential Solutions:
Commuter

Solution	Description
Solution 1	Midday depot recharging
Solution 2	Use more vehicles to deliver service (14 BEBs vs 11)
Solution 3	Midday charging in Sacramento
Solution 4	Adopt 40-ft commuter-style ZEBs with sufficient battery size

Potential Solutions:
Demand Response

Solution	Description
Solution	Assume technology will improve and plan to replace vehicles on a one-to-one basis

Greenhouse gas Impacts



Replacing all gas/diesel buses with a battery-electric bus fleet is like:

- **Removing 600 passenger vehicles** per year on our roads, or
- **Reducing emissions of the equivalent of 340 households** per year, or
- **Recycling 950 tons of waste** rather than landfilling
- **Reducing the need for 46,200 trees** to capture carbon emissions

Source: https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator

Group Discussion

Next Steps

- Public Workshop (June)
- Next SAC meeting (Fall)
- Design site plans and facility modifications (May/June)
- Develop needs and opportunities assessment (July)
- Develop rollout plan (July/August)

El Dorado County Zero-Emission Bus Fleet Stakeholder Advisory Committee Meeting

Thursday, May 20
11:30 a.m. - 1:00 p.m.

Please register for the meeting online here:
https://us02web.zoom.us/meeting/register/tZYoduyopz4iHdXeDrTa_JomGcbSrSMXjat4

After registering, you will receive a confirmation email containing information about joining the meeting.

During these unprecedented times, the El Dorado County Transportation Commission (EDCTC) is continuing to plan for public transportation in the region. EDCTC, in partnership with El Dorado Transit, is now developing a **Zero-Emission Bus (ZEB) Fleet Conversion Plan** to convert El Dorado Transit's current bus fleet to zero-emission buses by 2040. This effort will also plan for El Dorado Transit's use of alternative fuels to build climate preparedness and community sustainability, improve public health, and reduce regional greenhouse gas emissions in the region.

As part of the community engagement process for this project, EDCTC has identified a list of key stakeholder groups to serve as members of the project's Stakeholder Advisory Committee (SAC). **The SAC will provide important feedback and guidance to help shape the project team's recommendations, beginning with this meeting.**

Please contact us if you are unable to access Zoom or have additional questions regarding the upcoming meeting or project.

Thank you!