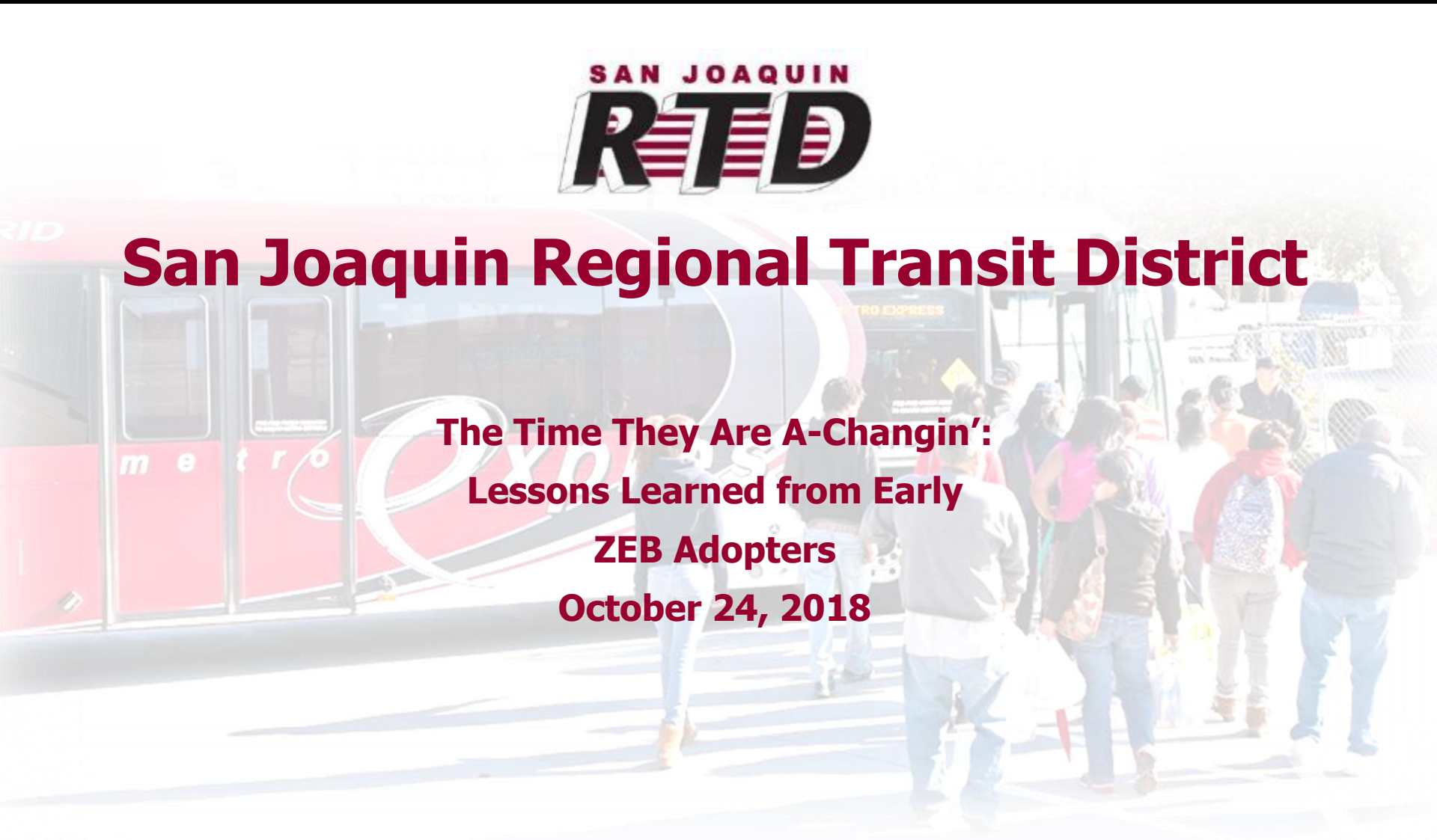


San Joaquin Regional Transit District

The Time They Are A-Changin':
Lessons Learned from Early
ZEB Adopters

October 24, 2018

San Joaquin RTD: Who We Are

- San Joaquin Regional Transit District (RTD) is the regional transportation provider for San Joaquin County, located in California's Central Valley
- The public transportation provider:
  - Stockton Metropolitan Area (since 1965)
  - San Joaquin County (since 1994)
- Service area: San Joaquin County (over 1,400 sq. mi.)
  - Approximately 680,000 people
    - 7 incorporated cities
    - Rural communities
    - Unincorporated areas
- Services:
  - BRT, Fixed-route, deviated fixed-route, commuter, mobility on demand, vanpools, and a variety of ADA options

Electric Bus Fleet

First Adopter

- In 2013, through a California Energy Commission grant and its partnership with Proterra, RTD introduced northern California's first 100% battery-electric buses into service.
- RTD implemented the **nation's first all-electric BRT corridor in South Stockton**. RTD is committed to investing in new technologies, not just as a matter of innovation, but as a matter of mobility, public health, and environmental justice.

Efficiency

- While the electric buses are more efficient (20 mpg) when compared to 3 mpg diesel and 6 mpg hybrid, the operating cost due to the cost of electricity has been elevated in comparison to the traditional fleet.

2013 Fleet:	2 35-foot Proterra buses
2017 Fleet:	10 40-foot Proterra buses
2018 Fleet:	5 40-foot Proterra buses

Press Conference

Challenges

As RTD plans to scale from pilot to fully-electric operations, new challenges emerge for transit electrification:

Charging Technology

- Standardization of technology
- Differences in depot & on-route charging

Infrastructure

- Power requirement is massive
- Long-term site and budget planning for infrastructure
- Grid upgrades to support new load

Electricity costs

- Demand charges increase charging costs for electric buses

Charging Technology

Early-stage bus and charging technologies lack standardization

Overhead Charging

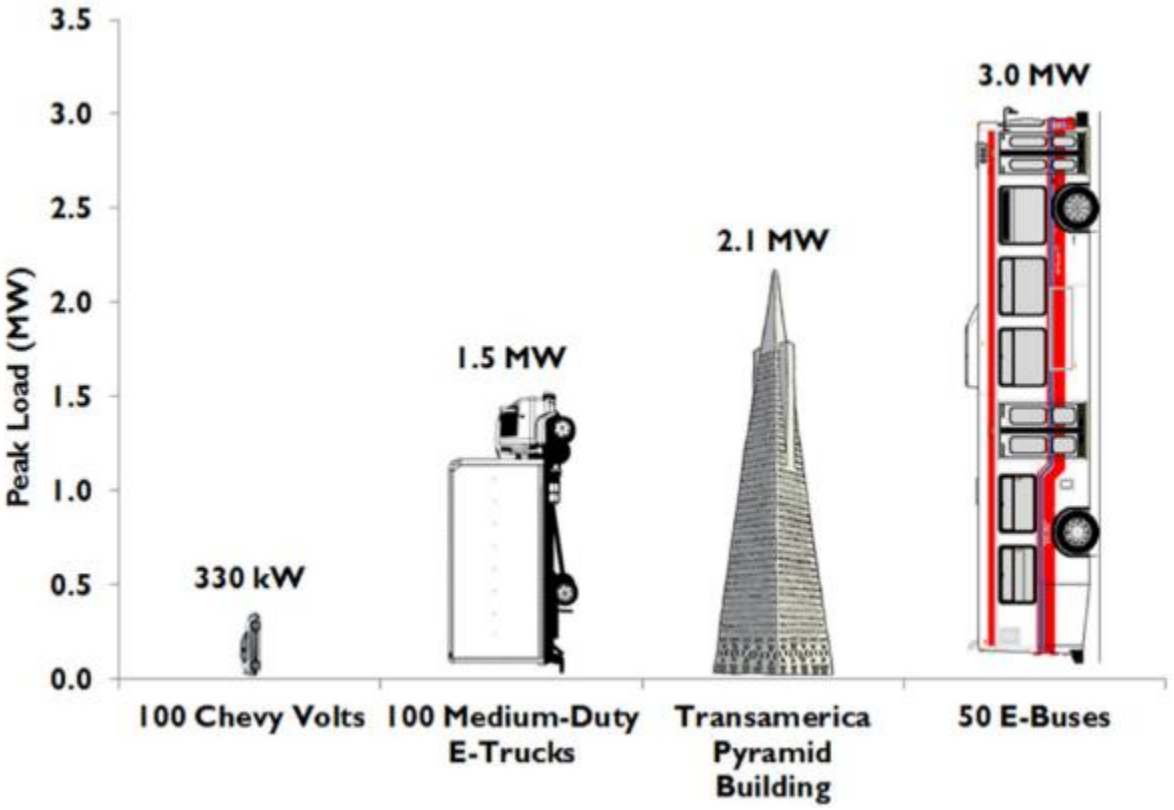
- First generation of RTD electric buses had short range and require frequent, on-route charging at high power levels
- Demand Management software did not exist until a custom implementation was created for RTD

Depot Charger

- Second generation RTD buses have longer range allowing for overnight charging at lower power levels
- Currently depot chargers available on the market only have 1 port
- Planning for full fleet electrification will require significant space for charging stations using current designs

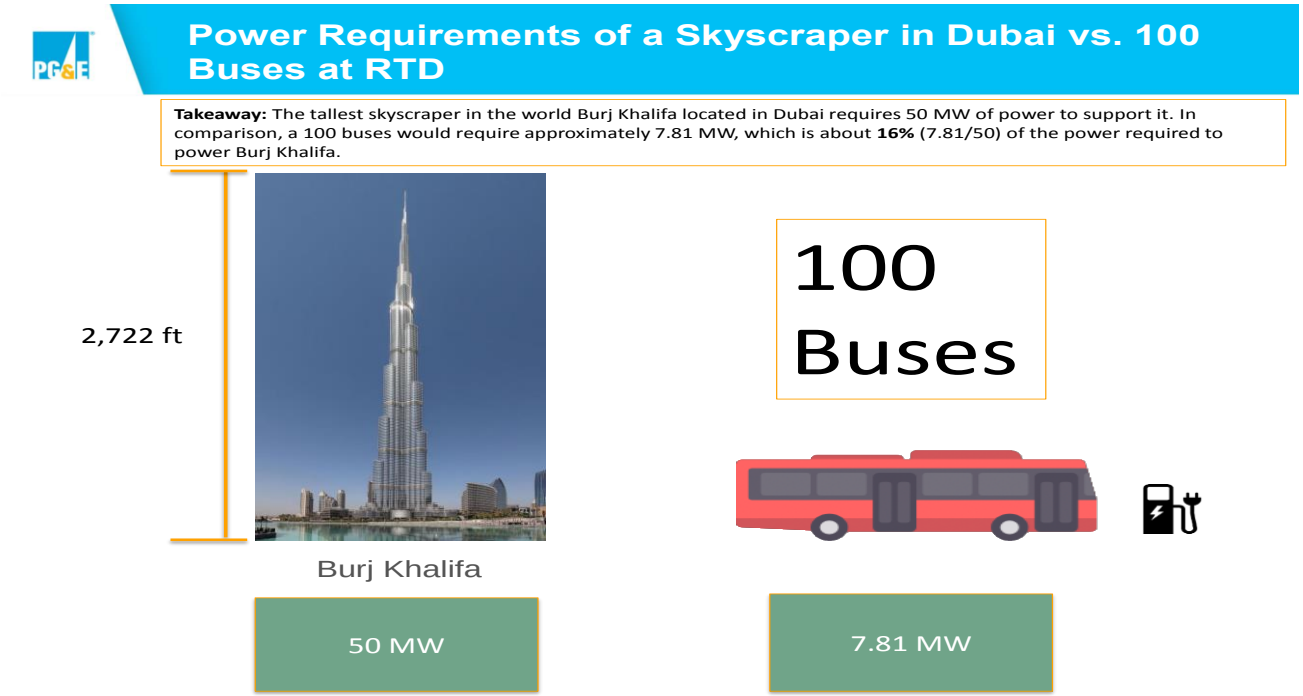
What Will it Take to Power Our Fleets?

Fully electrified fleets will have large energy needs, but utilities believe they can meet capacity requests with adequate planning and active collaboration with transit agencies



What Will it Take to Power our Fleets??

- 100 buses @ ~8 MW= 16%
- 250 buses @ 20 MW = 40%



50 buses @ ~3 MW = 150% of the Transamerica Building
100 buses @ ~8 MW= 16% of the Burj Khalifa Skyscraper
250 buses @ 20 MW = 40% of the Burj Khalifa Skyscraper

RTD and PG&E Partnership

RTD and PG&E are partnering on a pilot to better understand these challenges and develop innovative solutions to aid future agencies in electrifying

PG&E Collaborates with San Joaquin Regional Transit District on Electric Vehicle Pilot

Release Date: June 21, 2018
Contact: PG&E External Communications (415) 973-5930

SAN FRANCISCO, Calif. — Pacific Gas and Electric Company (PG&E) today announced it will conduct an electric vehicle (EV) pilot with San Joaquin Regional Transit District (RTD) to help prepare the agency for its long-term electric transportation needs.

With San Joaquin RTD, PG&E will test how smart charging and battery storage can lower operating costs and maximize efficiencies for the agency. PG&E will test, analyze and compare the economics for charging at various times of the day using different models with and without battery storage. As part of the pilot, PG&E will fund up to five new electric bus chargers and a battery energy storage system, and will fund and build the infrastructure from the electric grid to the chargers and storage system.

San Joaquin RTD has taken a lead in electric transportation and already has electric buses in its fleet. This pilot aligns with San Joaquin RTD's goal of being powered by 100 percent EVs by 2025.

San Joaquin Regional Transit District (RTD)

PRESS RELEASE

Contact: Terry Williams
Public Information Officer
(209) 467-6695

FOR IMMEDIATE RELEASE
June 21, 2018

RTD Selected for New PG&E Electric Vehicle Pilot Program

Stockton, CA —In another first for San Joaquin Regional Transit District (RTD) and Stockton, Pacific Gas and Electric Company (PG&E) today announced it will conduct an electric vehicle (EV) pilot to support RTD's long-term electric transportation needs with chargers and infrastructure improvements.

Recently approved by the California Public Utilities Commission, this pilot will be a test case for PG&E's new FleetReady program, which supports electric charging for customers with medium-duty, heavy-duty, and off-road fleets such as transit agencies, school districts, and delivery fleets. For this new pilot with San Joaquin RTD, PG&E will test how smart charging and battery storage can lower operating costs and maximize efficiencies for the agency.

Seeking to partner with a transit agency located in a disadvantaged community who already had electric buses and plans for more in the future in order to meet the timelines of the project proposal, PG&E chose RTD.

"Because we already had a plan for adding more electric buses to our fleet and have a long-term goal around electrification, PG&E approached us with this pilot opportunity," said CEO Donna DeMartino. "Due to our focus on electric transportation, PG&E can jump right into creating the specifics of the pilot, which aligns with our goal of being powered by 100% electric vehicles by 2025."

Utility Support for Charging Infrastructure

PG&E is launching the FleetReady program to reduce the infrastructure hurdles for medium/heavy duty electric vehicles. This program pays for a significant portion of the total site costs, including civil design, utility upgrades, and electrical construction costs:

Program participant pays for charging equipment and vehicles*

Additional rebates for public transit and school-bus fleets:

Maximum 50% rebate per charger**

PG&E pays for “make-ready” infrastructure*

* Some exceptions may apply to customers who hold Primary Service with PG&E

** Rebate amount not to exceed 50% of charger equipment and installation costs

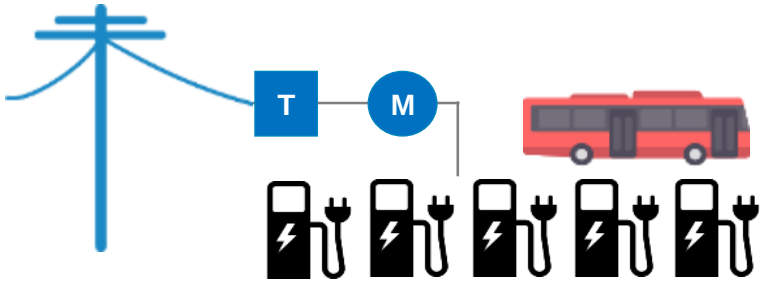
RTD and PG&E Partnership

Project Goals

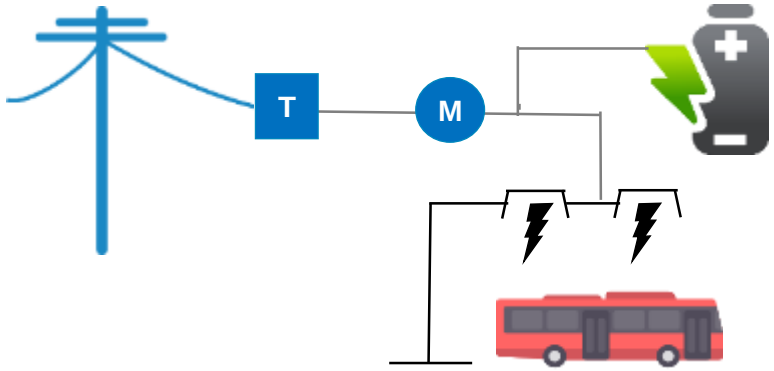
- Compare total cost of ownership (TCO) using three unique charging models:
  - Overnight charging at the depot
  - Extreme fast charging paired with energy storage
  - Extreme fast charging at a transfer station
- Additional value derived from charge management software
- Best practices for transit agencies looking to electrify

Project Scope

Site 1: Five 60 kW overnight depot chargers



Site 2: Battery energy storage system paired with existing high-power fast chargers



Re-imagining Electric Rate Design

Existing commercial rate structures can cost more than diesel per mile. PG&E is proposing a new EV rate for commercial charging applications:

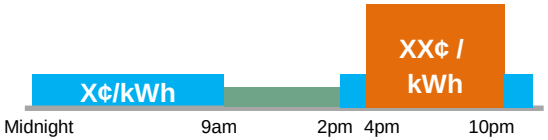
Proposed EV rate structure

Subscription Charge (monthly)

/ 50 kW connected load

Monthly subscription charge is much lower than current demand charges, and enables more predictable budgeting

\+ **Energy Charge (per kWh)**

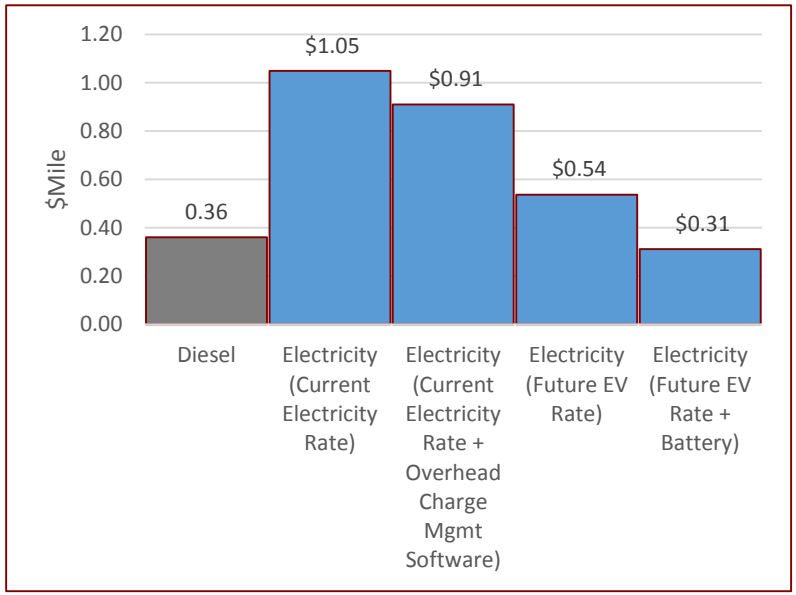


Time-of-use energy rates encourage charging overnight and mid-day, when renewable, solar energy is generated

Energy Costs for Overhead Charging

Insight: The $/mile on PG&E's current rate is $1.05/mile. On the proposed rate we expect it could drop to $0.54/mile. Value of LCFS credits could reduce this cost to $0.16/mile.

$/Mile



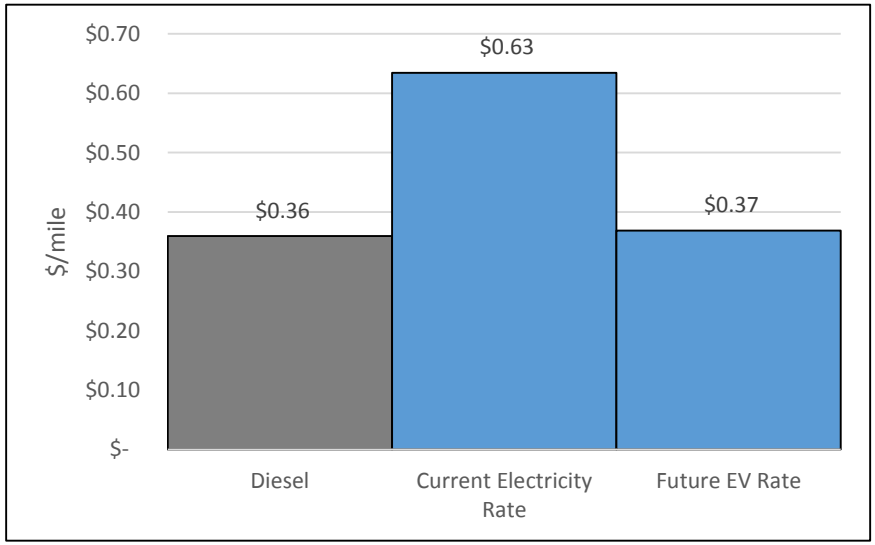
Factors	Value
Diesel Fuel Cost	$1.97 / gal
Diesel bus efficiency (miles / gallon)	5.5
Electric bus efficiency (kWh / mile)	2.8
Average electricity cost (current rate)	$0.38 / kWh
Target electric cost (Ideal)	$0.18/ kWh

Calculations based on historical electricity usage and fuel data, efficiency of vehicles provided by RTD.

Energy Costs for Overnight Depot Charging

Insight: The projected average $/mile with current rates $0.63. On the proposed EV rate we expect this to be $0.37/mile. Value of LCFS credits could reduce this cost to $0.00/mile.

$/Mile



Factors	Value
Diesel Fuel Cost	$1.97
Effective $/kWh (Current rate)	$0.23
Effective $/kWh (Future EV rate)	$0.13
Diesel Miles/Gallon	5.5
kWh/Mile	2.8

Calculations based on historical electricity usage and fuel data, efficiency of vehicles provided by RTD.

Questions?