Battery Bus Feasibility

Jan 29, 2018

Sam Schwartz
Transportation Consultants

Agenda

Battery Bus Technology

King County Metro Case Study

- Announcement
- Fleet Plan

TriMet Feasibility Study

- Service Analysis
- Fleet Scenario Analysis
- Lifecycle Cost Analysis

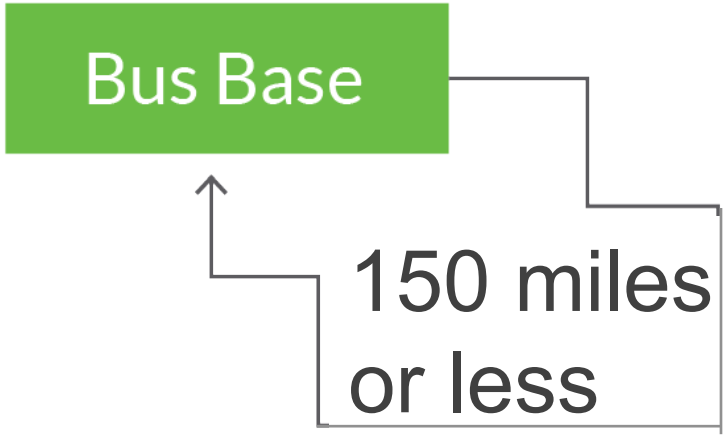
Questions?

Battery-Electric Bus Market

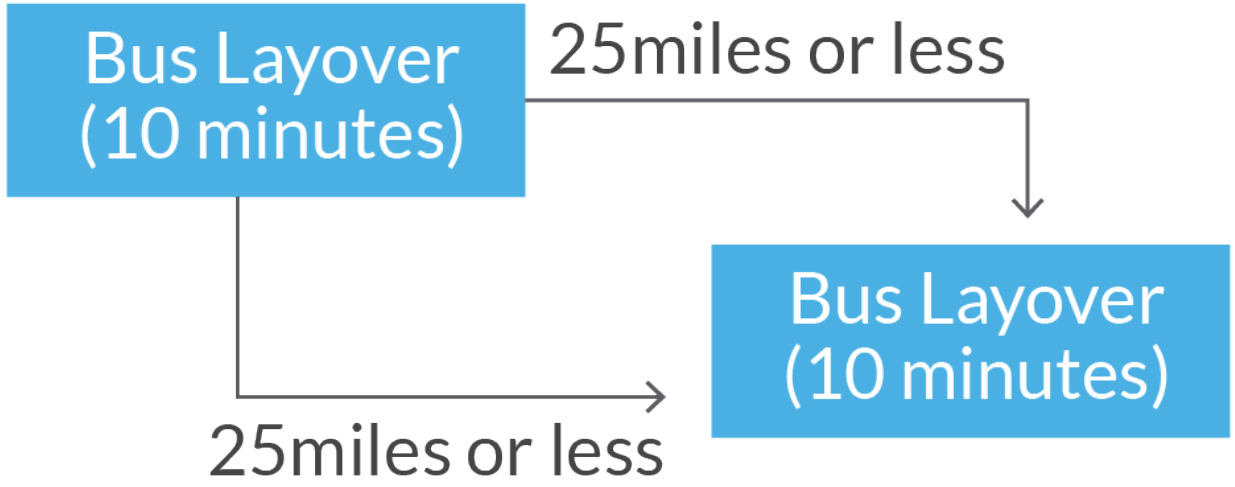
- Battery-electric bus manufacturing and technology are still in their development stages, but they are progressing rapidly
- Currently, five agencies in the United States are operating **10 or more electric buses**
- 38 agencies in the U.S. have **at least one electric bus** in service
- The industry is currently focusing mainly on 40-foot standard bus designs. Offerings in the **60-foot articulated bus** category are still growing

Battery-Electric Bus Technology

SLOW-CHARGE



FAST-CHARGE



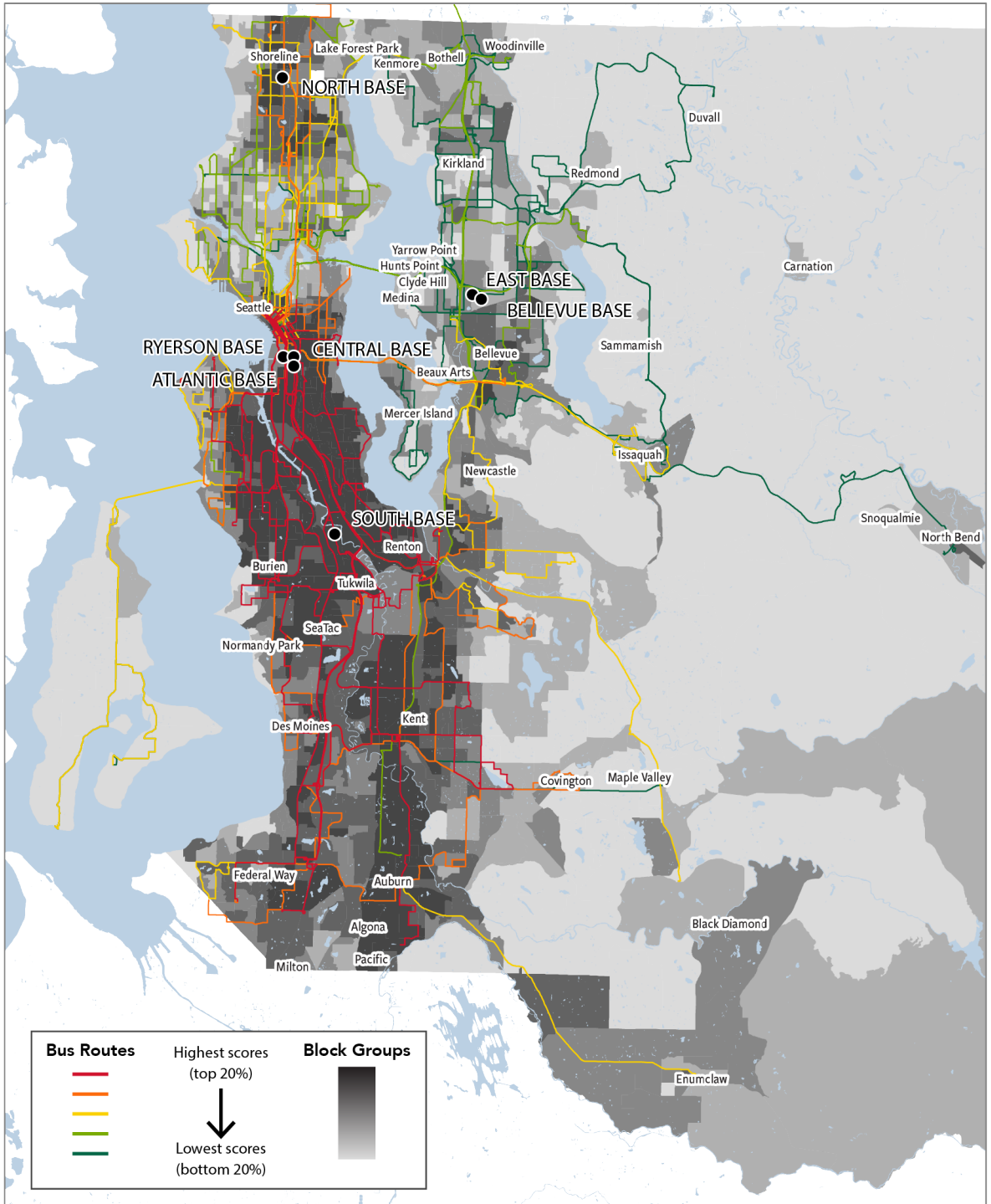
King County Metro Feasibility Study

KC Metro Commitment to Battery-Electric Buses

- A mix of slow-charge and fast-charge technology, along with some service adjustments, could make it possible for Metro to achieve a **100 percent battery-electric bus fleet.**
- According to the fleet replacement plan, this could be achieved by **2034 under a 14-year replacement** schedule or by **2036 under a 16-year replacement.**

Equity Analysis Results

Red routes indicate high priority routes that operate near most vulnerable populations



TriMet Feasibility Study

Service Analysis

Purpose

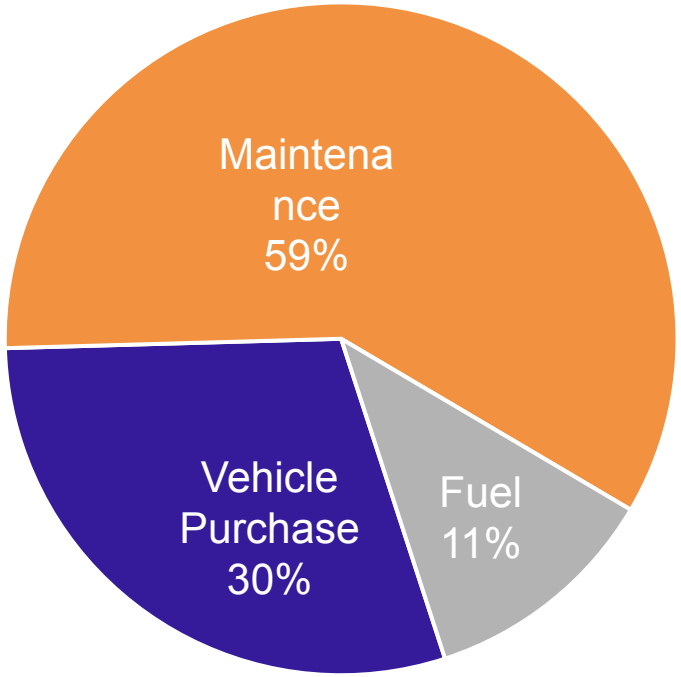
- Battery-electric buses should be introduced into the bus network in a way that minimizes impacts on operations and service
- How does TriMet's service match the operational characteristics of new battery-electric buses?

Service Analysis Results

- **Full transition by 2034 or 2036**
- **Fast Charge: 18% to 76% of TriMet's fleet**— could be transitioned to fast-charge battery buses.
  - However, after further consideration of siting constraints and efficiency of charging infrastructure, it is likely that a smaller subset would be feasible to replace in the near-term.
- **Slow Charge: 59% to nearly 100% of TriMet's fleet**— could be transitioned to slow-charge battery-electric buses.
  - Future scheduling must be designed to accommodate this charging structure to transition this percentage of the fleet.
- About **25% of the fleet (through 2024)** could be accommodated by either fast or slow charge technology

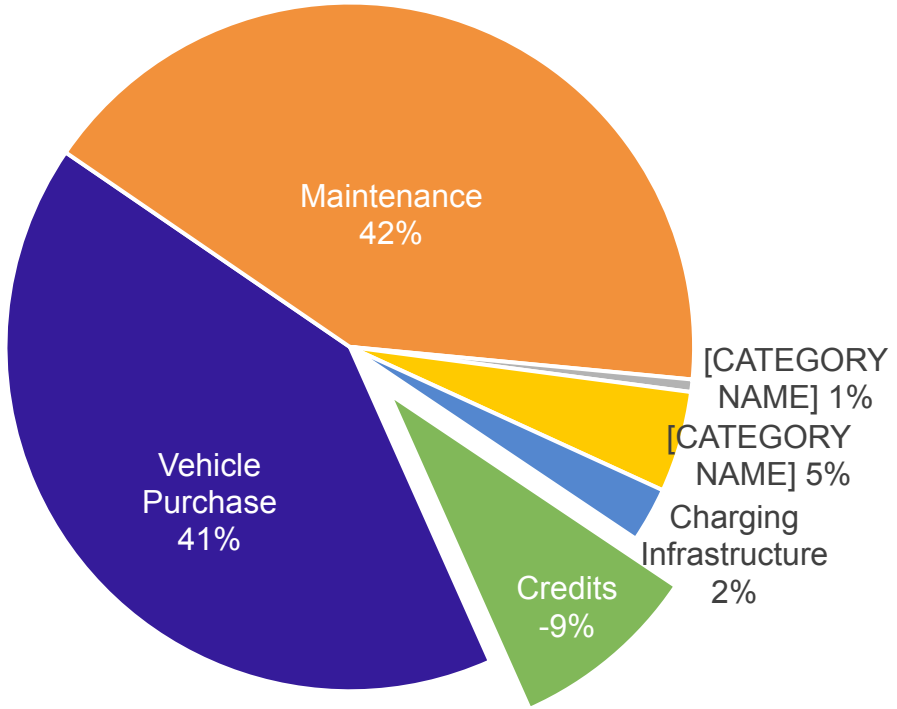
TriMet Fiscal Analysis Costs by Category

Costs by category for **diesel fleet** scenario



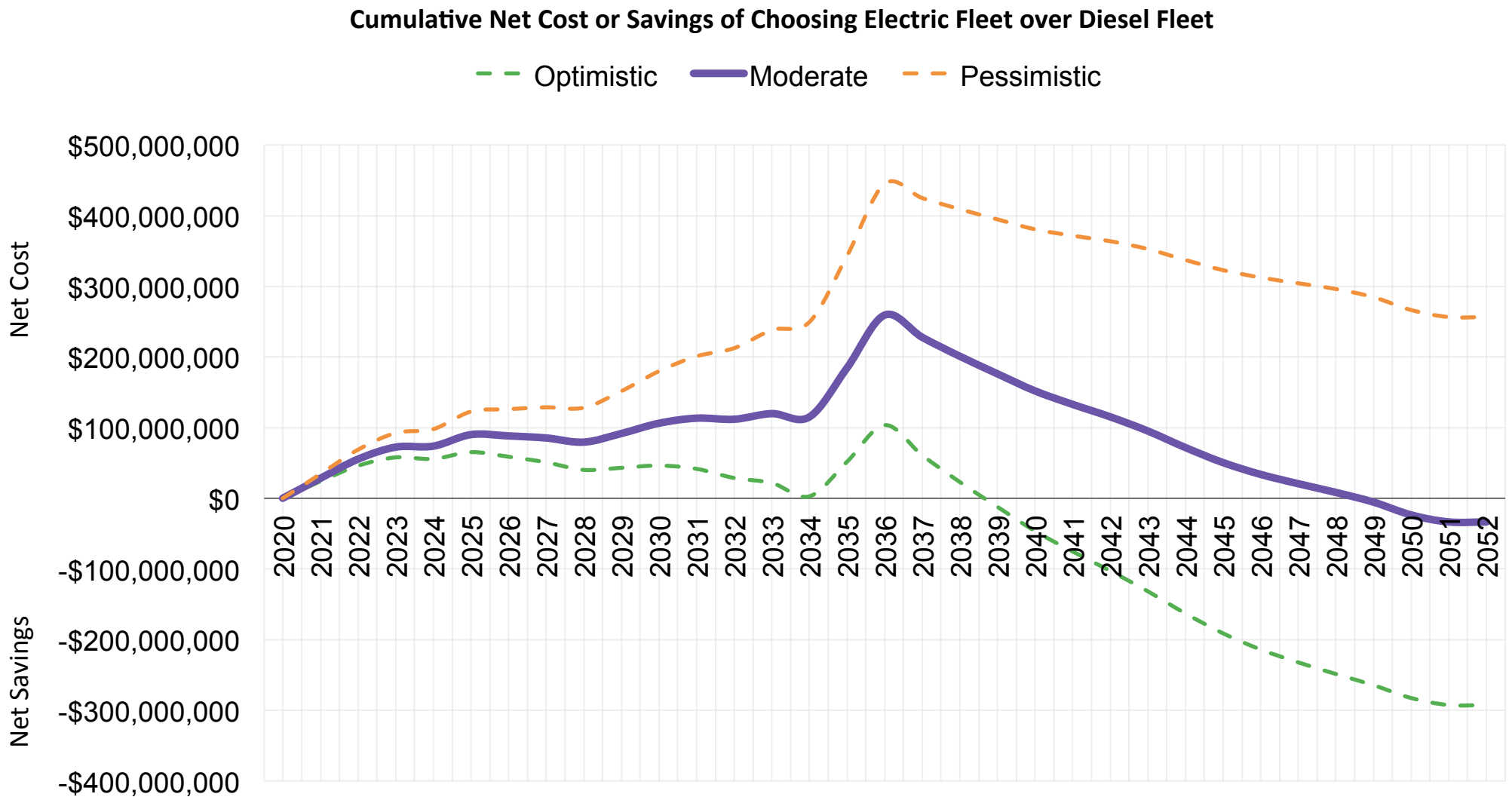
Costs by category for **electric bus fleet** scenario

(50/50 Fast/Slow Mix)

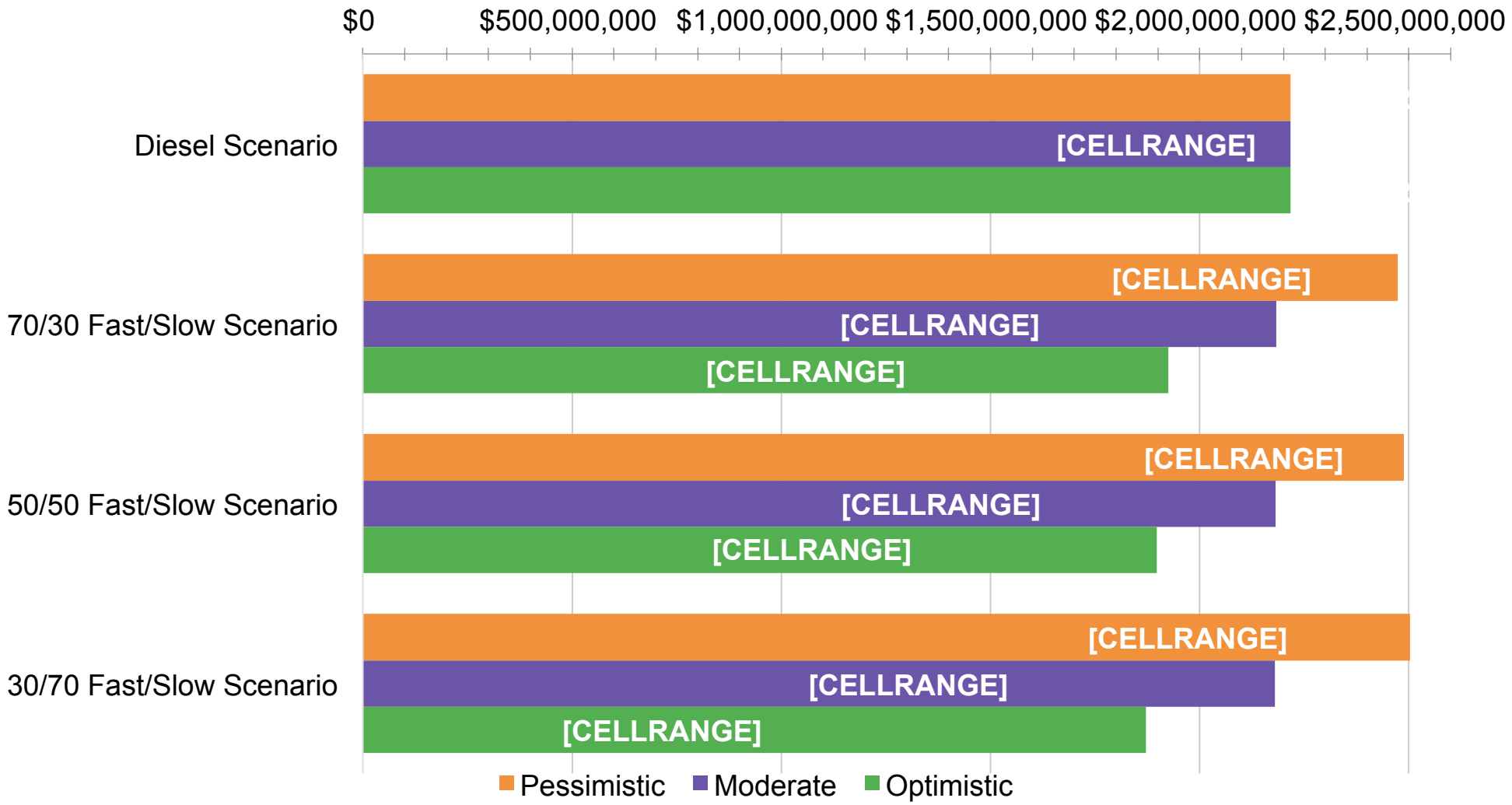


Only costs and credit to TriMet are shown. Moderate assumptions are used. Analysis covers vehicles added 2020-36.

TriMet Costs Over Time

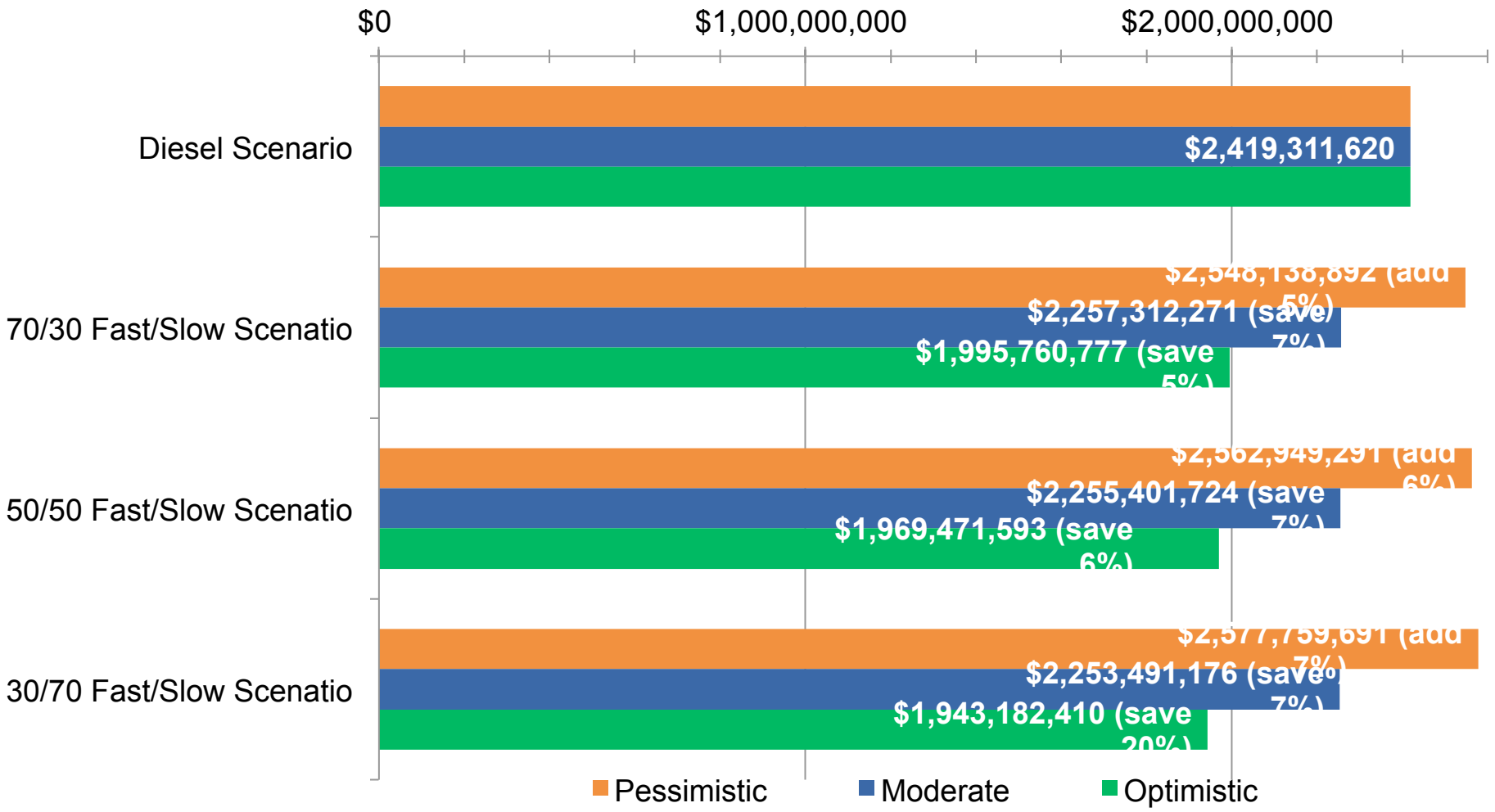


TriMet Electric Bus Net Savings



Only costs and credit to TriMet are shown. All costs are shown in 2018 dollars.

Including Social Costs – Global Cost Comparison



TriMet Electric Bus Cost Differences

- Fuel use savings of $240 million
- Maintenance savings of $70 million to $314 million
- Clean fuel credit savings of $65 million to $195 million
- RIN credit savings of $107 million
- Electricity use addition of $120 million to $133 million
- Charger infrastructure addition of $64 million to $151 million
- Vehicle purchase addition of $326 million to $547 million

All costs are shown in 2018 dollars.