

Trolley Bus System Evaluation



Replacing the trolley buses

Metro's electric trolley bus fleet is scheduled to begin replacement in September 2014. Before purchasing new buses, an in-depth, interdisciplinary evaluation of vehicle options to determine relative costs, limitations, and benefits was conducted. The study evaluated each technology using the current route structure as a base. The findings from this evaluation will inform the technology decision for replacement of the trolley buses.

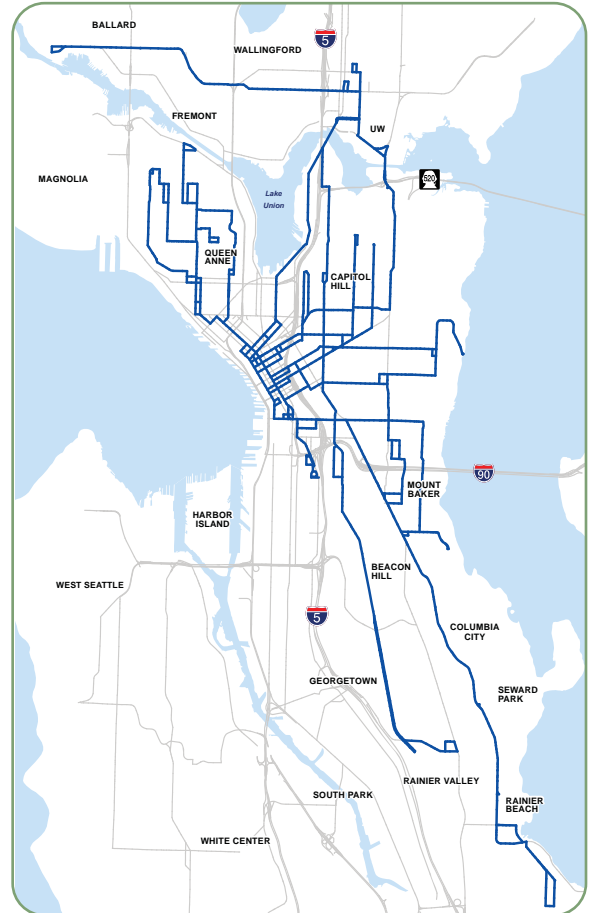
King County Metro's trolley bus network

The 14 trolley bus routes carry 20% of Metro's weekday riders on 159 trolley buses. The routes have 70 miles of two-way overhead wire. Currently, there are five trolley bus systems in the US: Seattle, San Francisco, Dayton, Philadelphia, and Boston.

Why the trolley buses need replacement

Metro's 159 electric trolley buses are reaching the end of their useful lives. The buses have outdated electrical systems, cracked frames, and some parts that are difficult to replace once they fail. There is no longer manufacturer support for the existing propulsion system.

Trolley Bus Service Area in Seattle



Diesel Hybrid and Electric Trolley Buses were Evaluated

Diesel Hybrid Bus



Transmission would be modified to travel on the steep hills in Seattle, which would limit the bus' top speed on level grades.

Electric Trolley Bus



To increase the flexibility, an auxiliary power unit (APU) would be added for off-wire travel. The study evaluated both diesel and electric APUs.

The following bus technologies were removed from evaluation:

- Diesel** Less fuel efficient
Greater environmental impact than diesel hybrids
- Electric Battery** Not commercially available
Reduced travel range
- Compressed Natural Gas** High costs
Greater environmental impact than diesel hybrids
- Hydrogen Fuel Cell** Not commercially available
High costs
Reduced travel range
Reduced reliability

Environmental Comparison

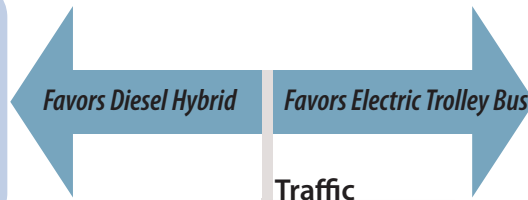
Environmental components are an important consideration for selecting the appropriate bus technology. After the King County Council selects the preferred fleet replacement option in the 2012-2013 biennial budget, King County Metro staff will determine if a more detailed environmental review is necessary.

The chart below shows why the environmental findings favor the electric trolley bus over the diesel hybrid technology. Electric trolley buses perform better on steep grades, are quieter, have lower greenhouse gas emissions and consume less energy on a yearly basis.

Diesel Hybrid



Electric Trolley Bus with Auxiliary Power Unit



KEY

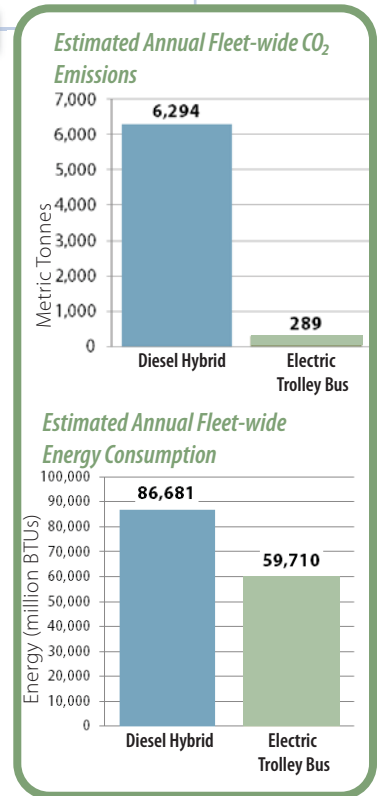
- Favors bus technology
- Greatly favors bus technology
- Similar benefit or impact for both bus technologies



Removal of overhead trolley wires improves the visual quality (the impact of the removal varies by location). Keeping the trolley wires has the greatest impact in view corridors and residential neighborhoods.



Removal of anchor bolts and overhead wires may impact historic structures.

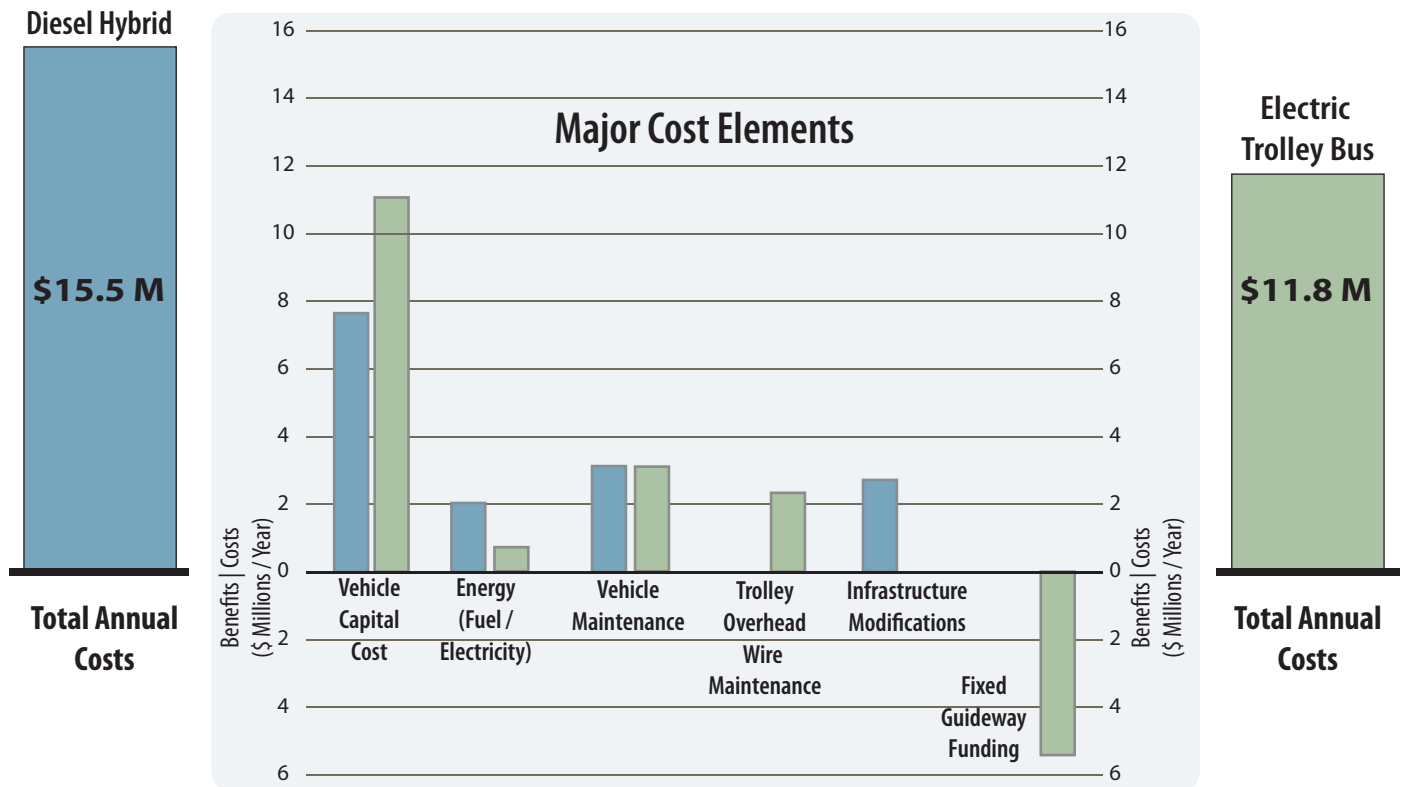


The electric trolley bus has significantly lower greenhouse gas emissions and a lower total annual energy consumption. Seattle City Light generates 98% of Seattle's electricity from non-greenhouse gas (GHG) emitting sources (hydroelectric, nuclear, wind, and biomass).

Life-Cycle Cost Comparison

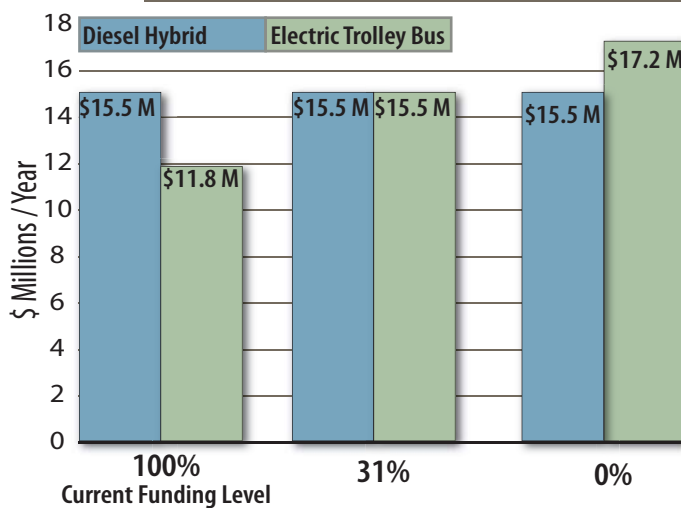
A life-cycle cost comparison is used to evaluate the full capital and operating costs of each bus technology. Because the estimated life-span of the electric trolley bus (15-years) and diesel hybrid (12 years) are different, the costs were annualized and discounted to today's dollars to provide a valid comparison.

Annualized Life-Cycle Cost Comparison Scenario



An important component of the cost comparison between diesel hybrid and electric trolley bus is the level of the Federal Transit Administration (FTA) fixed guideway funding. The level of fixed guideway funding would have to drop to 31% of current funding levels before the diesel hybrid bus technology would have a cost advantage.

31% or more of current grant funding, makes electric trolley bus more cost-effective



With the current Federal Transit Administration's (FTA) funding, the electric trolley bus option is \$3.7 million less per year.

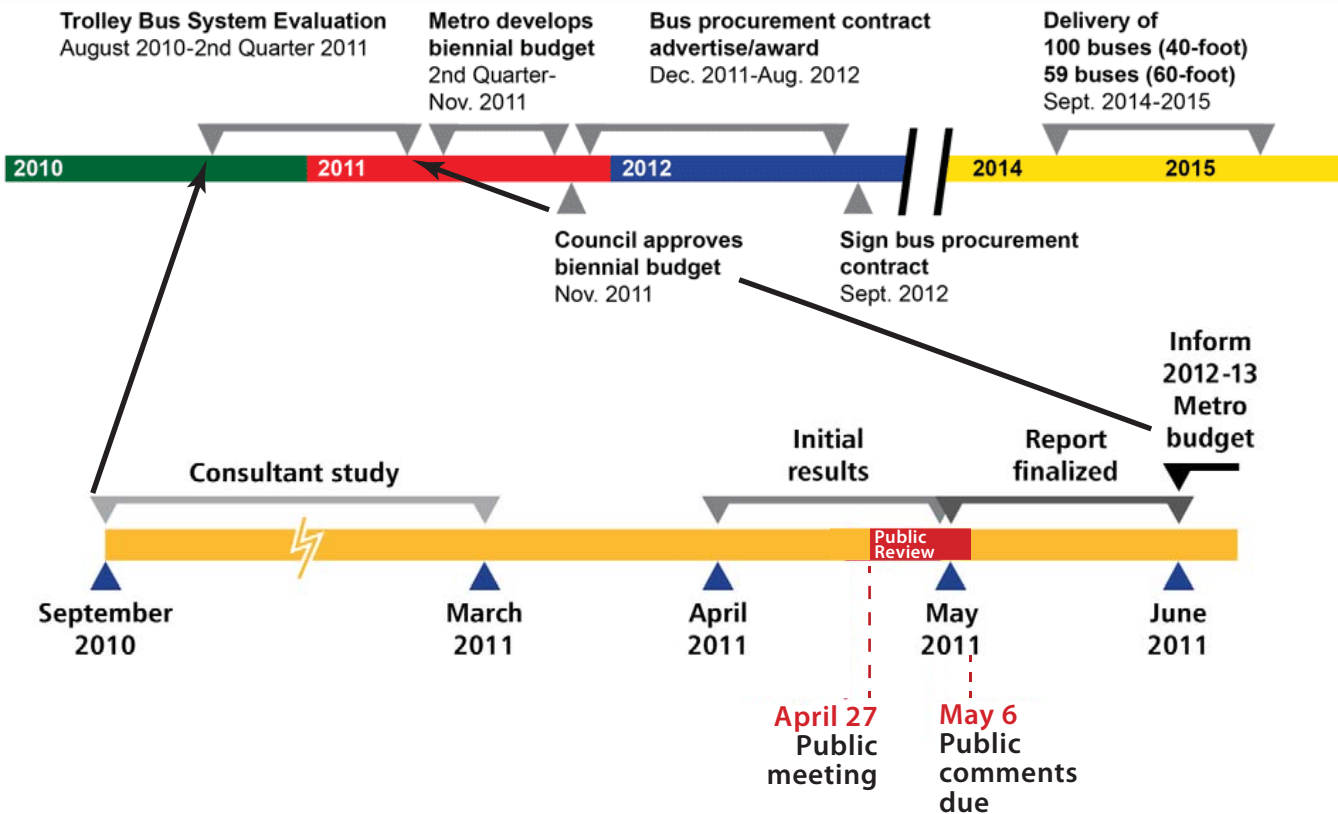
Influence of Fixed Guideway Funding

Preliminary Findings Favor Electric Trolley Bus

- ✓ More cost-effective based on reasonable federal fixed guideway funding scenarios
- ✓ Reduced climate and energy impacts
- ✓ Favored by environmental comparison



Next Steps



Contact Us

If you have any feedback on the preliminary findings or want to learn more about the project, please contact:

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