



Transitioning to a Zero-Emission Fleet

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**King County
METRO**

We'll Get You There.

Presentation Outline

- Why King County Metro is going zero-emissions?
- News
- Our fleet
- Our experience and near term plan
- Roadmap to zero-emissions



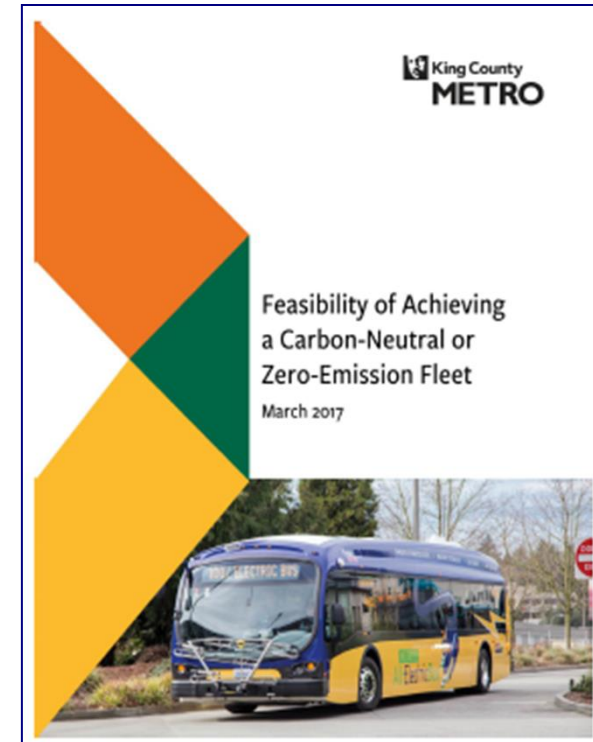
Evaluating the feasibility of achieving a carbon-neutral zero-emission fleet

Recommendation

- Transition to a zero-emission fleet powered by renewable energy

Evaluation criteria

- Environment
- Social equity
- Service and fleet needs
- Cost
- Supporting systems



Recent Announcement and News

Announcement

King County Executive announces purchases of battery buses, challenges industry to build next-generation transit

January 10, 2017

Summary

King County Executive Dow Constantine announced that King County Metro Transit will acquire 120 all-electric battery buses by 2020. As part of this commitment, Metro will purchase up to 73 battery buses from Burlingame, Calif.-based Proterra. The first 20 are scheduled to go into service this year and 2019.

Story

Fulfilling his commitment to the greening of King County's fleets, King County Executive Dow Constantine announced today that King County Metro will purchase up to 73 all-electric battery buses from Proterra at a cost of up to \$55 million, starting with 20 buses totaling \$15.12 million. Charging stations to support the initial orders of those buses will range from \$5.5 million to \$6.6 million.

Federal funding often helps pay for Metro's new bus purchases. Last year, King County Metro received a \$3.3 million grant from the Federal Transit Administration's Low-or No-Emission Vehicle Deployment Program to help fund some new battery buses and charging stations for three buses that are in operations on the eastside of King County.



The Seattle Times

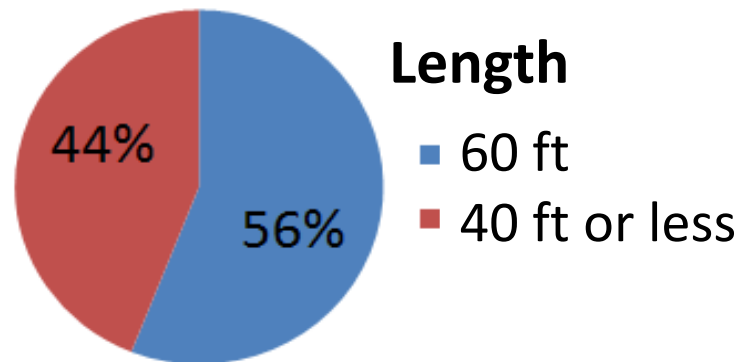
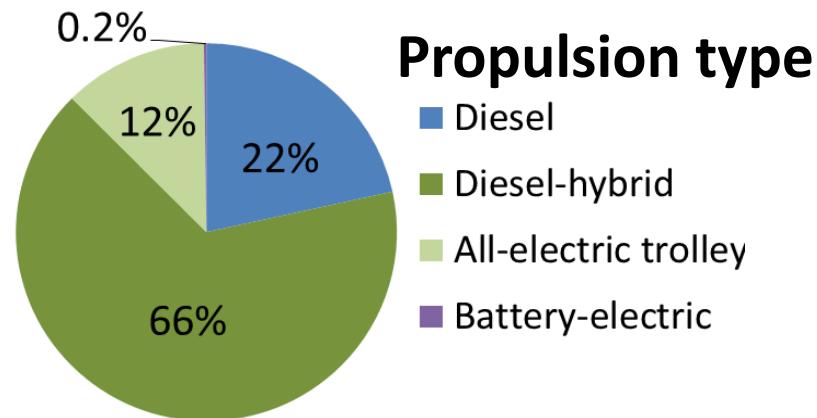
Coming soon to a Metro transit route near you: battery-powered electric buses

Originally published January 9, 2017 at 12:08 pm | Updated January 18, 2017 at 10:31 am



Our Bus Fleet today

- **1,419 buses**
- **More than 10 million gallons of diesel** consumed annually
- **All-electric and hybrid fleet by 2018-19**
- **Goal: By the end of 2020, all new buses will be battery electric**



Zero-emission battery-electric bus technology

Slow-charge



- Charges at base
- Range of 140 miles
- ~2 to 5 hours to charge midday or overnight
- Charger cost is ~\$34,000 per bus

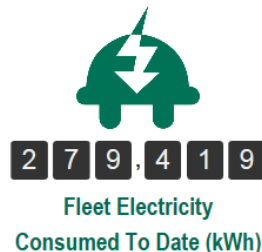
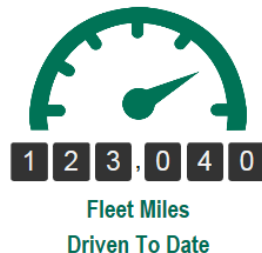
Fast-charge



- Charges at bus layover
- Range of 25 miles
- 10 minutes to charge
- Charger cost is ~\$144k per bus

Our Experience

- **Current Experience:** 3 Proterra fast-charge buses
 - ☑ At least 23 miles range
 - ☑ Charge time less than 10 min
 - ☑ Capability on county terrain



Data from 1/1/16 to 6/8/17

Near Term Plan

- **Near term bus plan: 120 more battery-electric buses by 2020**

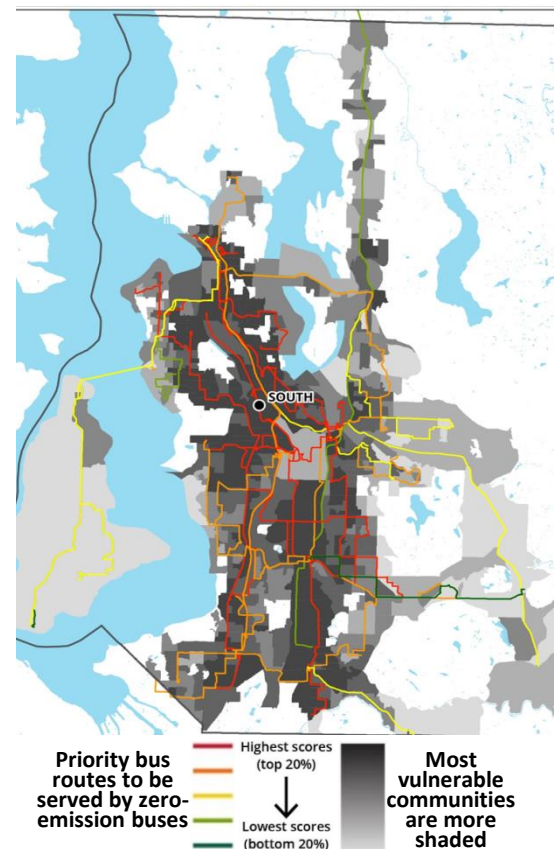


Routes	Base	Bus Charge Type	Electric Bus Testing and In Service Dates				
			2016	2017	2018	2019	2020
226, 241	Bellevue Base	3 Fast	Begin				
221	Bellevue Base	8 Fast		Begin			
Rtes Undetermined	South Base	8 to 12 Slow		Test		Begin	
245, 246	Bellevue Base	12 Fast			Begin		
Rtes Undetermined	South Base*	85 Undetermined				Begin	

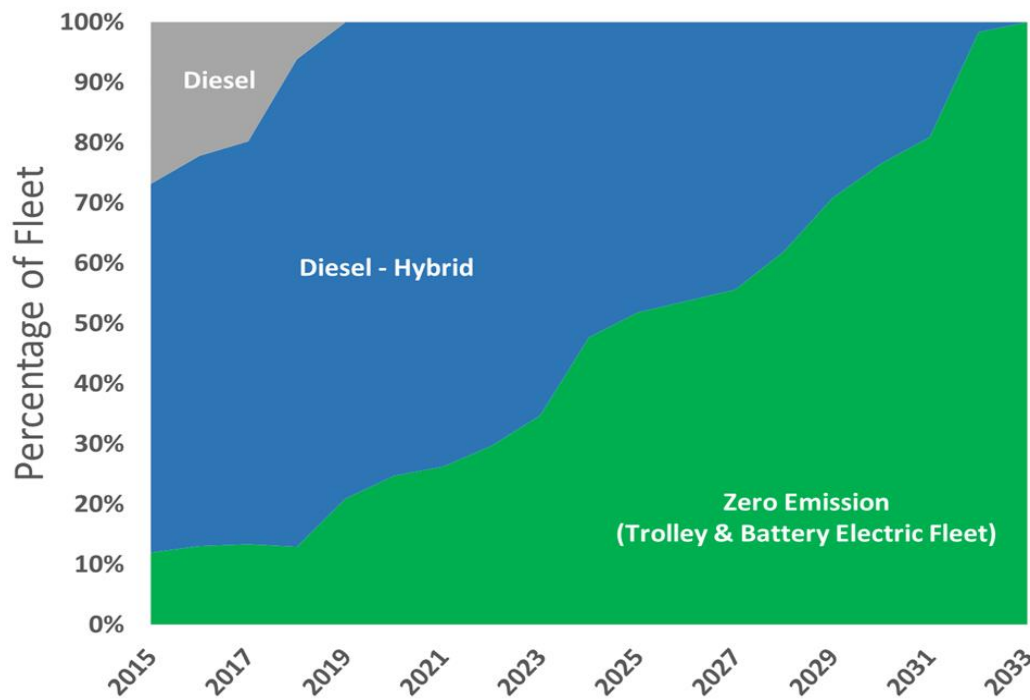
* One additional base under consideration based on testing an future need

Equity Analysis

- Opportunity to advance social equity by deploying zero-emission fleet in communities most vulnerable to air pollution
- Vulnerability based on air pollution levels, health conditions, and social risk factors
- South Base highest priority for transitioning to zero-emission fleet based on vulnerability of communities served



Estimate to Move to a Zero-emission Fleet

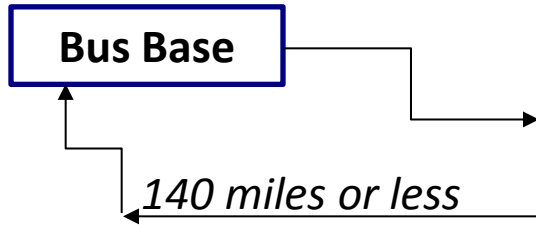


Environmental Benefits

- Eliminate GHG emissions from fleet operations
- Eliminate tailpipe air pollution emissions
- Reduce noise to levels equivalent to a passenger car

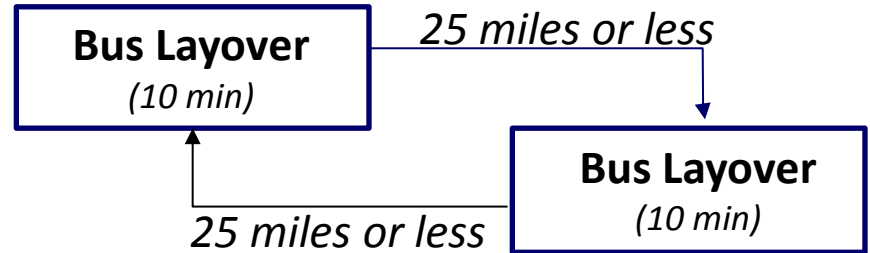
How technology will meet our service needs

Slow-charge



- Current slow-charge battery range could serve 70 percent of Metro's bus trips
- Next generation slow-charge battery range could serve 90 percent of Metro's bus trips

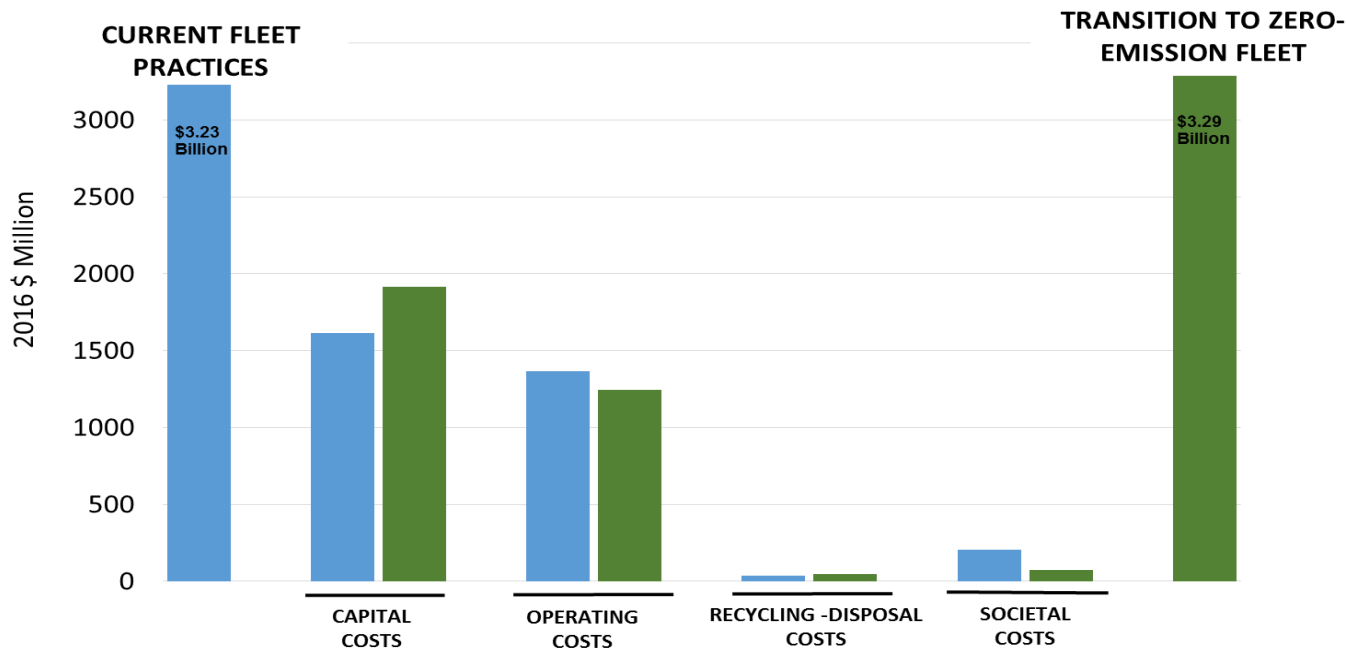
Fast-charge



- Current fast-charge battery range could serve 35 to 47 percent of our service

Cost of transitioning is comparable

(Costs over a 30 year fleet replacement period)



- Preliminary cost estimates based on pilot programs
- Societal costs depending on \$/ton of pollutants

Challenges to Preparing for Transition

- Plan, Plan, Plan
- Involve the right people and collaborate
- Take the time to educate and inform
- Charging infrastructure and scale-up challenges
- Operator acceptance
- Work-flow and training considerations
- Emergency preparedness

Zero-emission Bus Transition Requirements

Key technical requirements:

- Vehicle and charging technology to meet current and future service
- Charging infrastructure to meet standard operating requirements
- Renewable energy supplies

Key efforts for Metro and partners:

- Safety for customers and employees
- Workforce training and development needs
- Emergency preparedness plan
- Public outreach process
- Continued monitoring of total costs and performance

In Conclusion

- **Committed:** Transition to zero-emissions vehicles powered by clean electricity. Zero-emissions needed to achieve climate goals.
- **Team Effort:** Big challenge. We'll need support with vehicles and charging infrastructure. We will succeed by pulling together.
- **Challenging and achievable:** Success depends on partners, stakeholders, and technology advances. We aren't afraid to learn as we go.

Questions?