Equity considerations in transitioning to a Zero-Emission Fleet

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APTA Sustainability Conference

Presentation Outline

- Why King County Metro is going zero-emissions?
- News
- Our fleet
- Equity in the zero emissions transition
- Roadmap to zero-emissions

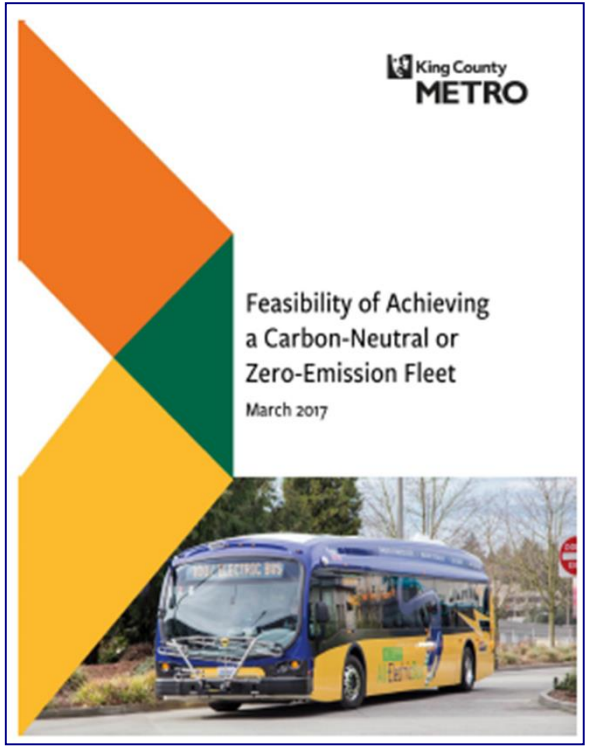
Evaluating the feasibility of achieving a carbon-neutral zero-emission fleet

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.

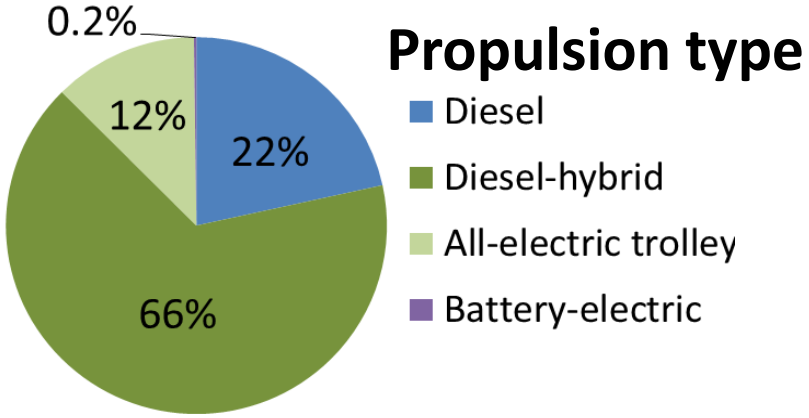
The Seattle Times

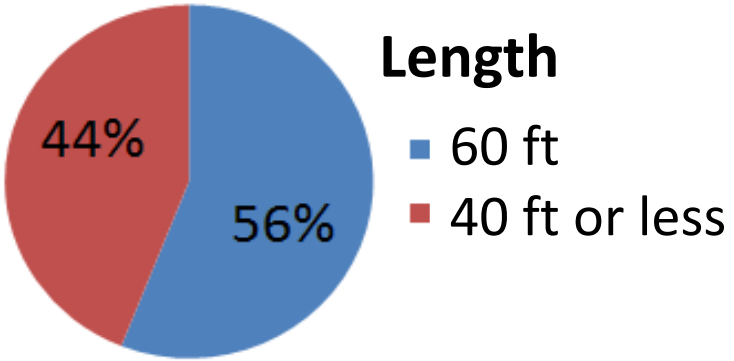
Coming soon to a Metro transit route near you: battery-powered electric buses

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

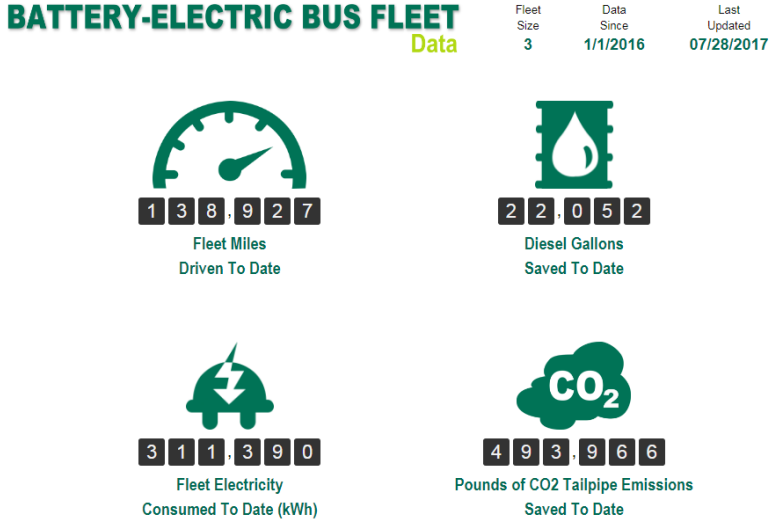
- Charges at base
- Range of 140 miles
- ~2 to 5 hours to charge midday or overnight

Fast-charge

- Charges at bus layover
- Range of 25 miles
- 10 minutes to charge

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 7/28/17

Near Term 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 TBD Slow charge Test	South Base	10 Slow		Test			
BYD	South Base	2- 40' & 2-60'					
New Flyer	South Base	2- 40' & 2-60'					
Proterra	South Base	2-40'					
245, 246	Bellevue Base	12 Fast or Slow			Begin		
Rtes Undetermined	South Base*	85 Undetermined					Begin

Equity Analysis

Equity analysis

- Low-income families and people of color are more likely to live in neighborhoods that have high concentrations of air pollution
- Providing public transit to disadvantaged populations is key to advancing equity, but the diesel technology currently in use throughout the county imposes undesirable effects on those very populations

Equity analysis

- Purpose
  - This analysis focuses on how the air pollution benefits of zero-emission technology could advance social equity by first serving communities most vulnerable to air pollution

Equity analysis methodology

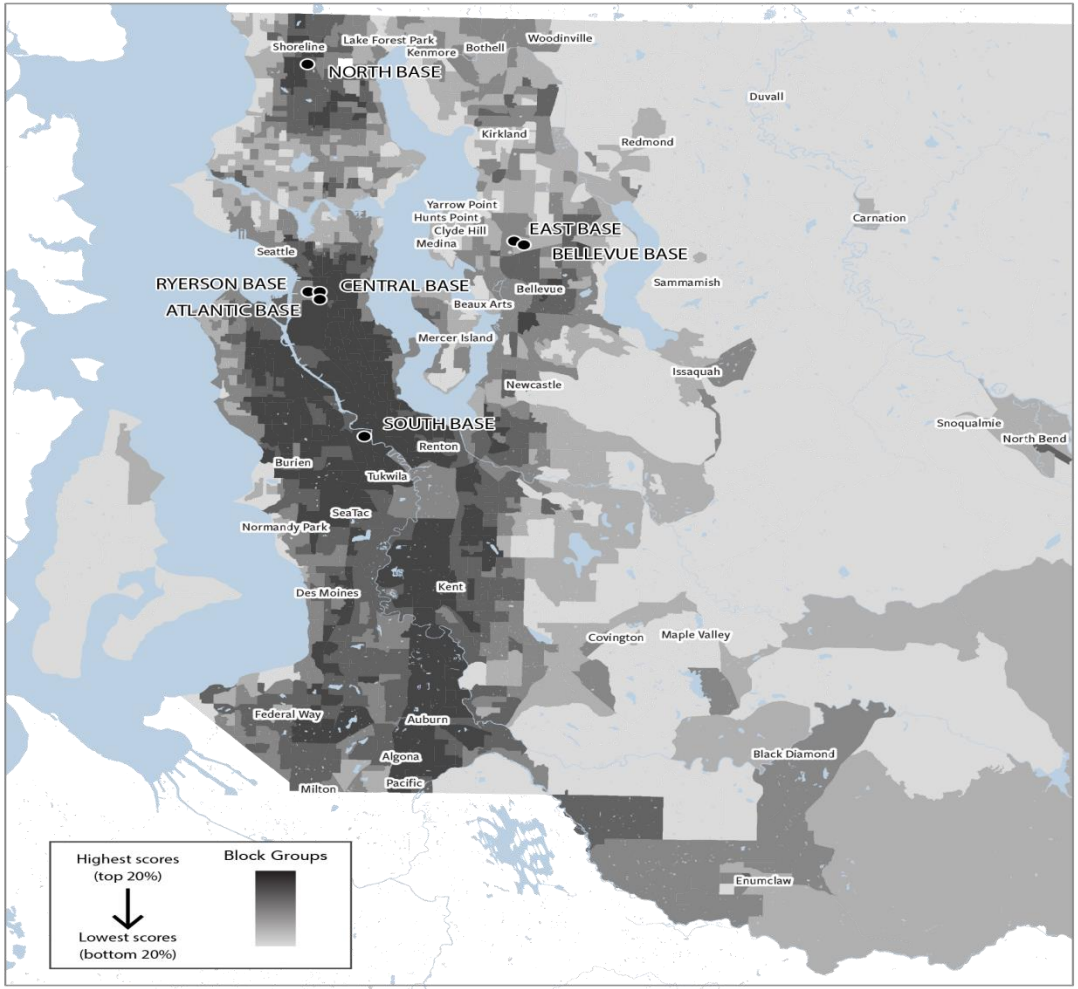
- Collaboration with King County Health, Puget Sound Clean Air Agency, US EPA
- Collect data for census block groups
- Weight all factors
  - Double weight for low-income %, minority % and asthma prevalence
- Divide into quintiles and apply score
- Buffer 200 meters around each bus route
- Apply rating for each route based on average score of census blocks within 200 meters
- Examine by bus base

Equity analysis data

- Poor air quality
  - Diesel emissions
  - Wood as primary heating fuel %
  - Proximity to WSDOT traffic
  - Sources with air operating permits
- Existing health conditions
  - Cardiac hospitalizations
  - COPD hospitalizations
  - Asthma prevalence
- Social factors
  - Minority %
  - Low income %
  - Population under 18
  - Population over 64
  - High school diploma %
  - Households with linguistic isolation
  - Single female head of household %

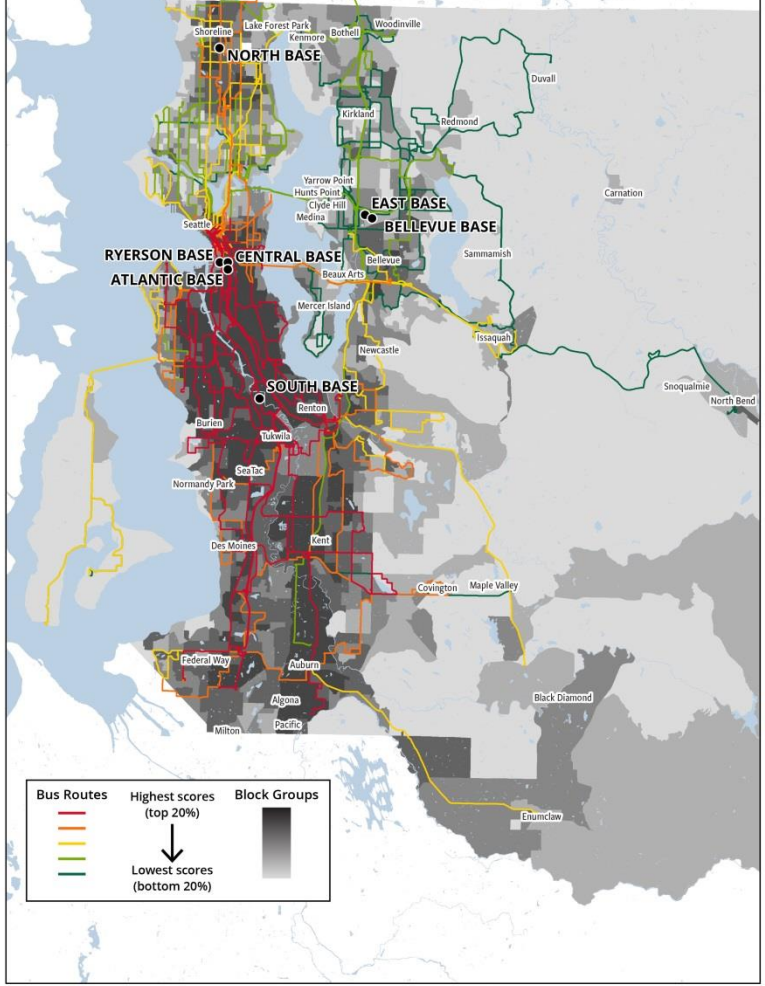
Scored census block groups

Darkest shades indicate most vulnerable populations



Non- zero-emission bus routes

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



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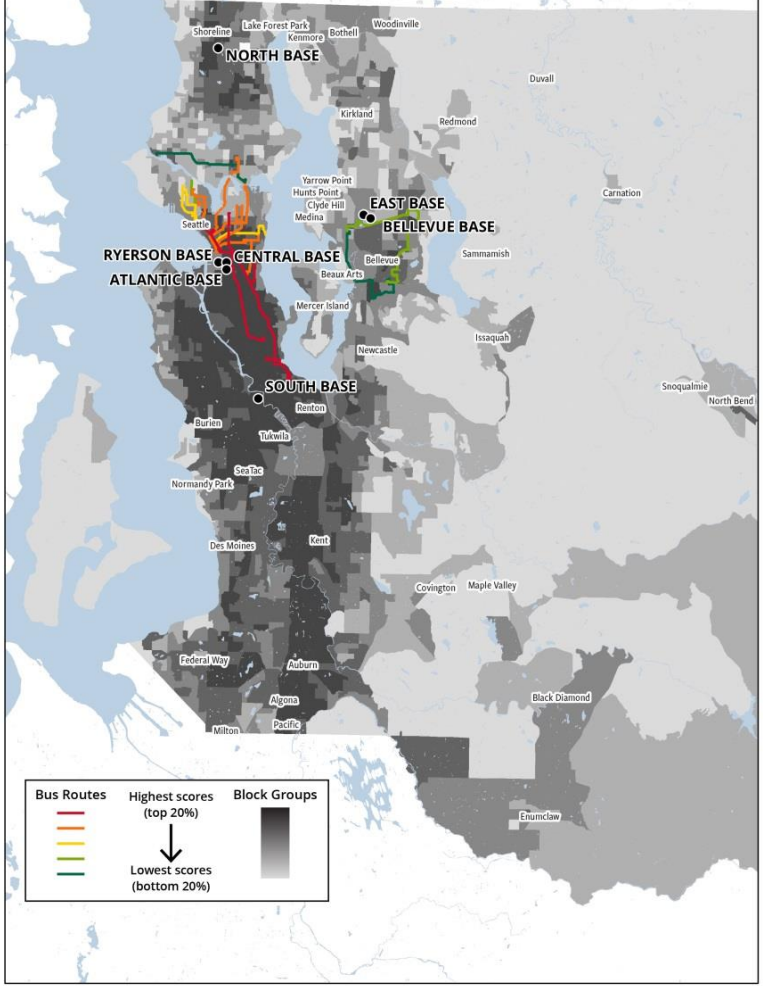
Existing zero-emission bus routes

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



Identify bus base with high priority routes

- Two methods:
  - Daily service mileage in each quintile
  - Number of census block groups routes intersect in each quintile

Total census block groups intersected by routes per scoring quintile

	Lowest score for poor air quality, health, social conditions				Highest score for poor air quality, health social conditions	
Bus Base	**1 (bottom 20%)**	**2**	**3**	**4**	**5 (top 20%)**	**Total census block groups intersected**
South	45	98	112	194	205	**654**
Central	39	91	100	83	117	**430**
Ryerson	33	98	102	81	94	**408**
Current zero-emission fleet	10	46	56	50	90	**252**
North	30	81	78	64	42	**295**
Atlantic	2	15	4	25	34	**80**
East	58	63	62	31	20	**234**
Bellevue	120	96	89	41	9	**355**
Total	**377**	**588**	**603**	**569**	**611**	**2,708**

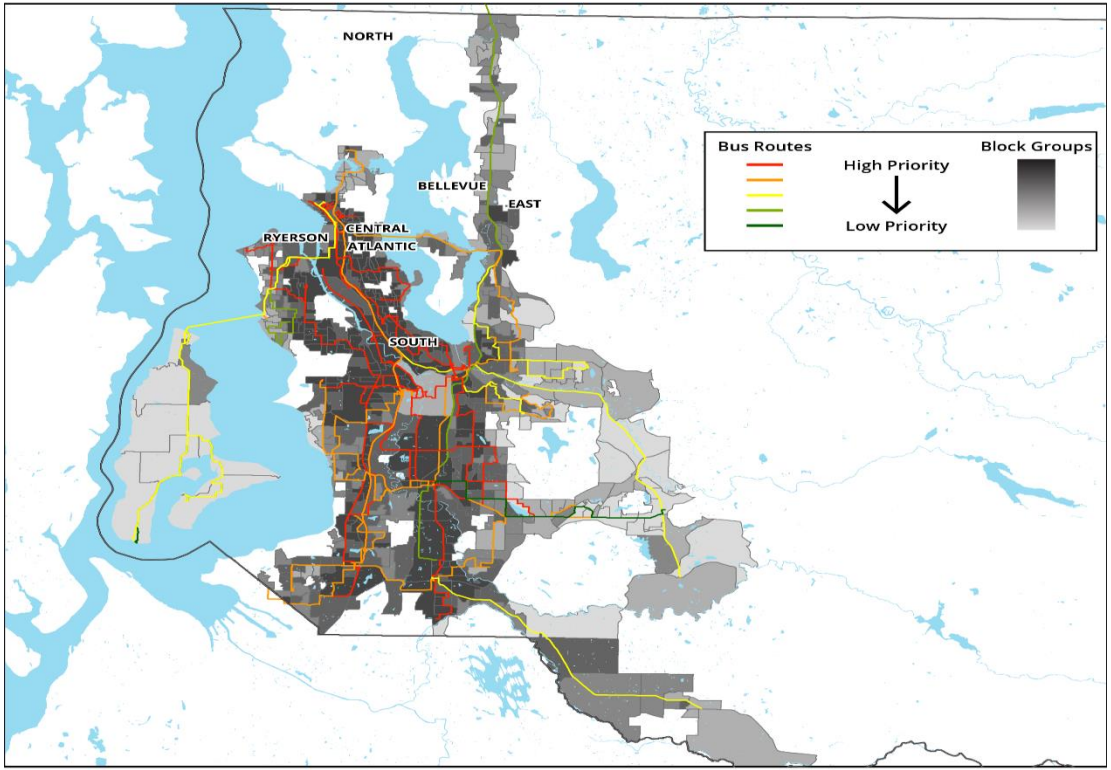
Total daily bus route mileage per scoring quintile

Lowest score for poor air quality, health, social conditions ⟷ Highest score for poor air quality, health social conditions

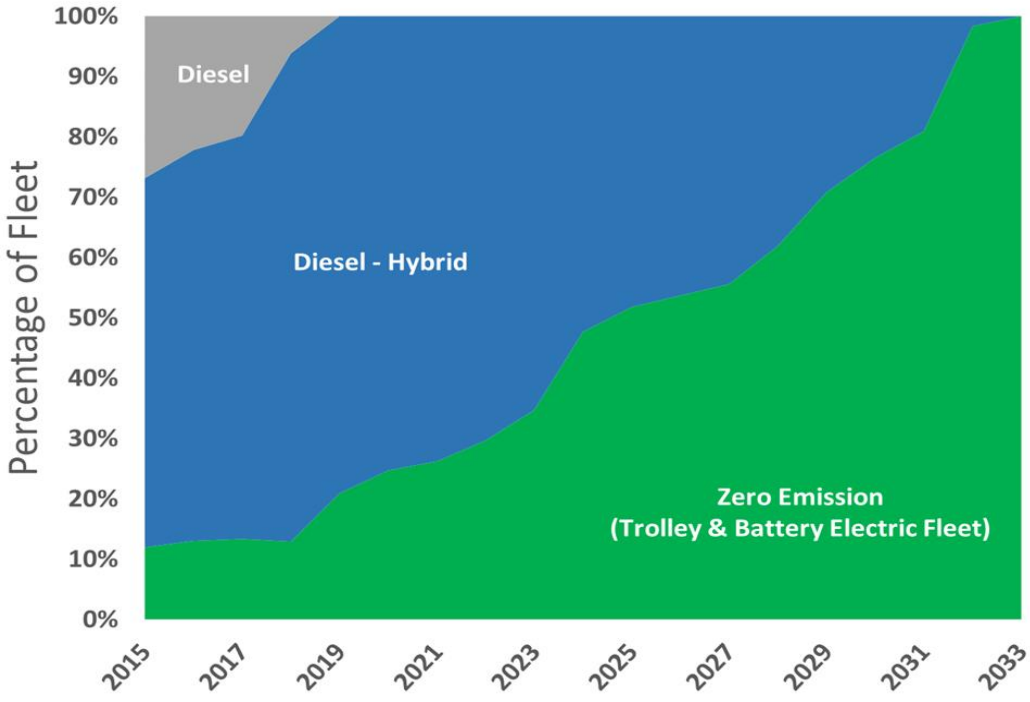
Bus Base	1 (bottom 20%)	2	3	4	5 (top 20%)	Total Miles
South	2,257	5,720	1,352	8,967	14,956	**33,252**
Current zero-emission fleet	1,066	959	1,727	3,902	4,035	**11,689**
Ryerson	1,302	1,566	2,721	4,252	3,598	**13,439**
Central	0	4,875	2,136	2,252	1,278	**10,541**
Atlantic	0	0	872	96	147	**1,115**
Bellevue	8,831	1,059	1,524	0	0	**11,414**
East	5,270	409	2,651	93	0	**8,423**
North	1,737	3,667	10,905	629	0	**16,938**
Total	**20,464**	**18,255**	**23,887**	**20,190**	**24,014**	**106,811**

Equity Analysis Results

- South Base has greatest number of high priority route miles and intersected block groups
- **62 percent** of the highest scoring route mileage originates at South Base.
- **31 percent** of the census blocks that South Base routes travel through are considered the most vulnerable.



Estimate to Move to a Zero-emission Fleet

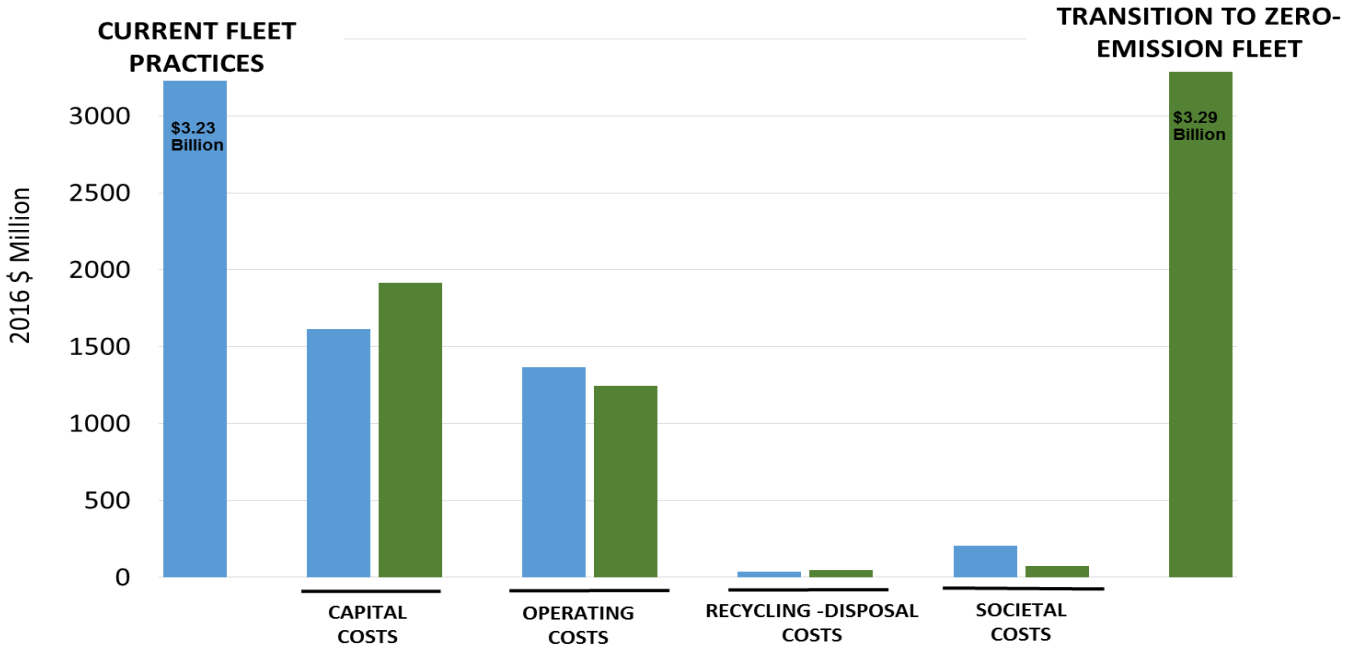


Environmental Benefits

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

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

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.
- **Equity**: Use equity factors to allocate new technology

Questions?

For more information

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