



# Sustainability and Metro's Zero-Emission Fleet

Presented by:

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# King County Metro's Trek to a Sustainable Future

- Strategy options:
  - **study:** learn from others, observe
  - **deploy:** test, evaluate and scale
  - **convert:** start replacing now



# 100% Clean: 100% Possible

## ELIAS

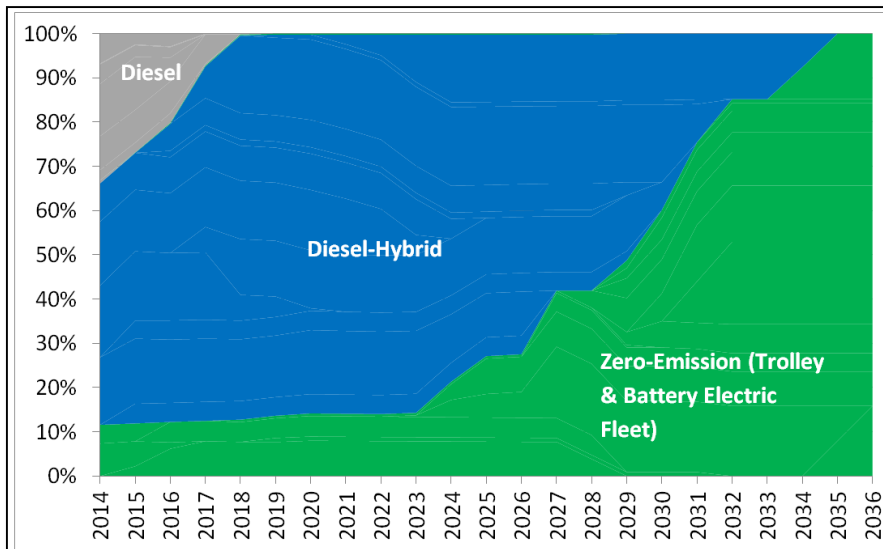
**King County Metro, Transit Operator  
Seattle, Washington**

“I have been driving for King County Metro for 5 years. Basically I’ve driven every single bus that we have in King County. The riders actually love these buses. I don’t think they realize it’s a 100% battery operated bus. When I tell them it’s an electric bus they just love it because it’s good for the environment.”

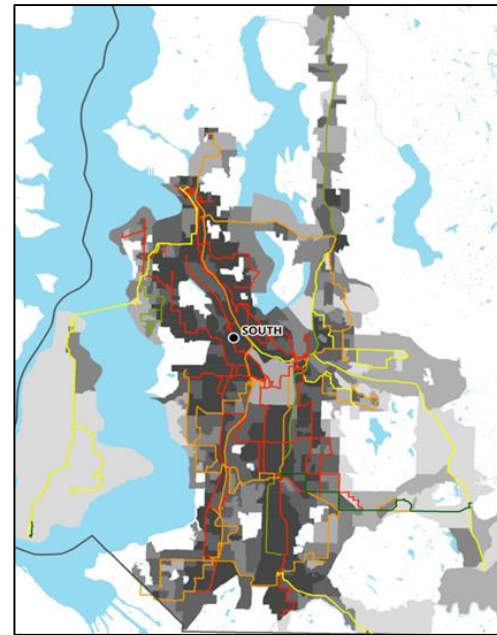


# Scope of Testing

- Current technology electric buses (AEB, BEB, ZEB) can theoretically meet **70%** of KC Metro **operational requirements**.
  - **174 Zero-Emissions *Electric Trolley Buses***
  - **11 Zero-Emissions *Battery Electric Buses***
  - **10 additional Zero-Emissions *Battery Electric Buses* 2018Q4**



**Note:** Achieving a 100% emission fleet is dependent upon the successful extended-range bus pilot test, availability of 60-ft. buses by 2020, and space efficient charging infrastructure.



# Testing Data

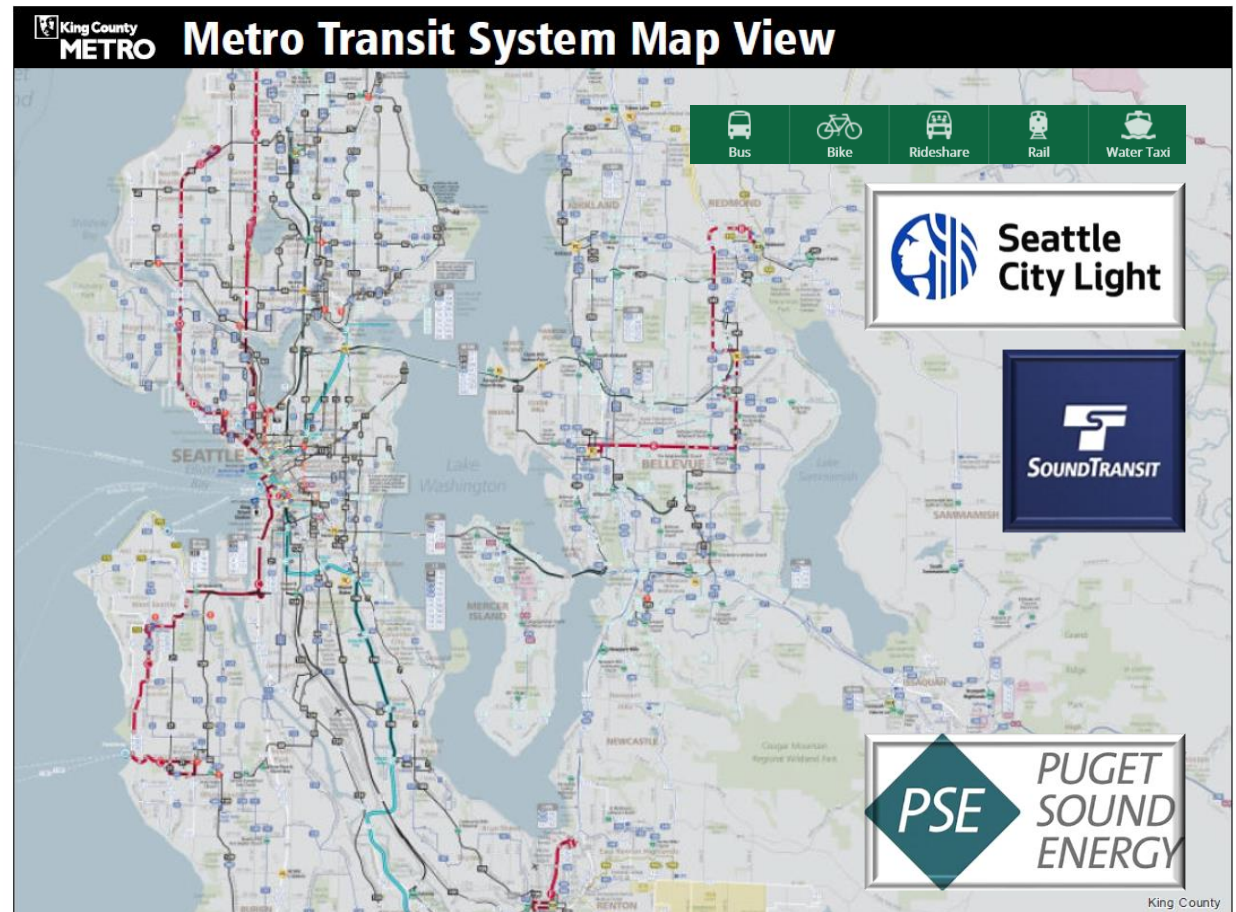
- **Document:**
  - bus size: 40' or 60'
  - Weight over each axle
  - Acceleration
  - Gradeability
  - Energy used, and energy recovered
  - Charge Power or Energy
  - other **KPIs**
  - Telematics

Extended Range Slow Charge Battery Electric Bus Evaluation Criteria					
Metro Assigned Number		Length 40/60'			
	Curb Weight	GAWR			
Front Axle Weight:					
Rear axle weight:			Pass	Fail	
SOC After 140 miles OR Load shed to full charge (Whichever Comes First) @ 4hrs. Or less					
Range 140 miles (@SLW)					
Revised 9/07/2016					
Rated Criteria					
Performance on Grade, Acceleration in Sec. at GVW					
Bus tested with simulated 38 passenger weight plus driver & tester (40)			Spec.	Actual	
0-10 MPH on 9% Grade (S. 150th St. to S. 140th St.)			7 Sec.		
0-20 MPH on 5% Grade (51st. Ave. S & S Ctr Blvd to Tukwila Int.)			12 Sec.		
0-20 MPH on 0% Grade (SAT test track)			7 Sec.		
Maintain Speed on Grade, 3.5% (I-5 at I-405 to I-5 & S 178th)			43 MPH		
Maintain Speed on Level (I-5 at MIL. Rd. to S. Kent Des Moines F)			60 MPH		
Test Hills in South Seattle					
Bus HVAC/Heat Temp. °F		SOC Starting	Kwh Consumed	Kwh Generated	SOC Remaining
Ambiant Temp. °F					
Queen Ann ave. N and W Mercer to Queen Ann ave. N and W Garfield st. (18%)					
Talbot Rd. and Puget Drv. To Puget Drv. And SE 19th St. (9% Grade)					
Highland Pwy. SW and W. Marginal Way SW to 9th and SW Thistle (10% Grade)					
First Ave. S and S Cloverdale St. to SW Roxbury St. and 8th Ave. SW (10% Grade)					
S Ryan Way and ML King Way to Beacon Ave. S (10% Grade)					
Service Routes to be Tested					
All routes driven the same, from base route to return to base.	Starting SOC	Kwh Consumed	Kwh Generated	Remaining SOC	
Route 143					
Route 158					
Route 180/181					





# Electric Bus Ecosystem



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Printed on September 20, 2018



## Sustainability and Metro's Zero-Emission Fleet 13% there, 87% to go...

**Thank you!**

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**APTA - September, 2018**