King County Metro Zero Emission System Transition

March 20, 2025

King County METRO
Moving forward together

ZERO EMISSIONS

King County Metro Overview

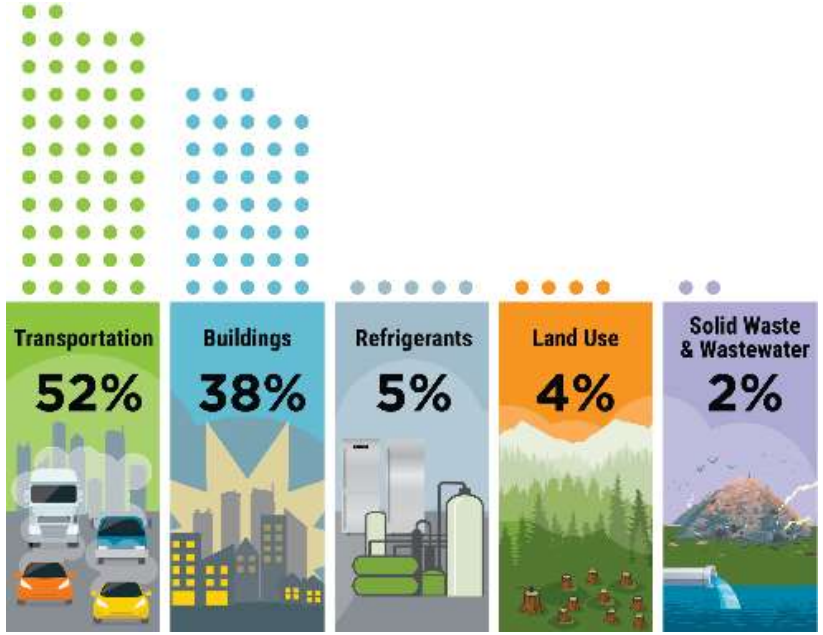
1470 buses, **900** vanpool, **400** cutaways,
3 water taxis, and over **900** non-revenue vehicles

Delivering **223k** rides every weekday

King County METRO *Moving forward together*

ZERO EMISSIONS

Community Greenhouse Gas Emissions



King County Geographic GHG Emissions Sources*
total emissions of all residents, businesses, governments, 2022

Goal: Reduce countywide GHG emissions
(compared to 2007)

- 50% by 2030
- 80% by 2050

Metro Policy and Climate Goals – Metro Operations

Strategic Climate Action Plan Targets for Metro Operations

70% REDUCTION IN GREENHOUSE GAS EMISSIONS FROM FLEET BELOW 2017 LEVELS BY 2030

100% ZERO-EMISSION REVENUE BUS FLEET BY 2035

100% LIGHT-DUTY ELECTRIC VEHICLE (EV) BY 2030

90% INCREASE IN UTILIZATION OF TROLLEYS ON WEEKENDS BY 2025

Metro Connects

Metro Connects will confront climate change by transitioning to zero-emissions vehicles, powered by renewable energy, over the next 20 years.

Metro will use a phased approach to acquire battery-electric buses, convert operations, prepare the workforce, and build the necessary infrastructure to support a 100 percent zero-emissions bus fleet.

Strategic Plan Strategy

Reduce vehicle emissions in all of Metro's fleets through transition to zero-emissions, efficient operations, and other strategies.

Electrification Targets from King County Council Ordinance 19052

Fleet Targets	% Zero Emissions	Year	2024 Status
Bus Fleet (1470)	100%	2035	174 Trolley 40 BEBs 15%
ADA Paratransit (379)	67%	2030	0
Rideshare (~1100)	100%	2030	120 EVs *coming soon: 11%*
Light-duty vehicles (350)	50% 100%	2025 2030	88 EVs 25%
Medium-duty vehicles (111)	50% 100%	2028 2033	0
Heavy-duty vehicles (35)	50% 100%	2038 2043	0

- **Installation of 125 chargers** at King County-owned park-and-rides by 2030
- **Installation of 150 chargers** by 2030 in County facilities

Moving to Zero Emission – Milestones

- **1940:** The electric trolleybus fleet & network began operation in Seattle
- **2004:** Metro is one of the first transit agencies to adopt diesel hybrids
- **2015-2018:** Deployed 3 Proterra battery electric buses (BEB) for pilot program and deployed 8 more Proterra BEBs
- **2019:** Metro committed to transition the fleet to zero emission by 2035
- **2022:** Commissioned South Base Test Facility to test BEBs with charging solutions from two manufacturers
- **2022:** Deployed 20 40-ft and 20 60-ft New Flyer BEBs
- **2024:** Procured 89 40-ft GILLIG BEBs (deliveries starting in 2025) with an option to purchase up to 306 more BEBs from GILLIG

How does Metro compare?

Metro has the 7th largest bus fleet in the country

#	Agency	Location	# Buses (2023)
1	NY MTA	New York, NY	5,924
2	NJ Transit	Newark, NJ	2,435
3	LA Metro	Los Angeles, CA	1,987
4	CTA	Chicago, IL	1,875
5	WMATA	Washington DC	1,576
6	SEPTA	Philadelphia, PA	1,433
7	**KC Metro**	**Seattle, WA**	**1,328**
8	Houston Metro	Houston, TX	1,194
9	MBTA	Boston, MA	1,149
10	MTA	Baltimore, MD	1,043

Metro has the 10th highest BEB miles in the country

#	Agency	Location	BEB Miles (2023)
1	AVTA	Lancaster, CA	3,466,343
2	LA Metro	Los Angeles, CA	1,778,495
3	St. Louis Metro	Saint Louis, MO	1,502,031
4	ATN	Anaheim, CA	1,089,008
5	Miami-Dade	Miami, FL	1,082,755
6	City of LA	Los Angeles, CA	933,040
7	KAT	Knoxville, TN	841,491
8	IndyGo	Indianapolis, IN	815,928
9	CARTA	Charleston, SC	813,811
10	**KC Metro**	**Seattle, WA**	**747,864**

Metro has the 2nd highest annual ZEB miles in the country

#	Agency	Location	ZEB Miles (2023)
1	SF MTA	San Francisco, CA	4,875,414
2	**KC Metro**	**Seattle, WA**	**3,530,562**
3	AVTA	Lancaster, CA	3,466,343
4	LA Metro	Los Angeles, CA	1,778,495
5	St. Louis Metro	Saint Louis, MO	1,502,031
6	ATN	Anaheim, CA	1,089,008
7	Miami-Dade	Miami, FL	1,082,755
8	AC Transit	Oakland, CA	1,018,446
9	City of LA	Los Angeles, CA	933,040
10	KAT	Knoxville, TN	841,491

King County METRO *Moving forward together*

Source: National Transit Database, 2023 Vehicle Dataset, 2023 Fuel and Energy Dataset
Note: Battery electric bus (BEB) miles only include miles traveled by battery electric buses
Note: Zero emission bus (ZEB) miles include miles traveled by battery electric buses, electric trolleybuses, and hydrogen fuel cell buses

GHG Reduction

19.7% Of Metro's Bus Fleet is Zero Emissions

- 40 Battery Electric Buses (BEB), acquired 2021-2023
- 174 Trolley Buses

Will hit 1.5 Million BEB Miles Traveled

- 1,730,600 miles for entire BEB fleet as of March 4 2025
- Average 43,265 miles per BEB

Greenhouse Gas (GHG) emissions impact

- To date, BEB fleet prevented 3.8K metric tons of GHG emissions*. This equates to:
  - Taking 911 cars off the road annually (saving 440,000 gallons of gas).

*calculation assumes 2,212g of CO_2 equivalent per 1 diesel-hybrid bus mile.

Source: https://www.rtachicago.org/uploads/files/general/Drupal-Old/documents/aboutus/meeting_documents/02-17-22/4a_Public%20comments%20for%202-17-22.pdf

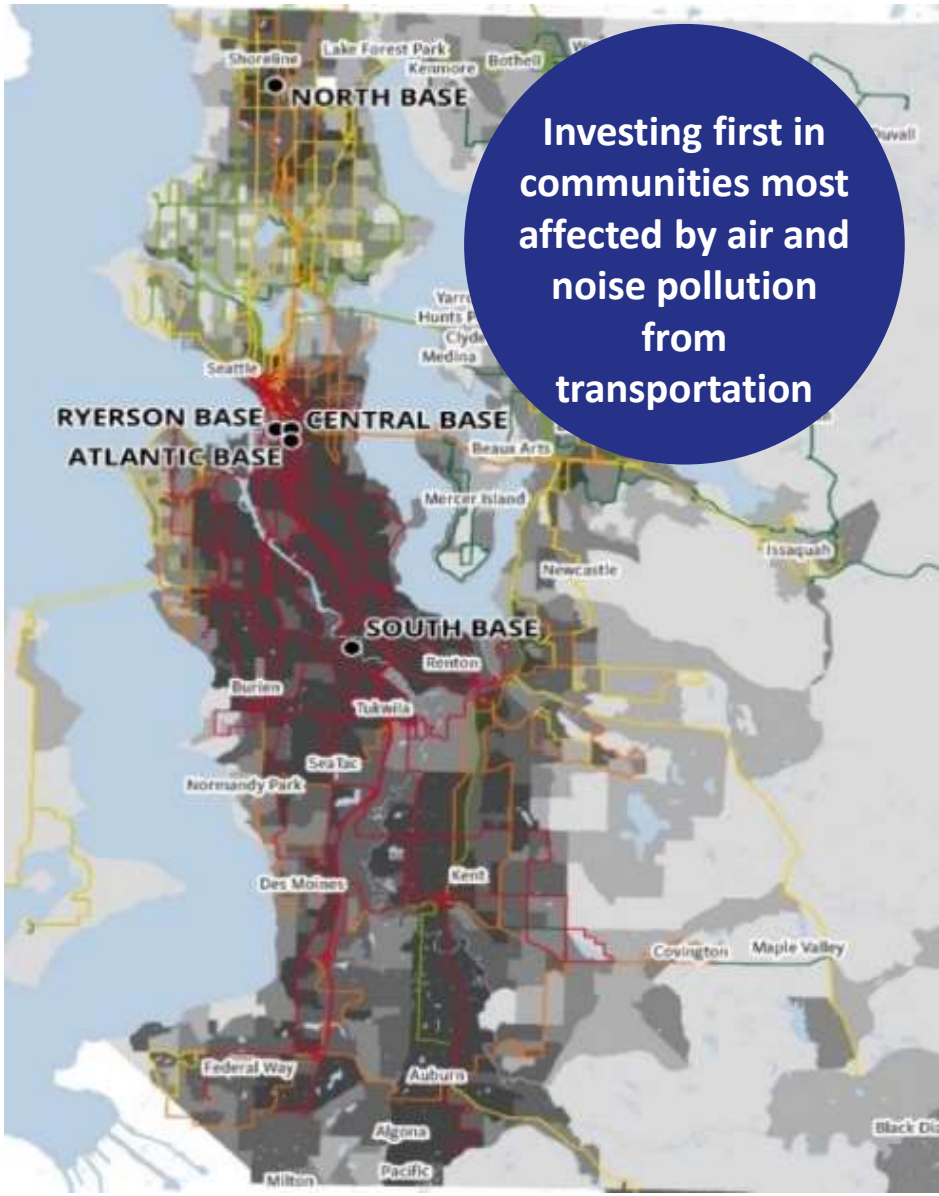
Expanding first in South King County

Community benefits of zero-emission buses:

- Eliminate tailpipe-related pollution and climate impacts
- Reduce noise down to levels of a car

South Base is the highest priority for transitioning to zero-emission fleet due to community vulnerability

Communities most vulnerable are darker shaded. Red bus routes are highest priority to be served by zero-emission buses, green routes the lowest.



King County METRO *Moving forward together*

Zero Emissions

Modes of Transit and Fleet

Bus

- Tukwila Base
- South Annex Base
- Opportunity/Layover Charging
- South Base Test Facility
- Electrify Planning
- Bus Procurement Program
- Charge Management Project
- Yard Management Project

Trolley

- Trolley Oversight Committee (Strategy and Vision + Implementation)
- Route 48
- Energy Monitoring
- Replacing all batteries on trolleys

Marine

- Vessel Design and Rebuilds
- Infrastructure design and build
- Technology

Non-Bus Transit Fleet (Contracted/Flex Services)

- Strategy and Plan for Non-Bus Electrification Efforts (Access, rideshare, flex services, CAT, DART)
  - Contracted Service Study
  - ACCESS EV Pilot
  - Rideshare At Home Charging & 120 EV purchase

Support Fleet (NRV)

- Strategy and Plan for Electrification Efforts (vehicle and infrastructure)
  - Energy Usage Data for Charging Infrastructure Deployment
  - Enterprise EV Charging Infrastructure Feasibility Study (FMD funded)
- NRV Infrastructure Installation Project – Light duty vehicles

Enterprise EV Charging Infrastructure Feasibility study (for rural and unincorporated) (Climate Cabinet) – 125 chargers at Park and Rides.

Moving to Zero Emission – Key Bus Fleet Milestones

2017-2021

Feasibility Report and commitment to transition to zero emission

174 trolley buses

11 Proterra

Eastgate Park and Ride Charging Facility

Electric bus test

2022-2024

South Base Test Facility

40 BEBs in service

Transit system electrification study

Procure suite of software technology

BEB Academy +

We are here

2025-26

Tukwila Base Soft Launch

Tukwila Base opens Mar '26 (120 BEBs)

Planning for future base conversion

2026-2029

Purchase additional trolleys

South Annex Base opens (250 BEBs)

Shutdown Ryerson for conversion

Planning for additional chargers

2029 – 2035 and beyond

Ryerson Base re-opens

Conversion of Metro's remaining 6 existing bus bases

825 BEBs purchased

Additional layover charging around King County

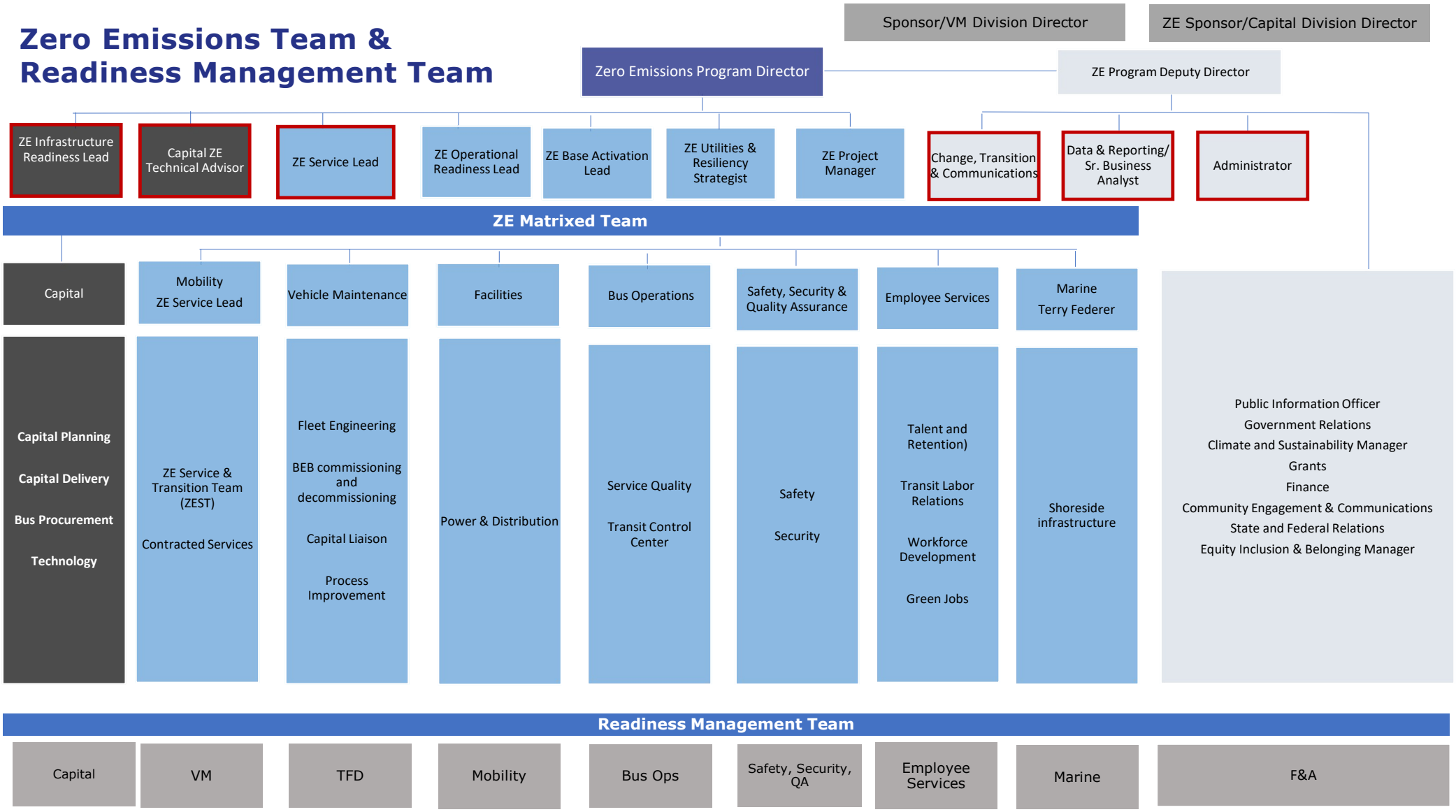
King County METRO ZERO EMISSIONS

- On-going partnerships with utilities, jurisdictions, transit partners, other agencies
- Workforce training and agency preparation

Zero Emissions Approach

- Prioritizing **equitable, safe, clean, and reliable service**
- **Balancing investments in ZE technology with service requirements** to minimize impacts on customers and maintain service levels
- Exploring **incremental fleet conversions** rather than assuming full fleet conversions
- Focusing on **reducing GHGs as *quickly* as possible**
- **Piloting, learning,** working across divisions, being agile in our approach

Zero Emissions Team & Readiness Management Team



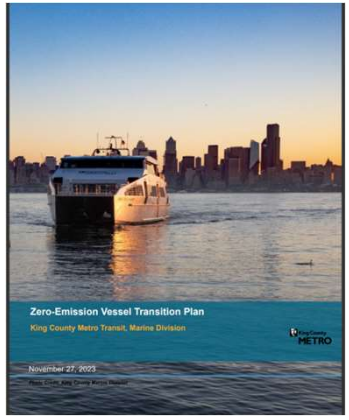
2023 Year in Review

$33.5M FTA grant for buses and workforce development

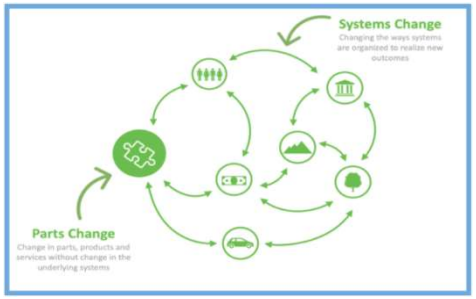
$4.9M Green Transportation Grant for opportunity chargers

Completed reports/studies:

- Marine – Zero Emissions Transition Plan
- West Seattle Mobility Hub/Passenger Ferry Terminal Site Selection Study
- SCAP Biennial Report Update
- Public Private Partnership study in partnership with UW
- Transit System Electrification Planning (TSEP) Phase I initial report
- South Base Test Facility Winter Weather Pilot



ZE systems map and contextual analysis completed



WA State Clean Fuels Standards

Risks and Values Workshop series completed

KCM and KCIT received CIO 100 Award

King County METRO

ZERO EMISSIONS

2024 Achievements to Date

1.5 millionth battery electric bus mile

40th long range battery electric bus in service

Software procured:

- Charge Management Software (INIT)
- Scheduling Software (INIT)
- Yard Management Software (Giro/HASTUS)

Broke ground at Interim Base (pic below)

Base Activation Team launch

EV transition: 88 to date

South Annex Base at 100% design (pic top right)

Battery electric bus procurement (GILLIG) awarded

Dept of Commerce EV charger grant award received

4 Opportunity charging locations under design

Zero Emissions audit complete

Hydrogen fuel cell bus pilot planning

ZE service transition

EV chargers installed at training site, Central Base, and 6th Avenue Garage

King County METRO

ZERO EMISSIONS

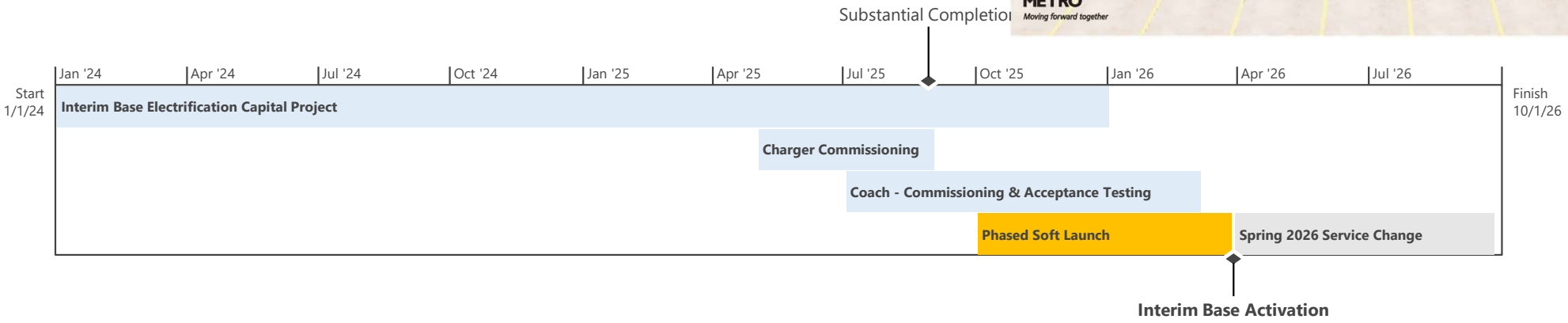
South Base Test Facility (SBTF)

- Purpose
  - Test hardware, software, firmware both coach and charger side prior to rolling out more broadly
  - Evaluate different charging solutions ahead of purchase
- 40 New Flyer BEBs
- 9 pantograph chargers, mix of both Heliox and ABB, 2 plug in chargers
- Nearly 1.5 million miles driven over the past 2.5 years
- About 3.2K metric tons of CO2 prevented

ZERO EMISSIONS

Tukwila Base

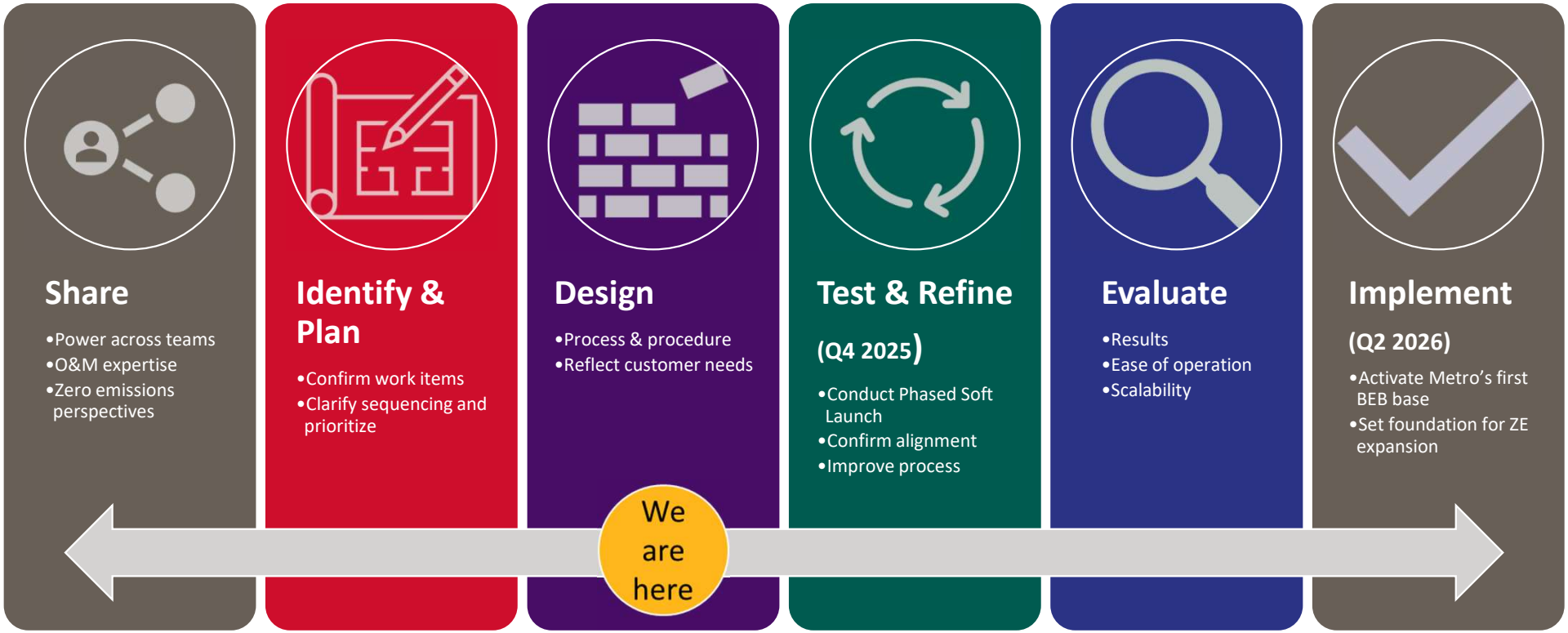
- Operates revenue service beginning March 2026
- Size: 544,000 square feet
- Charging: 123 pantograph-down charging
  (3 fast chargers)
- Fleet: 120 coaches



King County METRO

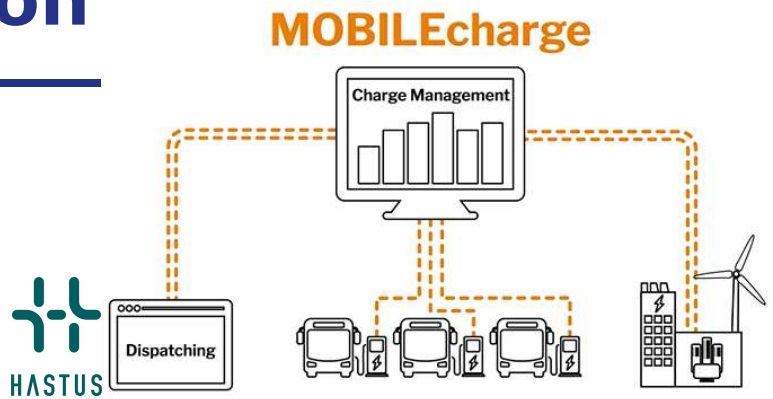
ZERO EMISSIONS

Pilot Phases of Tukwila Base Activation



Software to Support ZE Transition

- Charge management
  - Deployment to SBTF in Jan 2025
  - Deployment to Tukwila base in Q3 2025
- Telematics
  - Deployment to New Flyer BEBs in Feb 2025
  - Deployment to new Gillig BEBs from bus manufacturer
- Yard management
  - Vendor contract signed
  - System evaluation phase (Dec 2024 – Feb 2025)



BEB Fleet Activities

2024

- **Jan: Awarded Gillig contract to procure BEBs for Tukwila Base (89 40-ft BEBs)**
- Dec: Orders 4 BEBs from Solaris for pilot testing
- **Winter 24: Signs contract for Solaris Procurement of 4 buses**

2025

- **Q1: Sign lease for Solaris 60ft Trolley**
- **Jan: Gillig delivers test buses (2 40-ft BEBs)**
- **Aug: Gillig BEBs start arriving (3 40-ft BEBs/week)**
- **Spring 2025: Solaris delivers 1 60-ft electric trolleybus (pilot); Initiate Testing**
- **Year-end: Solaris delivers 2 40-ft BEBs (pilot) (Poland build); Initiate Testing**

2026

- **Mar: 89th/last Gillig 40-ft BEB arrives for Tukwila Base operations**
- **Late 2026: Solaris delivers 2 60-ft BEBs (pilot) (Poland build); Initiate Testing**

2027

- Ongoing testing; Make decisions based on results.

Trolley

- Metro's original zero-emission fleet
- 17 percent of daily bus ridership (2023)
- Metro will maintain and strategically expand the trolley system as ZE transition progresses
- Current/upcoming program emphasis:
  - Retrofit fleet with larger battery packs for greater off-wire capabilities
  - Increase utilization of trolleys on weekends
  - Evaluate existing routes for potential conversion to trolley

ZERO EMISSIONS

FTA Low-No Awards

- FTA Low-No Awards
  - **2023:** $33.5M ($2.1M for Workforce Development)
  - **2024:** $6.7M ($818k for Workforce Development)
  - Funding for:
    - BEB purchases
    - New Apprenticeship Positions
    - Expand supportive services for apprentices *(purchase tools, dependent care, etc.)*
    - Train-the-trainer classes for Metro's Battery Electric Bus Academy
    - Metro Career Pathways outreach events in underserved communities in King County

King County METRO

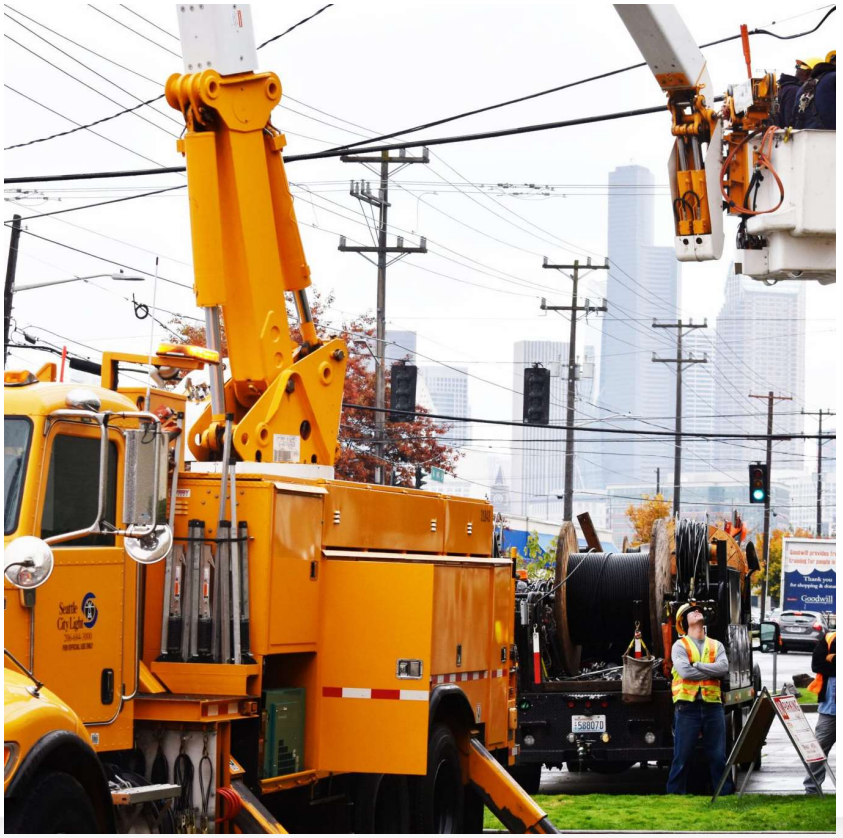
ZERO EMISSIONS

Utility Coordination

- Establishing relationship with utilities
  - SCL (Municipal utility)
  - PSE (Investor-owned utility)
- Estimating power needs and timelines
  - Current rates & usage
- Exploring innovative solutions

Seattle City Light

PSE PUGET SOUND ENERGY



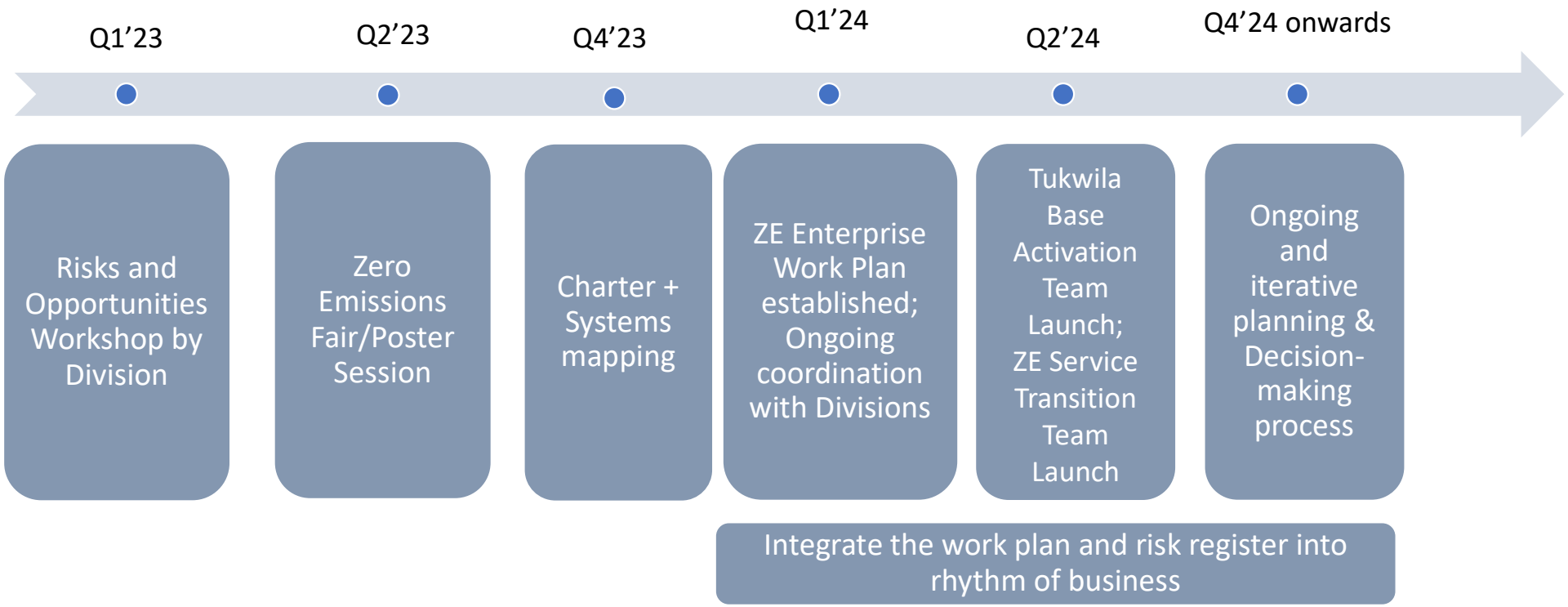
Challenges & Lessons Learned in ZE Transition

- Challenges with Bus Performance & Connectivity
- Bus Technology Limitations (especially 60-ft BEBs)
- Limited Bus Manufacturers in U.S.
- Challenging Supply Chain
- Staffing Shortages and workforce development
- Lack of Funding for Increased O&M Costs
- Limited Power Availability & Lack of Green Hydrogen
- Unknown Life of Assets and Lifecycle Costs

Research & Learning

- South Base Test Facility
- Pilot BEBs & chargers from multiple manufacturers
- Visits to Transit Agencies in U.S. & abroad
- Peer Transit Agency interviews
- Partnerships with University
- Industry research/interviews
- Involvement in ZEBRA, APTA, IBBG, TCRP

Enterprise Transformation: ZE Readiness Steps



"The secret to successful change lies beyond the visible and busy activities that surround change. Successful change, at its core, is rooted in something much simpler: How to facilitate change with one person."

- Jeff Hiatt, Founder, PROSCI – ADKAR Model

ZERO EMISSIONS

Looking ahead to 2025

Implementation Activities	Planning & Decision Making	Engagement
Tukwila Base Activation (business processes; resiliency, site prep; hire; train; commission assets)	26-27 Budget	Labor Strategy
Tukwila Base Construction	Service Transition	Ramp up communications
89 BEBs (GILLIG) start arriving	Base conversion strategy	Change Management; Engage Employees
Software integration	Opportunity Charging	Government Relations
BEB pilot with Solaris	Transit System Electrification Plan (ZE Transition Plan; Tech revisitation; Central Campus)	Partnerships
Deploy 120 EVs for Vanpool	Planning for all modes Bus, Trolley, NRV, Contracted Services, Vanpool, Water Taxi	Peer agency engagement
Trolley Battery Replacement	Marine & P3 Exploration	Utilities Engagement
Non-Rev Vehicle replacement	Grants	

Incorporate activities and strategy into Proviso due in Q2'25

Reflects revised zero emissions program approach

Thank you!

King County METRO

ZERO EMISSIONS