



DART Transform System Modernization Program Briefing

DART Board Budget & Finance Committee
May 28, 2025

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Today's Agenda

- Program Overview
- Progress To Date
- Unified Signal System Update and Strategy
- Light Rail Vehicle (LRV) Fleet Replacement
- LRV Procurement Strategy
- Board Schedule and Financing

A yellow and white bus with the number 41041 is parked on a city street. The bus has a large advertisement on its side. In the background, there are several tall, modern buildings with glass facades. The sky is blue with some clouds. The entire image is overlaid with a semi-transparent blue filter.

Program Overview

What is DART Transform?

DART Transform is our 10-year System Modernization program to modernize necessary infrastructure to address state of good repair, optimize system performance and improve the customer experience.

Five Core Elements of DART Transform



VEHICLES

Replace up oldest Light Rail Vehicles and Buses that are reaching the end of their useful life.



UNIFIED SIGNAL SYSTEM

Modernize signal systems to maximize safety, communications, reliability, and network capacity.



RESILIENCY

Enhance resiliency and reliability of operations during extreme weather events and other system disturbances.



STATIONS & PASSENGER FACILITIES

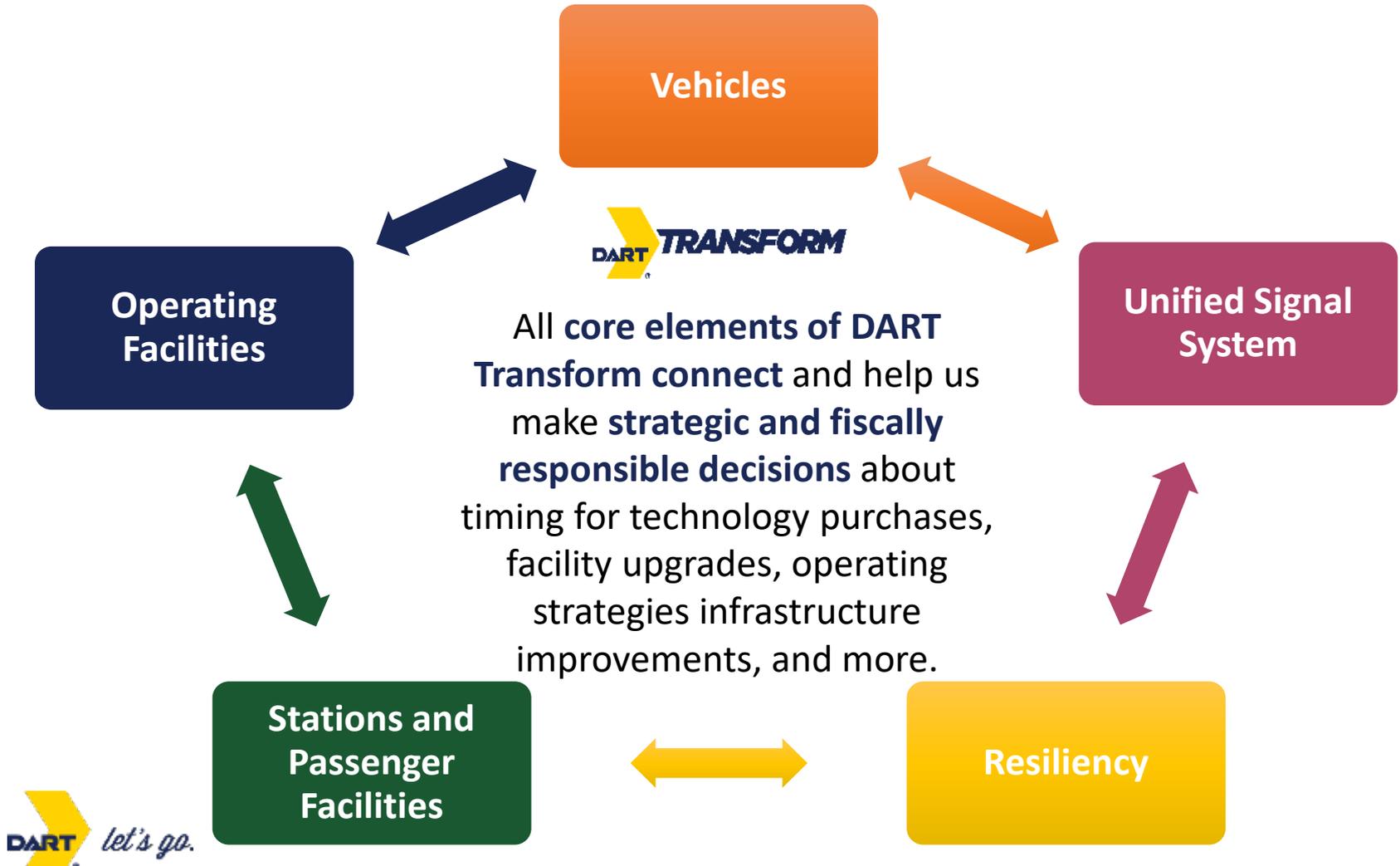
Raise platforms to support universal level boarding and improve other passenger facilities.



OPERATING FACILITIES

Modify operating facilities to support new vehicle maintenance activities and future technology advancements.

DART Transform Core Elements



DART Transform Goals



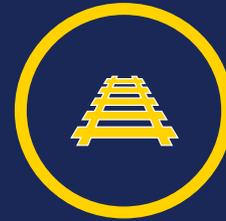
Thoughtfully improve the customer experience – safety, security, cleanliness and reliability



Continued stewardship of the system considering operability, maintainability, reliability and resiliency



Understand total cost of ownership and make program decisions to maximize whole life outcomes



Modernize the system to address current needs while future proofing network to accommodate changing mobility needs and technologies



Deliver the program systematically while also maintaining appropriate scalability based on funding availability

Related Studies to Optimize Modernization Efforts

Efforts Informing the Transform Program:

State of Good Repair (SGR) Baseline Assessment

Bus Operating Facility Study

FY24 – FY28 Capital Improvement Plan

Agency Strategic Plan

Transit System Plan

Internal and External Customer Surveys

Annual CPTED Reviews

City Area Plan Discussions

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Progress to Date – Rail

Recent Progress on Core Elements - Rail

Operating Facilities

- Considered LRV assembly site options
- Reviewed CROF/NWROF and Pioneer design concepts and needs with stakeholders
- Refined facility needs and cost estimates
- Submitted budget change request for FY26

Passenger Facilities

- Reviewed concepts and needs with stakeholders
- Developed scope documents, renderings and cost estimates for Cityplace and 22 other stations
- Developed solicitation instructions in preparation for design contracts through General Engineering and Design Services (GEADS)

Resiliency

- Developed scope and cost estimates
- Initiated procurement(s) for vehicle and system elements
- Corinth street grade crossing is under construction
- Thyristor Control Rectifier (prevents lightning damage / downtime) is under negotiation

Upcoming on Core Elements - Rail

Rail Operating Facilities

- Updating facilities design concepts based on DART feedback – Spring 2025
- Revising LRV assembly site plans – Spring 2025

Rail Passenger Facilities

- Preparing to solicit Final Design through GEADS contract – Summer 2025
- Assessing risk and mitigation procedures - Ongoing

Resiliency Projects

- NTP for Spring Tensioners detail design – Spring 2025
- NTP for Signal House Backup Power Design – Spring 2025
- Install of Ice Shrouds in strategic locations – Summer/Fall 2025

A photograph of a city street with a yellow tram. The tram is moving away from the camera, and its destination sign reads 'LEDBETTER'. The tram has the number '171' on its side. The street is paved with cobblestones and has tram tracks. In the background, there are several tall buildings, including one with a large red sign that says '1505'. A street sign on the left reads 'Akard St. 300 ft'. A yellow rectangular box is overlaid on the center of the image, containing the text 'Unified Signal System' in bold blue letters.

Unified Signal System

Unified Signal System – Recent Progress

Current signals system is a hybrid system. Technologies on Red and Blue Lines are 30 years old and need to be replaced due to parts obsolescence.

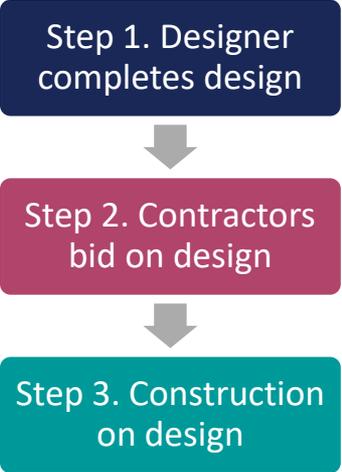
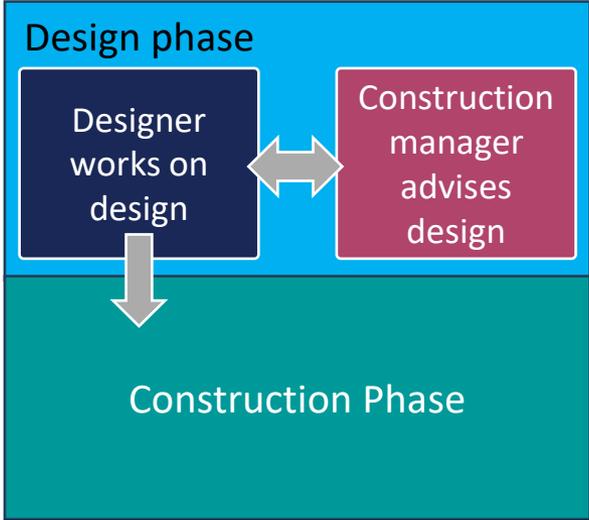
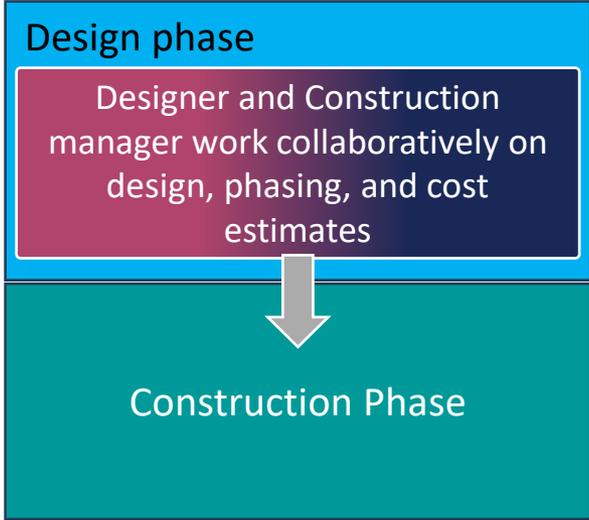
Activities to Date:

- Assessed signal technology options – Digital Automatic Train Protection (ATP) vs. Communications Based Train Control (CBTC). Continue to monitor industry advancement to confirm assumptions
- Discussed delivery methods and technology with Light Rail Vehicle RFI respondents and evaluate benefits of bundling with vehicle procurement
- 30% signal design task order is approximately 40% complete
- Central Business District (CBD) simulation assessment approximately 65% complete, seeking to improve downtown throughput and train track technology to improve travel times, reliability, capacity and frequency
- Implementing upgrades at Rowlett Grade crossing to address operational issues in advance of full system upgrades

Upcoming:

- Review 30% ATP signal design
- Finalize procurement methodology

Unified Signal System – Progressive Design Build Delivery Method

Design Bid Build	Construction Manager/General Contractor (CM/GC)	Progressive Design-Build (PDB)
<p>Project completed in separate steps. Designer and construction manager are completely siloed.</p>  <pre> graph TD A[Step 1. Designer completes design] --> B[Step 2. Contractors bid on design] B --> C[Step 3. Construction on design] </pre>	<p>Construction manager hired during design phase to advise on cost, schedule constructability. Scope and budget finalized before construction.</p>  <pre> graph TD subgraph Design_Phase [Design phase] D[Designer works on design] <--> CM[Construction manager advises design] end Design_Phase --> CP[Construction Phase] </pre>	<p>Design is progressive, owner is involved in design, and scope and budget are finalized before construction contract.</p>  <pre> graph TD subgraph Design_Phase [Design phase] DCM[Designer and Construction manager work collaboratively on design, phasing, and cost estimates] end Design_Phase --> CP[Construction Phase] </pre>

*Team selected **Progressive Design Build** due to early collaboration to determine most appropriate roadmap to quickly **advance design, prioritize phasing, determine early works based on long lead items, improve risk management and provide better cost certainty.***



LRV Replacement – Right-sizing Fleet

Rail Fleet Optimization

- Current plan is to replace only 77 of the original 95 cars. The remaining 68 cars (20+48) will likely be replaced under a future procurement.
- Reduce fleet spare ratio from 60% to 32% over time moving from a fleet of 163 to 145 vehicles. Move portion of fully depreciated fleet to contingency for special event service

Fleet up for replacement

Fleet	Quantity	Year Entered Service	30-Yr. Life Cycle
Fleet 50	40	1995	2025
Fleet 51	34	1997	2027
Fleet 52	21	1998	2028
Fleet 53	20	2008	2038
Fleet 54	48	2010 / 2011	2040 2041
Total:	163		

Recent and Upcoming Activities

Q2 FY25

RFP planning and vehicle design

Finalize specification and terms and conditions based on RFI input and issue RFP.

Finalize design concepts validating stakeholder input.

Identified LRV assembly site.

Q3 FY25

Fleet Management Strategy & RFP adjustments

Develop fleet management plan to confirm fleet replacement cycle and appropriate fleet contingency and management strategy.

Adjusting RFP based on feedback, privatization considerations and reduced order size.

Q3 FY26

Board Action

Board action requesting purchase of LRVs and consideration of options.

Q4 FY29

New LRV Delivery Begins

New LRV delivery begins. 21 new LRVs will be accepted each year until 77 total LRVs are accepted by Q3 FY33.

Exploring Procurement Approach

Include Options for Technical Support and Spares Supply Agreement (TSSSA) in LRV procurement to provide support for maintenance of light-rail vehicles. Scalable terms for agreement (e.g., 5, 10, 15-year options, etc.)

TSSSA/Maintenance Options*

1. Maintenance planning and guarantee of supply of Parts, Spare Parts, and Obsolesce Management
2. Technical Service Support and Training
3. Upgrades and Modernization
4. Overhaul Support and Components
5. Digital Solutions (remote diagnostics tools/services) to support Maintenance and Performance Optimization to guarantee reliability.
6. Full-service maintenance support to maximize availability by managing the vehicles and performing preventive and corrective maintenance.

**DART Board Policy No. V.03 outlines examination of service to see if able to be operated more effectively by private sector; Sec. 452.105.b states that the transit authority shall encourage to the maximum extent feasible the participation of private enterprise*

A yellow DART bus with the number 41041 is parked on a city street. The bus has a large advertisement on its side. In the background, there are several tall, modern skyscrapers under a cloudy sky. The entire image has a yellow tint.

DART Transform Proposed Budget

External Funding Opportunities

Transform projects will be funded through a combination of local funding, grant pursuits and short- and long-term debt. DART will be prioritizing leveraging outside funding sources. Most programs are competitive.

- **Light Rail Vehicles**
 - FTA: Rail Vehicle Replacement Competitive Program (RVRP)
 - Better Utilizing Investments to Leverage Development (BUILD)
- **Bus Network Improvements**
 - FTA: Sec. 5339 Grants for Buses and Bus Facilities
 - Formula Program
 - Bus and Bus Facilities Competitive Program*
 - Low or No Emissions Bus Vehicle Competitive Program
 - Congestion Mitigation and Air Quality Improvement (CMAQ)/Surface Transportation Block Grant Program (STBG)/Carbon Reduction Program (CRP) Flexible Federal Funding
 - FTA: Section 5307 Urban Formula Program

External Funding Opportunities

- **Signal System and Network improvements**
 - FTA 5337 State of Good Repair Formula Program
 - FTA: Section 5307 Urban Formula Program
 - FTA 5309 (b)(2) Fixed-Guideway Modernization Competitive Program
- **Resiliency**
 - FHWA: PROTECT Competitive Program
- **LRT Maintenance Facility Modifications**
 - FTA 5309 (b)(2) Fixed-Guideway Modernization Competitive Program
- **Station Modernization**
 - FTA 5309 (b)(2) Fixed-Guideway Modernization Competitive Program
 - CMAQ/STBG/CRP Flexible Federal Funding
 - Better Utilizing Investments to Leverage Development (BUILD)
- **Other potential funding**
 - FTA: Community Project Funding/Congressionally Directed Spending

Financial Strategy

Project Name	Future Budget	Expended Thru-2024	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	FY33
606 - 2023 - New LRV Procurement	\$849M	\$5M	\$9M	\$69M	\$151M	\$220M	\$156M	\$67M	\$62M	\$57M	\$53M
606 - 2024 - New Bus Procurement	\$377M	\$0M	\$97M	\$111M	\$169M						
609 - 2024 - Unified Signal System-Design & Construction	\$710M	\$3M	\$12M	\$62M	\$87M	\$100M	\$144M	\$129M	\$94M	\$54M	\$25M
840 - 2023 - CROF and NWROF Facility Upgrades	\$99M	\$1M	\$4M	\$6M	\$22M	\$33M	\$26M	\$7M			
840 - 2023 - Red and Blue Lines Platform Level Boarding	\$192M	\$1M	\$3M	\$51M	\$51M	\$45M	\$41M				
System Resiliency Projects	\$62M	\$0M	\$4M	\$18M	\$24M	\$16M					
Total	\$2.3B	\$10M	\$129M	\$317M	\$504M	\$414M	\$367M	\$203M	\$156M	\$111M	\$78M



Upcoming Items

Upcoming Contract and Task Order Awards

Summer 2025

- Resiliency – Signal House Power Back-up design contract award through Systems Engineering & Design Services (SEDS) contract
- Resiliency - Request for Thyristor Controlled Rectifier (TCR) Control System Upgrade for Substations*
- Stations – Stations design contract through GEADS contract

Spring 2026

- Operating Facilities – Facilities Modernization, Pre-Construction contract award*
- Passenger Facilities - City Place, Pre-Construction contract award*
- Passenger Facilities - Platform Leveling, Pre-Construction contract award*
- Resiliency – Signal House Back-up Power Units construction contract award*

Fall 2026

- Unified Signal – Pre Construction contract award*
- Passenger Facilities – Platform Leveling – Construction contract award (group 1)*
- Operating Facilities – Construction award*
- Passenger Facilities - City Place – Construction contract award*

- Resiliency – LRV Projects contract award*
- Operating Facilities – Design contract through GEADS

Fall 2025

- Vehicles - LRV Manufacturer contract award*

Summer 2026



**Board action required*





Appendix

History of Fleet Replacement Plan



2004 – DART commits to the FTA to transition to level boarding at all doors by 2030 to remain compliant with the Americans with Disabilities Act Accessibility Guidelines and applicable regulations set out in 49 CFR Parts 37 and 38.



2016 – Evaluated decision to make major repairs or pursue future replacement of the oldest fleet.



2019 – Executive decision to move forward with replacement incorporated into FY20 budget and capital plan with new LRVs arriving by 2023. This program was disrupted by the covid-19 pandemic.



2022 – Recommendation was made to move forward with fleet replacement.

Light Rail Vehicle Replacement

Light Rail Vehicles are reaching the end of their useful life (3.1/5 on 2023 SGR Report). To maintain State of Good Repair, DART is proposing replacing 85 of the oldest vehicles, Fleet numbers 50, 51, 52.

Fleet #	Average State of Good Repair Rating
50	2.79
51	2.84
52	2.83

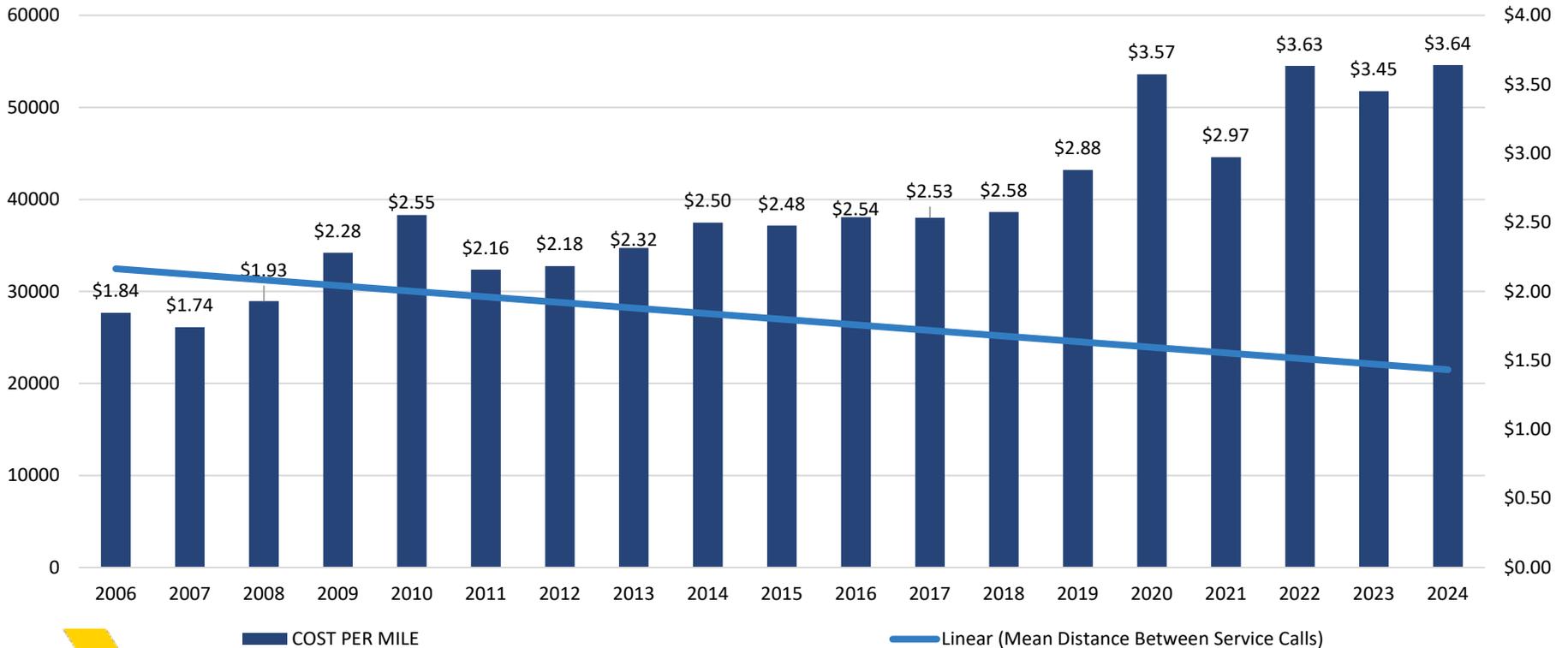
Why Now?

- Due to manufacturing time, financing requirements, and upcoming infrastructure updates, DART is preparing to release a competitive RFP for the procurement of vehicles.
- Deferring replacement of vehicles will result in increased maintenance costs, decreased service reliability, and increased capital costs overtime.

Fleet Reliability and Cost Per Mile

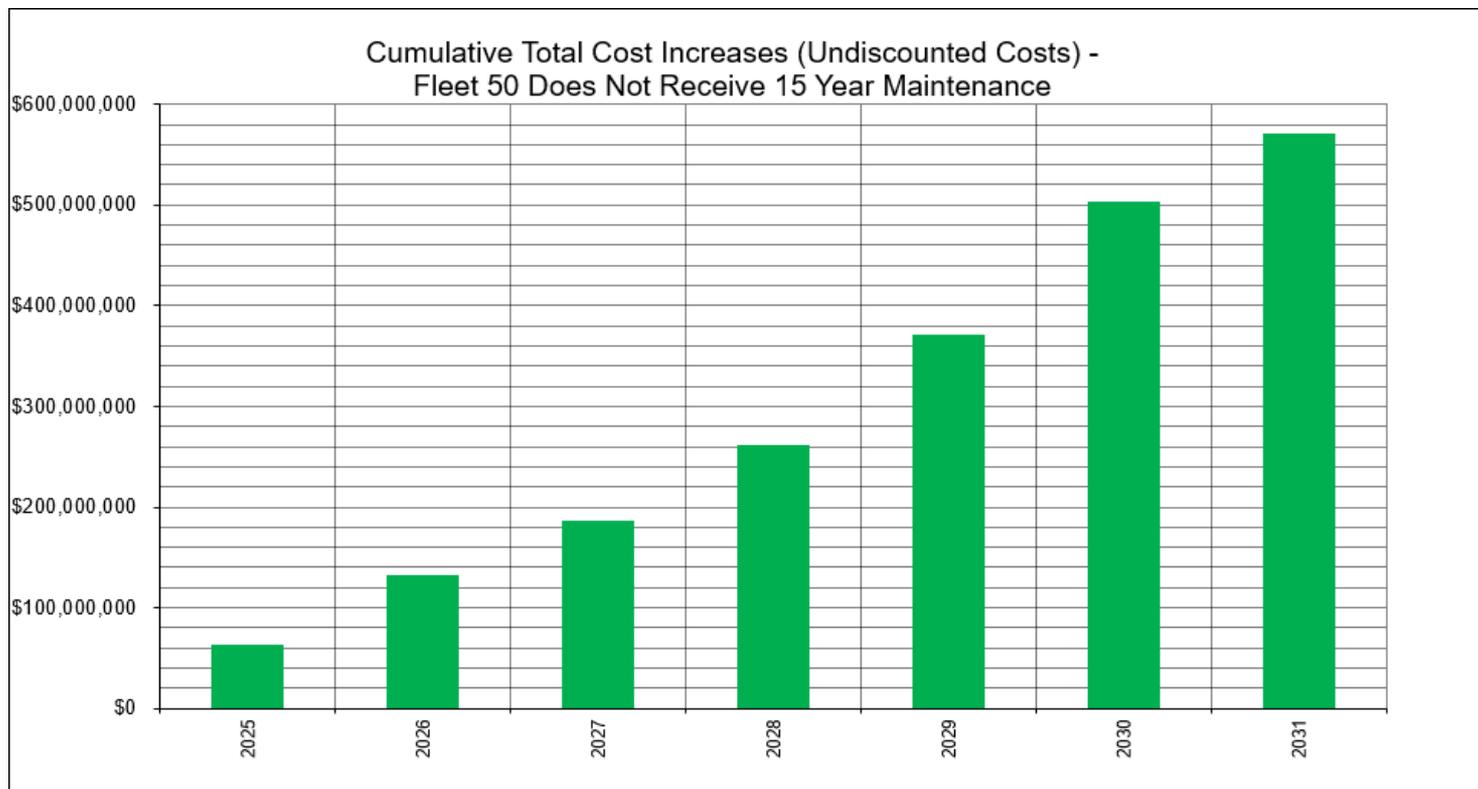
Mean Distance between Service Calls trending downward as vehicles age. Cost per mile increasing over time.

Cost per mile vs. Mean Distance Between Service Calls



Cost of deferring – Outside Report

Estimated additional costs associated with each year of delaying the procurement from now through 2031.



Pros and Cons of Fixed Fleet

Pros

- ✓ Meets the desire to have a single security person to walk the length of the train
- ✓ Provides up to 10% increased passenger capacity per train
- ✓ Open gangway would allow people to migrate to open seats on other car selection

Cons

- ✗ Lack of operational flexibility will increase operating and maintenance costs
- ✗ Lack of operational flexibility will impact service reliability
- ✗ Lack of competition will increase vehicle cost
- ✗ Facility infrastructure must be modified to support longer vehicles

Impact – Fixed Fleet

Operational:

- DART currently runs two-LRV trains during peak service and single LRVs during off-peak periods.
- If DART is unable to run shorter trains off-peak due to trains being permanently fixed, there will be an **approximate 17% increase in cost** in traction power cost and an **approximate 10% increase** in maintenance cost.

Infrastructure:

- DART maintenance and storage facilities are setup for single LRVs. Fixed three LRV trains requires one of two solutions:
 - 1) Open gangway being able to be easily split into three sub-vehicles for maintenance requires custom design, limiting competition and raising procurement cost.
 - 2) Modify existing infrastructure to accommodate 3x longer vehicles.

Designed for
quick separation

Could be separated but requires special design and separation



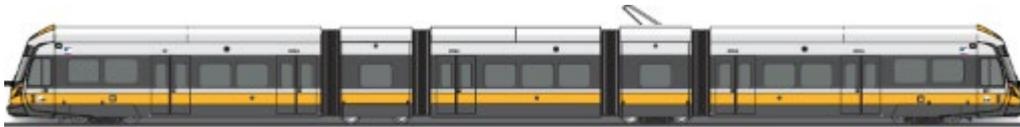
Not practically separated



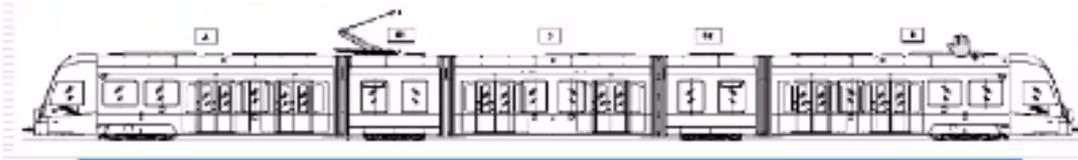
Potential Proposers of Standard LRVs



Alstom Citadis 124'



Kinki Sharyo LRV 124'



CAF URBOS 131'



Siemens S700 92'

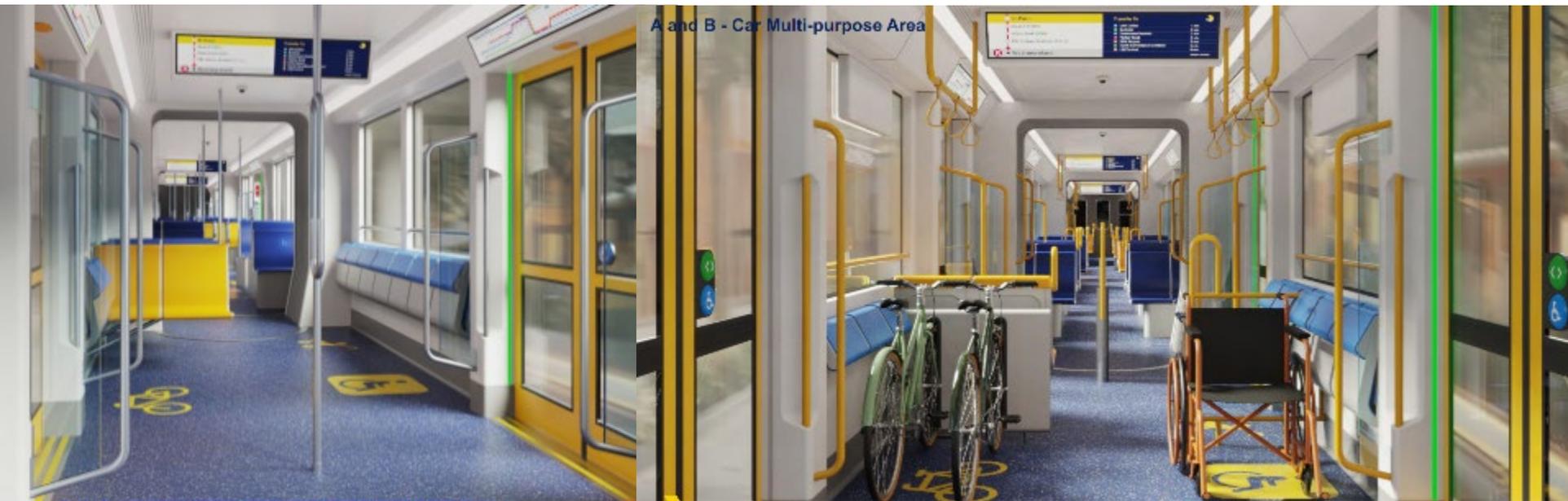


Stadler LRV 124'

New Light Rail Vehicles – Overview of Conceptual Design



New Light Rail Vehicles – Conceptual Design



- Accessibility via level boarding at all doors
- Improved passenger information displays, door indications and larger windows
- Improved lighting on vehicles

New Light Rail Vehicles – Conceptual Design



- Improved operator cab with increased visibility and climate control

Resiliency Items – All Season

Planned Projects: All season events prioritized due to likelihood of occurrence.

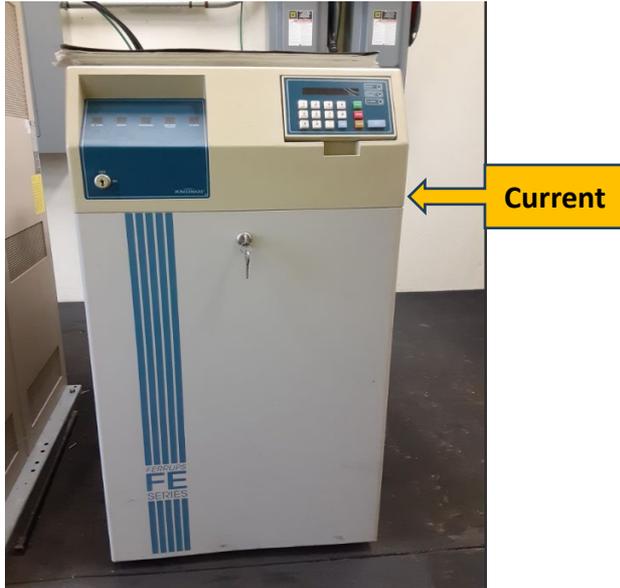
Category	Scope	Problem/Recurrence
Systems	Increase Battery Back-up / UPS	<ul style="list-style-type: none"> • Current UPS not rated to handle extended outages; • 47 outages from 1 location alone in last 5 years
LRV	Replace Air Supply Unit (ASU)	<ul style="list-style-type: none"> • ASUs operate doors, brakes, and horns • ASUs failing due to age, obsolescence and weather
LRV	Refurbish Air Supply Unit	<ul style="list-style-type: none"> • 158 major repairs to ASUs in 2023 • 294 OCC incidents of ASUs losing pressure in 2023
All Season	LRV	<ul style="list-style-type: none"> • Existing pneumatic door cylinders failures are difficult to repair due to obsolete parts; only for LRVs that will be retained • Approx. 2653 occurrences in 2023 • Approx. 874 major repairs in 2023
	Systems	Thyristor Controlled Rectifier (TCR) Control System Upgrade <ul style="list-style-type: none"> • TCR control system regulates the DC voltage output of the Traction Power Substation (TPSS) and provides operational status of the TCR • This project addresses damage resulting from electrical surges caused by lightning and obsolescence of parts • Only 2 spare control system boards in stock

Resiliency Items – Winter / Summer

Planned Projects: Prioritized due to disruption to service upon occurrence.

	Category	Scope	Problem/Recurrence
Summer	Systems	Replace Overhead Contact Wire Counterweights w/Automatic Tensioners	<ul style="list-style-type: none"> • Conductors of overhead contact system expand due to heat, causing the conductors to sag, which reduces speed and creates 10-15 minutes delay • 35 destructive interfaces in 2023
Winter	Systems	Anti-icing Paste/Gel Vehicles for OCS	<ul style="list-style-type: none"> • Ice/snow accumulation on bottom of contact wire results in loss on conductivity to LRV and system slow down or shutdown
	Systems	Ice Shrouds over OCS	
	LRV	Replace Existing Pantograph with Heated Ice Cutting Collector Strip	<ul style="list-style-type: none"> • Cold weather events cause disruptions when pantograph freezes over
	LRV	Heated Windshields	<ul style="list-style-type: none"> • Cold weather events cause interruptions with windshields and mirrors icing over, delays pullout approximately 15-30 minutes

All Weather - Signal Alternate Power Capacity



Issue:

When utility power is lost, existing UPS (back-up power) is not rated to handle extended outages. In the last 5 years, there have been 47 outages from one (1) location alone.



Solution:

Increase battery backup power capacity through replacement with new UPS units at 10 major interlocking locations.

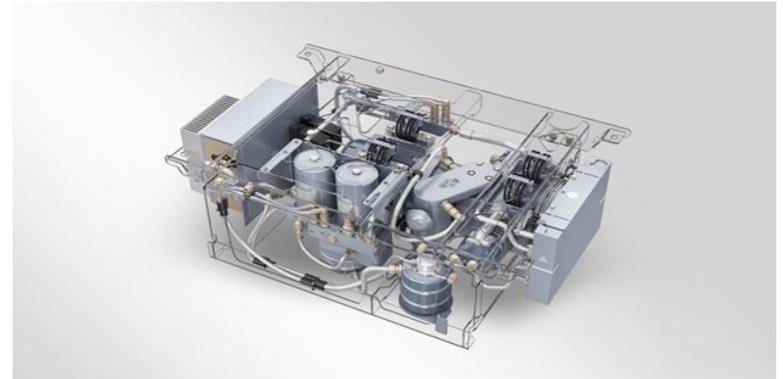
All Weather – Air Supply Unit



Issue:

Air supply units (ASUs) on LRVs that operate doors, brakes, and horns that are failing due to their age and obsolescence. Extreme weather also impacts performance.

- Approximately 158 major repairs to ASUs in the past year (2023)
- Approximately 294 OCC incidents of ASUs losing air pressure in past year (2023)



Solutions:

- 1) Replace the ASUs on 68 LRVs that are not programmed within the older LRVs replacement.
- 2) Refurbish the ASUs on 95 LRVs that DART will replace and use until the new LRVs arrive.

All Weather – Pneumatic Door Replacement with Electric



Issue:

Existing pneumatic door cylinders on LRVs fail to operate due to loss of air pressure resulting from faulty air supply units.

- Approximately 2,652 occurrences of doors failure incidents losing air pressure in past year (2023).
- Approximately 874 major repairs to the pneumatic door system in the past year (2023).



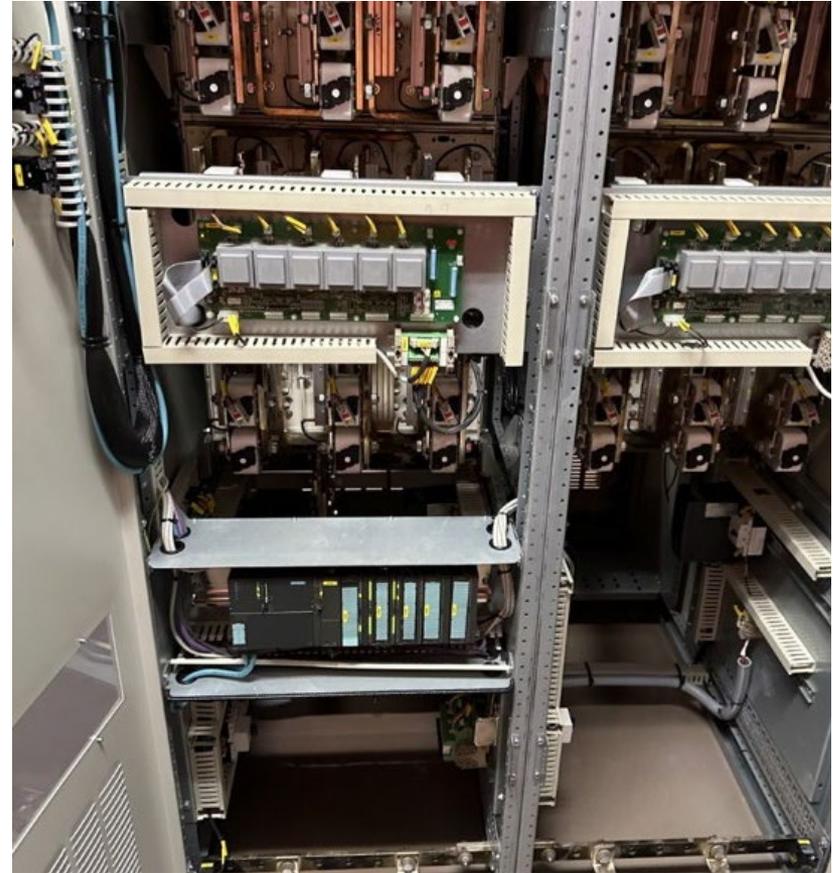
Solution:

Replace the pneumatic door cylinders with electric cylinder drive on the 20 LRVs that are not programmed within the older LRVs replacement.

All Weather – Thyristor Controlled Rectifier Control System

Issue: Electrical surges damage the Thyristor Controlled Rectifier System. Parts obsolescence is making repair difficult.

Solution: Upgrade system at 8 substations to address damage and ensure ability to address potential for multiple substation outage, which would cause operational delays.



Extreme Heat – Overhead Catenary Wire

Issue: Extreme heat causes the conductors of the overhead contact system to expand to the point where the counterweights bottom out on the lower temperature limit plate. This effect causes conductors to sag, resulting in reduced speeds. This creates 10-15 minute delays in DART's travel times. System speed reductions were imposed to 40-mph systemwide in 2023.

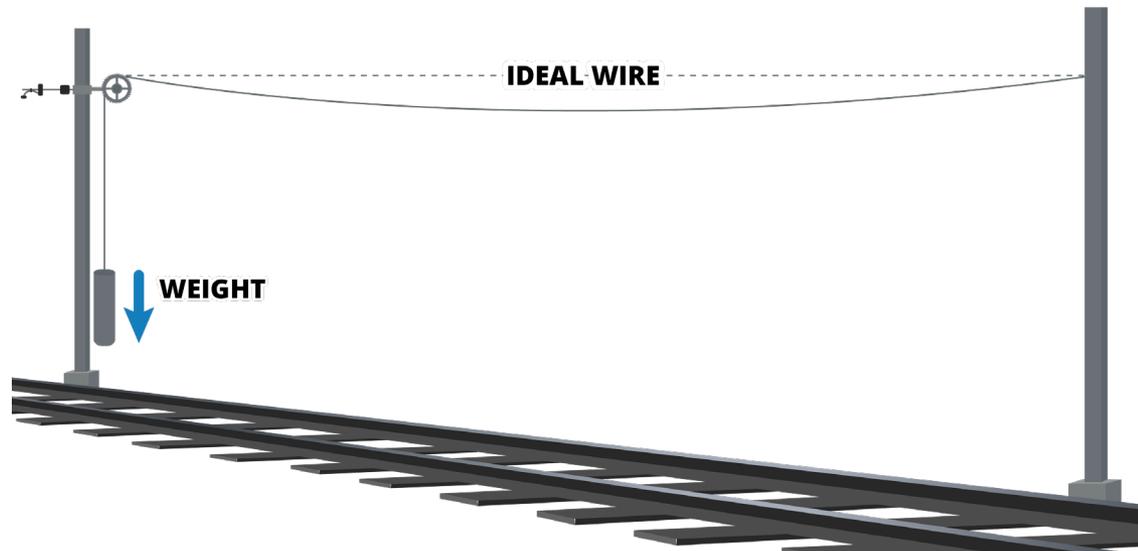
In worst-case scenarios, catenary entanglements occur with the LRV pantograph result in extended service disruptions.

No. of Destructive Interfaces in 2023: 35



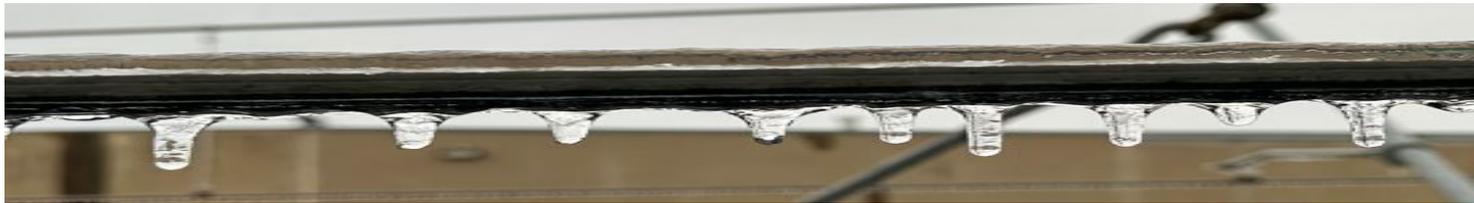
Solution: Replace counterweights with automatic tensioning device system wide (511 units), eliminating regular adjustments.

Extreme Heat – Overhead Catenary Wire



Severe Winter - Contact Wire

Issue: Ice and/or snow accumulation on bottom of the contact wire, resulting in loss on conductivity to LRV and system slowdown or shutdown.



Solutions:

- 1) Anti-icing Paste/Gel
- 2) Shrouds (Ice Caps) for Contact Wire



Severe Winter - Pantograph and Windshield

Issue: Winter events (ice, snow, freezing temperatures) can cause LRT service interruptions with:

- 1) Windshields and mirrors icing over – this occurs when the air temperature is at or below freezing (32 degrees). Current time to clear: 15 mins to 30 mins.
- 2) Pantographs icing over

Solutions:

- 1) Replace forced-air defrosters with electrically-heated windshields on the 68 LRVs that are not programmed within the older LRVs replacement.
- 2) Replace Existing Pantograph with Heated Ice Cutting Collector Strip on the 68 LRVs that are not programmed within the older LRVs replacement.

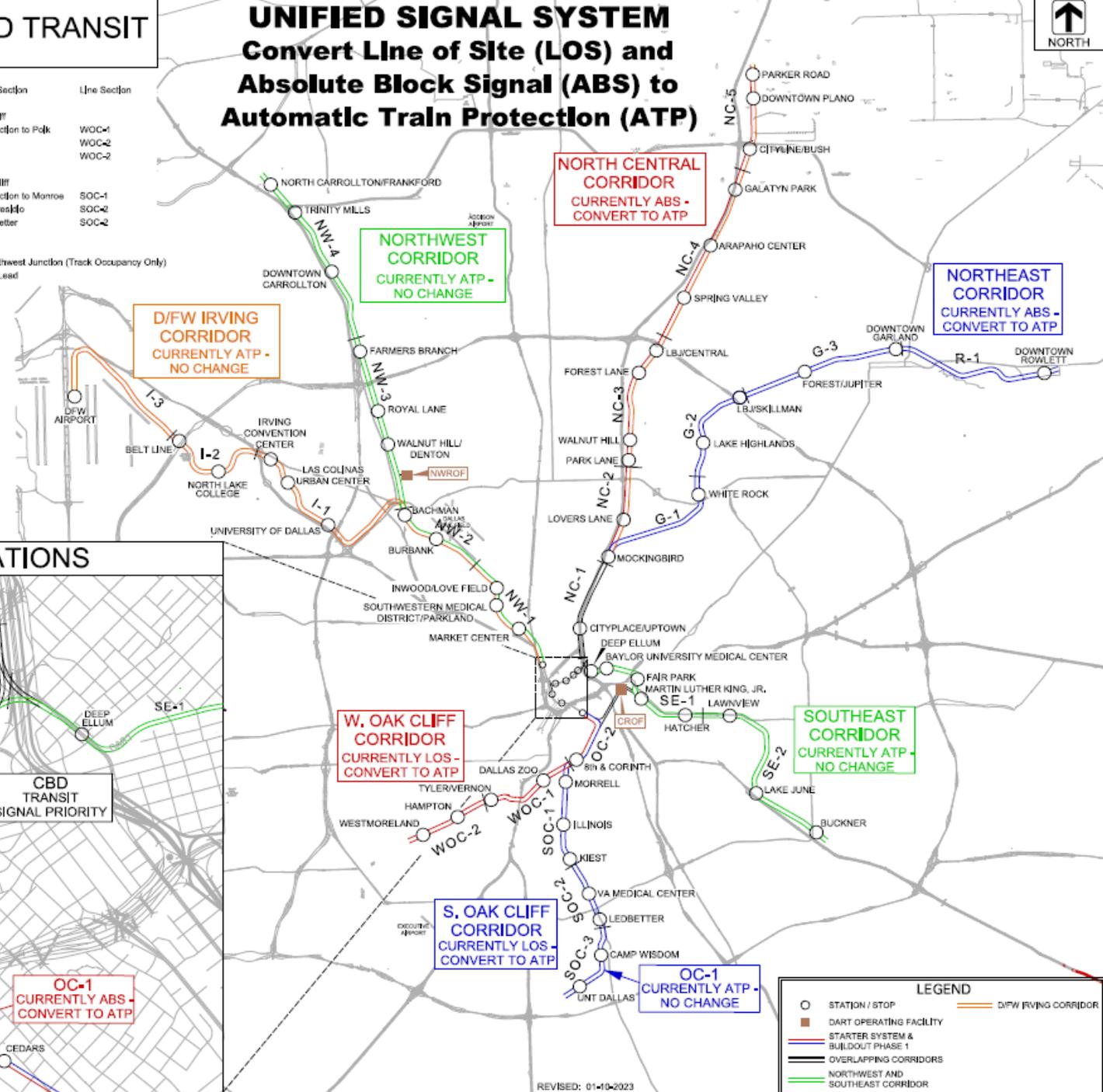




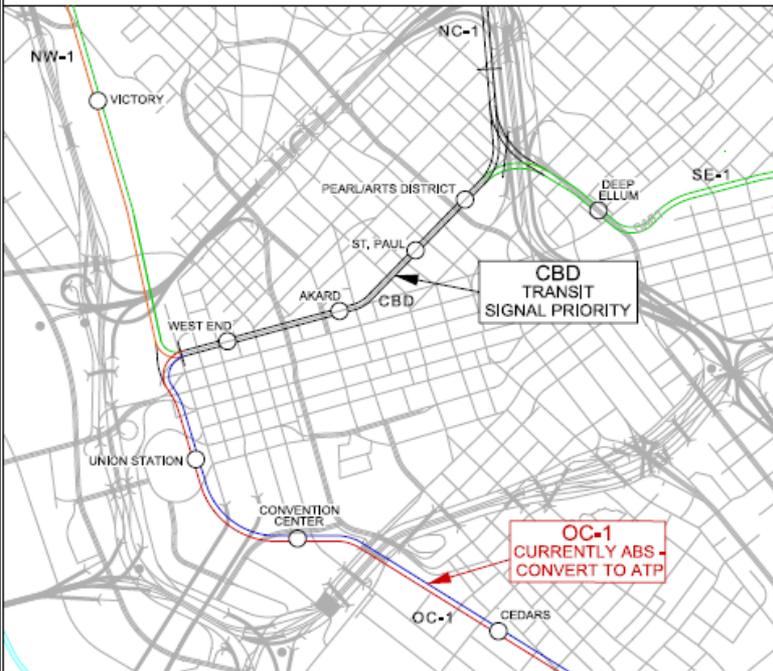
UNIFIED SIGNAL SYSTEM Convert Line of Site (LOS) and Absolute Block Signal (ABS) to Automatic Train Protection (ATP)



Group	Interlocking Section	Line Section	Group	Interlocking Section	Line Section
1	North Central Portal to Blvd	NC-1	4	West Oak Cliff	WOC-1
	Blvd to Katy	NC-1		Oak Cliff Junction to Polk	WOC-2
	Katy to Greenville	NC-2		Polk to More	WOC-2
	Greenville to Tree	NC-3	5	South Oak Cliff	SOC-1
	Tree to Mark	NC-3		Oak Cliff Junction to Monroe	SOC-1
	Mark to Sherman	NC-4		Monroe to Presidio	SOC-2
	Sherman to Hill	NC-4		Presidio to Better	SOC-2
	Hill to Telecom	NC-5	6	CBD	
	Telecom to Bush	NC-5		Portal to Northwest Junction (Track Occupancy Only)	
	Bush to Archer	NC-5		CROF Yard Lead	
Archer to Parker Road (end)	NC-5				
2	Northeast				
	Katy to Woodcrest	G-1			
	Woodcrest to Knights	G-1			
	Knights to Balnes	G-2			
	Balnes to Miller	G-3			
3	Oak Cliff				
	Northwest Junction to Center	OC-1			
	Center to Santa Fe	OC-1			
	Santa Fe to Nineteen	OC-2			
	Nineteen to Cleveland	OC-2			
Nineteen to Oak Cliff Junction	OC-2				



DOWNTOWN DALLAS STATIONS



LEGEND

- STATION / STOP
- DART OPERATING FACILITY
- STARTER SYSTEM & BUILDOUT PHASE 1
- OVERLAPPING CORRIDORS
- NORTHWEST AND SOUTHEAST CORRIDOR
- D/FW IRVING CORRIDOR

Long-Term Debt Issuance (\$M)

Project	FY 2025	FY 2026	FY 2027	FY 2028	FY 2029	5-Yr Total	20-Yr Total
RRIF - Silver Line	\$519.2					\$519.4	\$519.4
Silver Line		\$364				364	364
Unified Signal			\$200	\$200	\$200	600	710
Platform Level Boarding			70	60	30	160	190
LRV				100	50	150	1,350
Total	\$519.2	\$364	\$270	\$360	\$280	\$1,793.4	\$3,133.4

Project	FY 2030	FY 2031	FY 2032	FY 2033	FY 2034	FY 2040	FY 2041	FY 2042
Unified Signal	\$110							
Platform Level Boarding	30							
LRV	160	\$200	\$220	\$190	\$130	\$200	\$50	\$50
Total	\$300	\$200	\$220	\$190	\$130	\$200	\$50	\$50

- Debt issuance is for previously approved projects
- No new FY 2025 capital project requests require debt funding
- Removed planned debt issuance for new TRE vehicles and Dallas Streetcar