



DC Circulator

Electric Bus Program

d.

July 28, 2020

CHARGING FACILITY IDENTIFICATION AND CONSTRUCTION



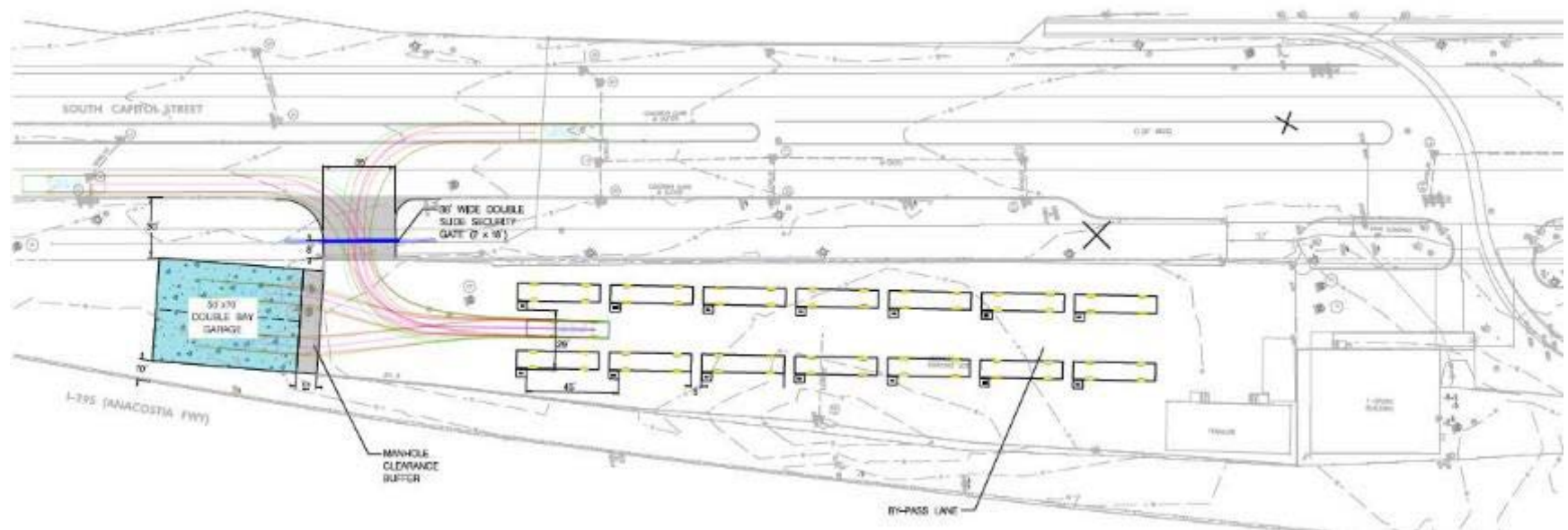
South Capitol Construction

- Substantial completion on April 14, 2018
- Chargers installed/ commissioned on April 19, 2018
- Electric bus service began May 1, 2018



Next Steps

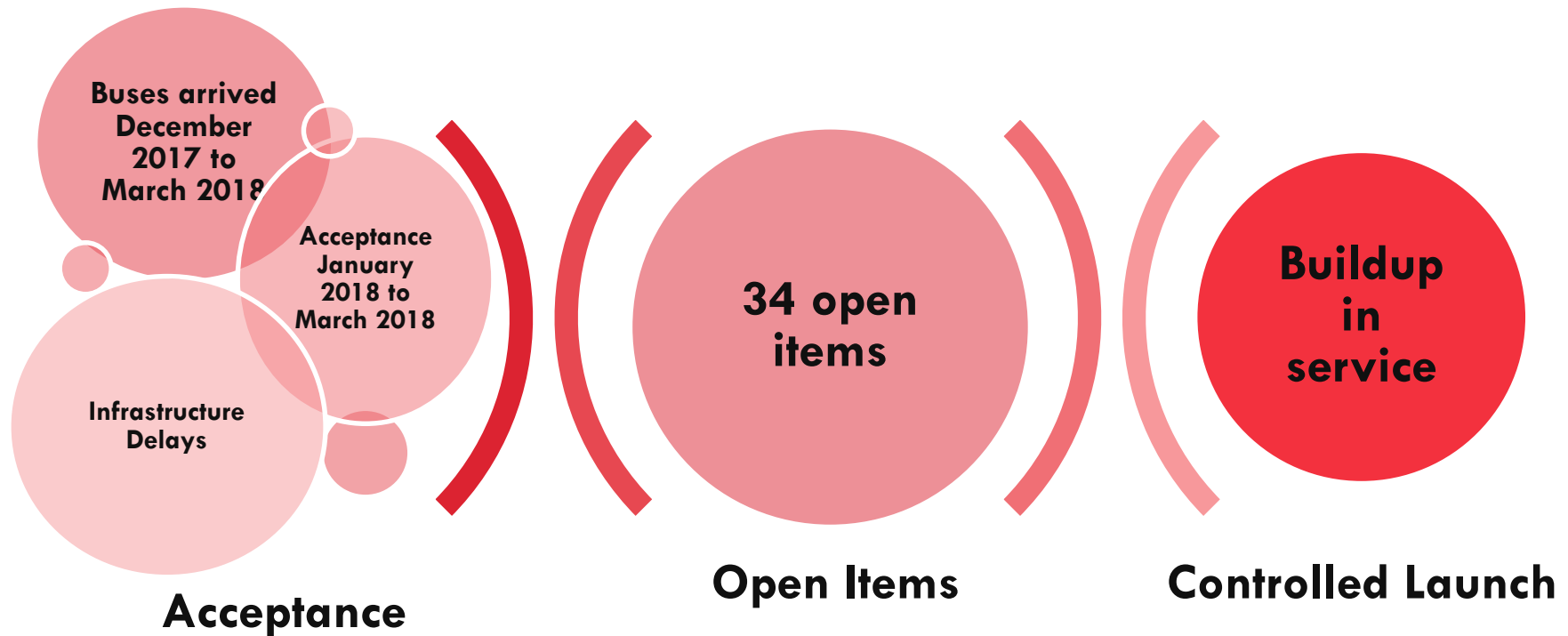
- Add a turn bay from southbound South Capitol
- Add concrete bus pads at chargers
- Construct new maintenance garage



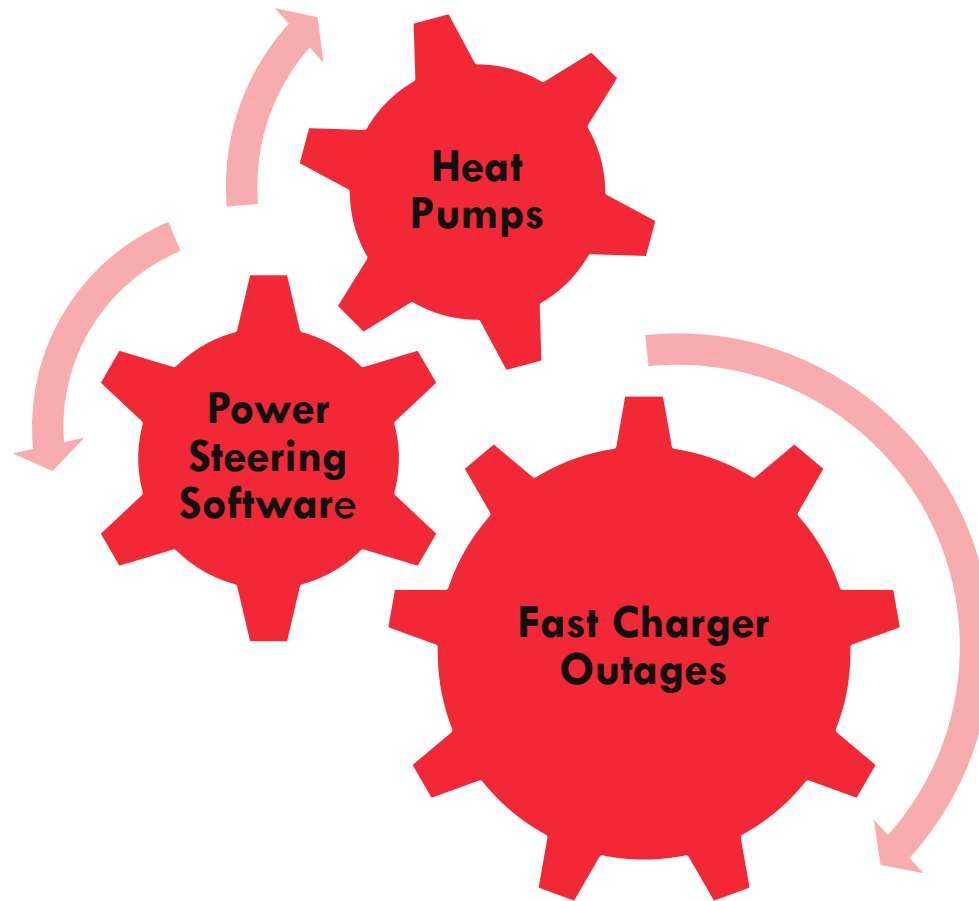
OPEN ITEMS



Challenges During Acceptance: Open Items



Most Common Open Items



PRELIMINARY FINDINGS



Initial Pilot Finding – Average Range

Nominal Range vs. Operating Range

NOMINAL RANGE =

Total nameplate energy in batteries (kWh) ÷ Vehicle efficiency, based on Altoona testing (kWh/mile)

251 miles

OPERATING RANGE =

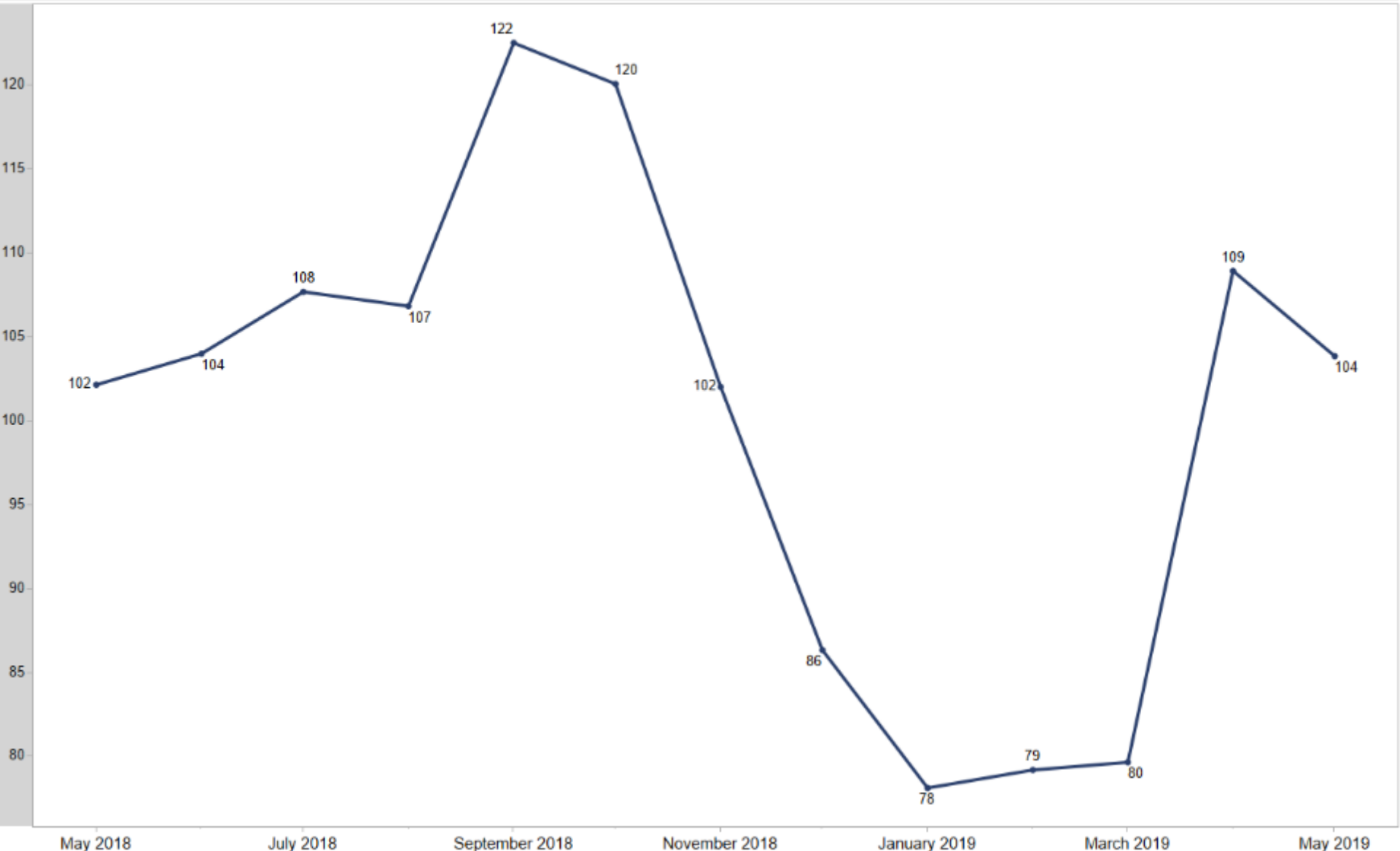
Usable energy in batteries (kWh) ÷ Operating efficiency (kWh/mile)

1 miles

Source of formula: Proterra. Understanding Range: Clarity behind the Calculations. 2018

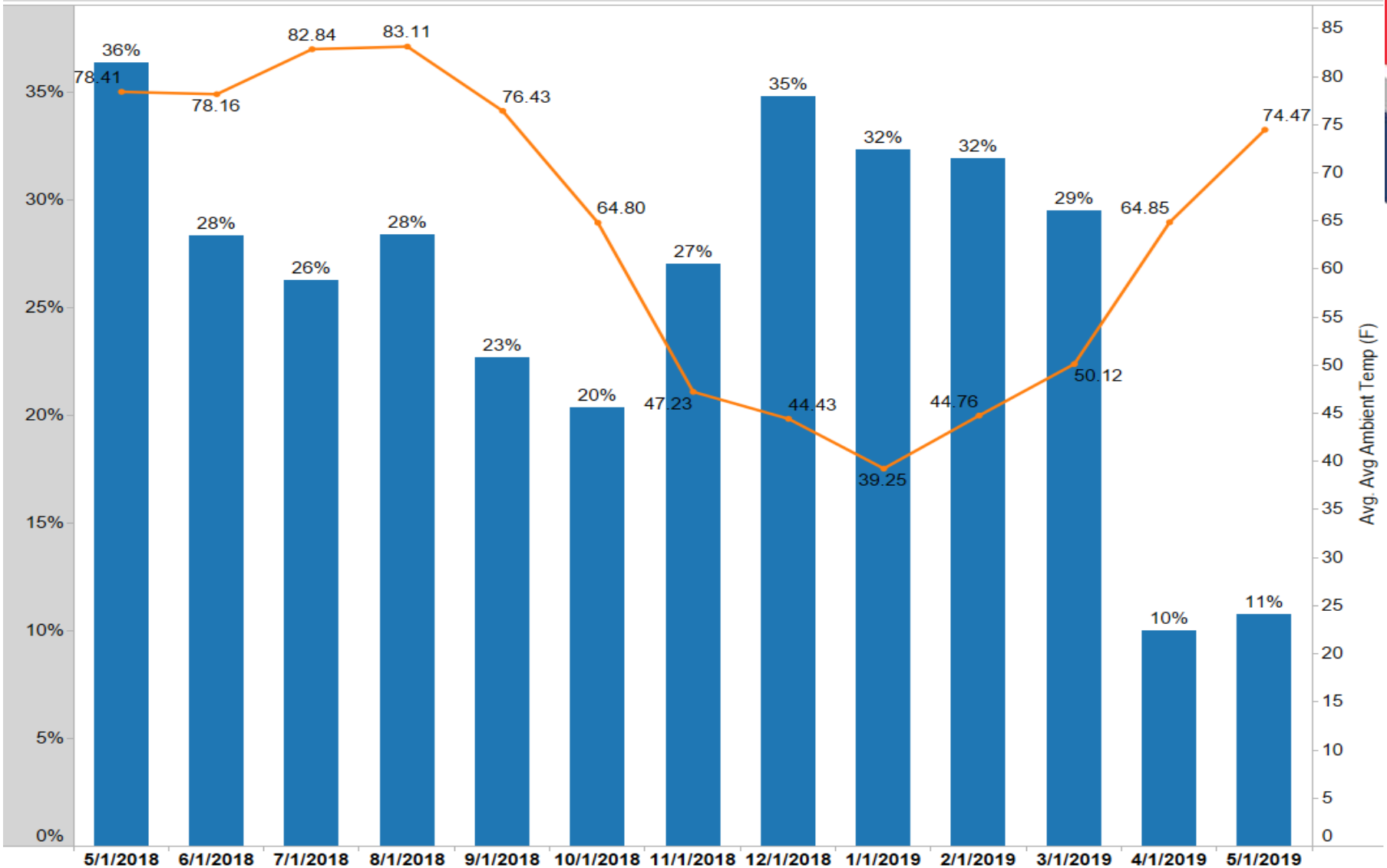
Initial Pilot Finding – Average Range by Month

Average Operating Range by Month



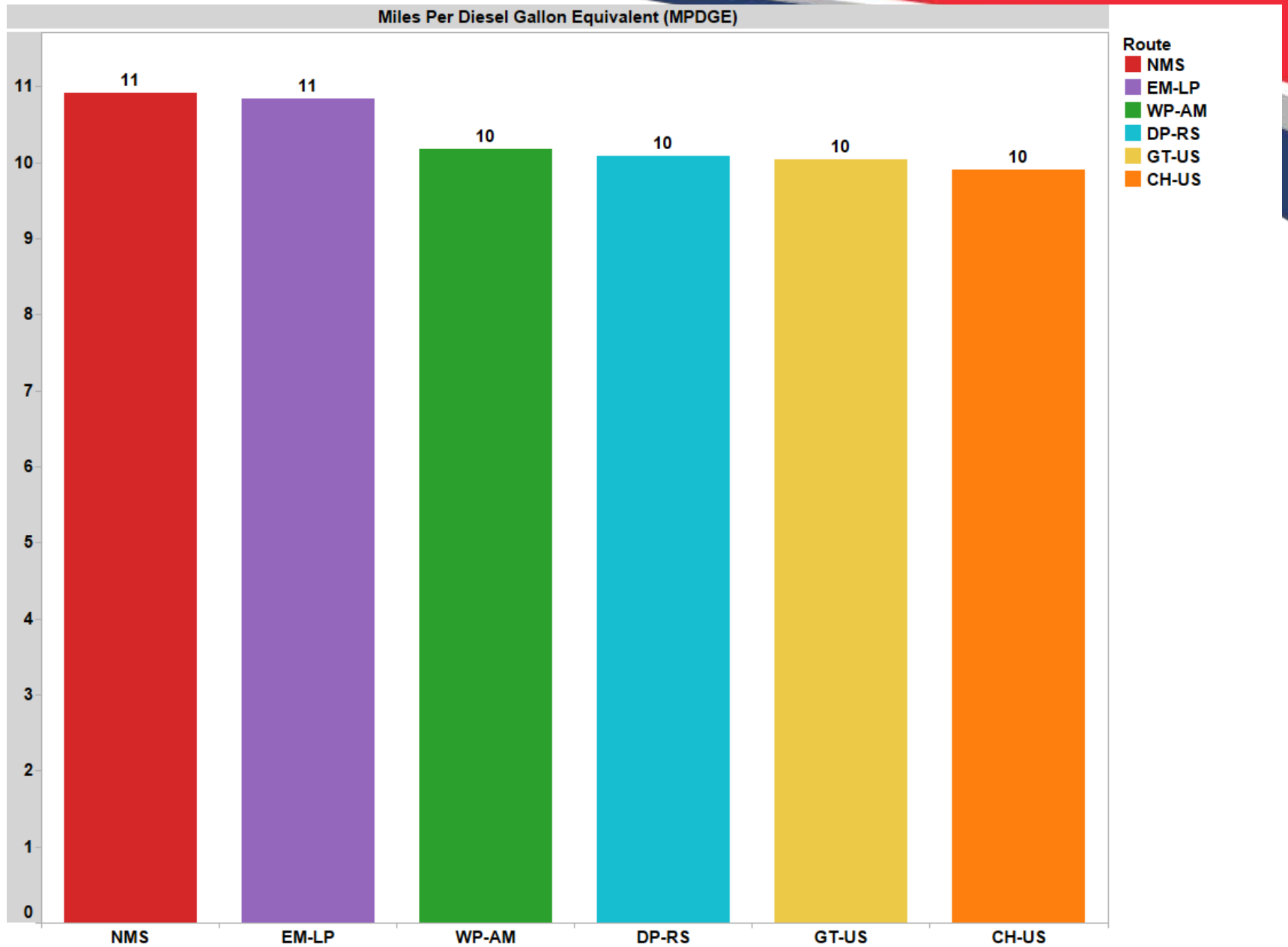
Initial Pilot Finding – Temperature’s Impact

Heating & Cooling Energies vs. Temperature by Month



Measure Names
■ Avg. Avg Ambient Temp (F)
■ Avg. HVAC + Defroster Energy Consumption

Initial Pilot Finding – MPDGE



Initial Pilot Findings – Dashboard



Circulator Electric Bus Pilot Program Dashboard (05-01-2019 – 05-31-2019)



148,487

Miles Traveled

22,074

Running Hours

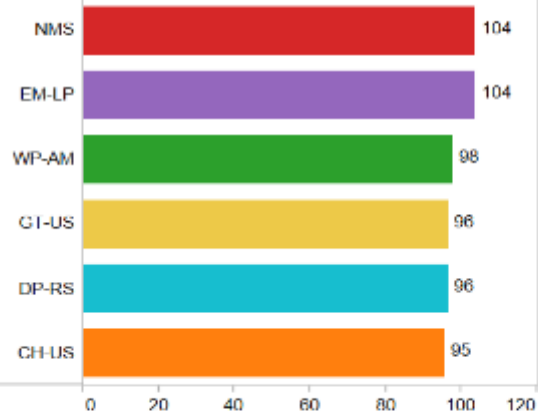
98

Miles Operating Range

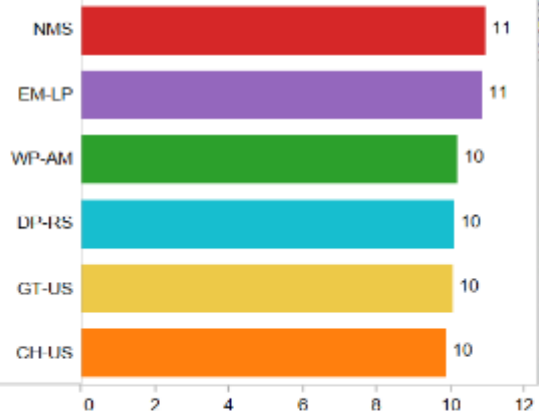
10

Miles per Diesel Gallon Equivalent

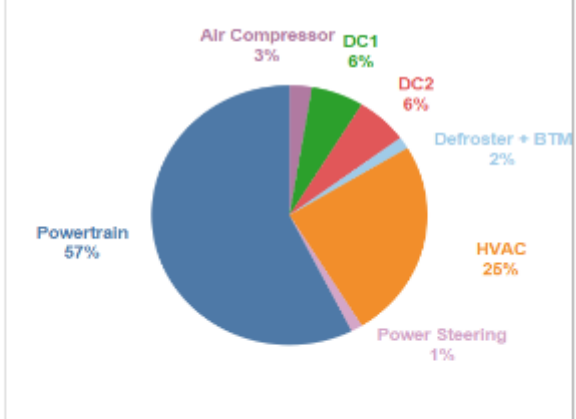
Operating Range by Route



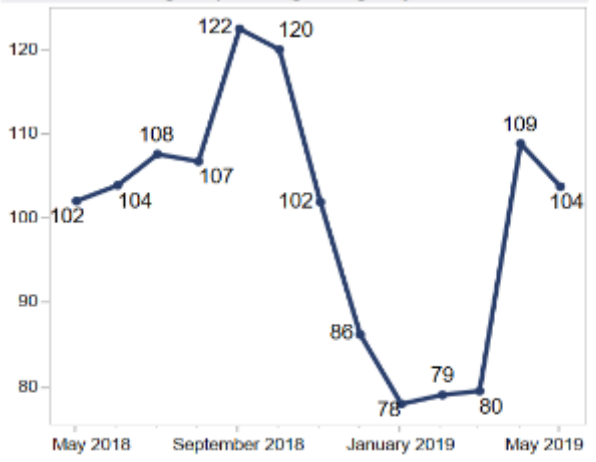
Miles per Diesel Gallon Equivalent



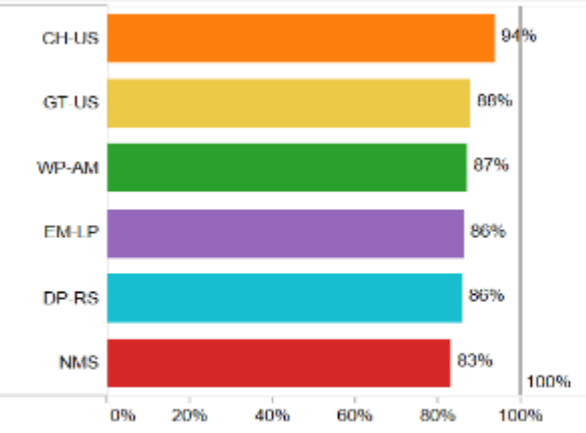
Energy Consumption



Average Operating Range by Month



Average SOC Required for 10-Hour Revenue Service with 30% Energy Reserve



Month/Year

- May 2018
- June 2018
- July 2018
- August 2018
- September 2018
- October 2018
- November 2018
- December 2018

Route

- CH-US
- DP-RS
- EM-LP
- GT-US
- NMS
- WP-AM

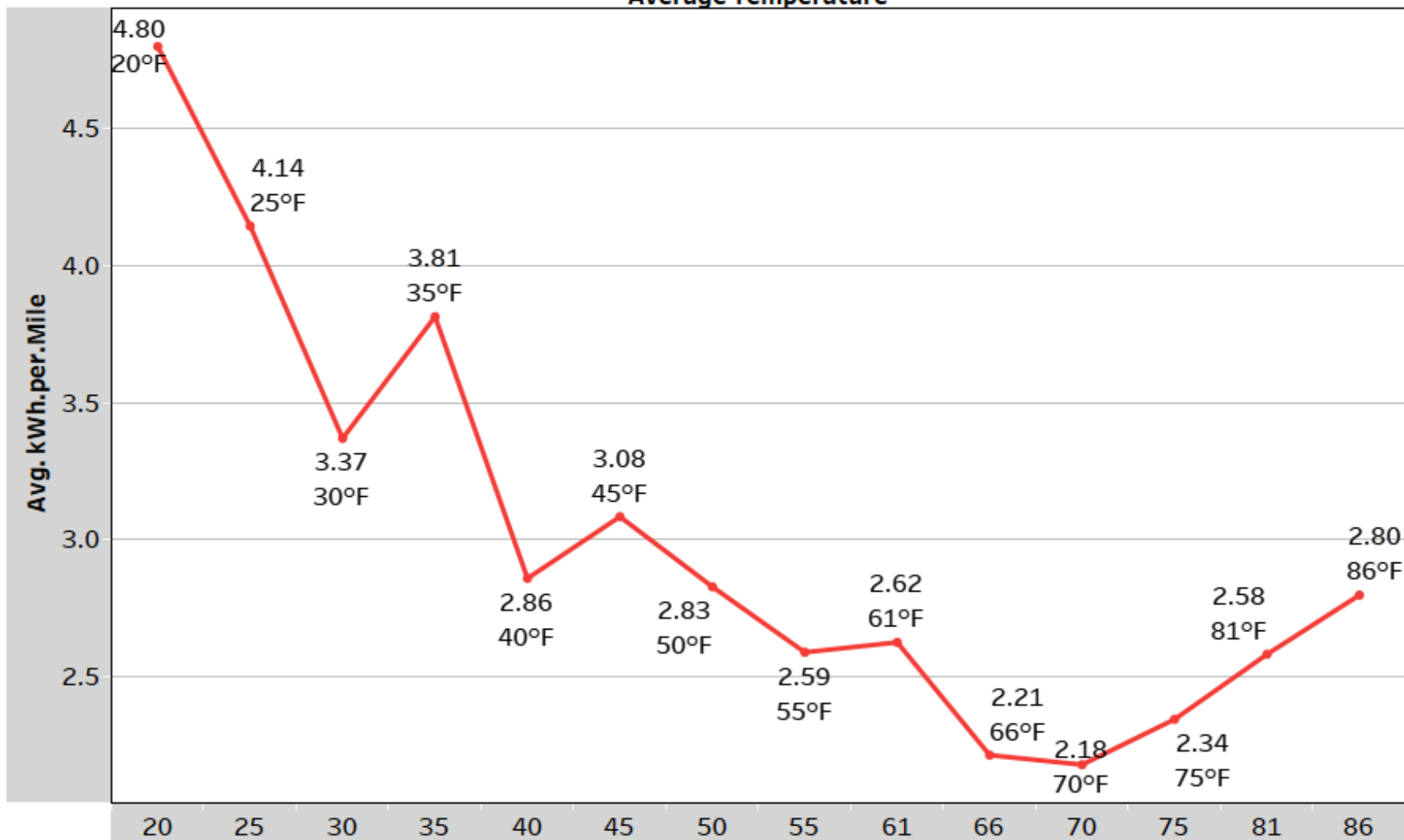
Route Names

- Congress Heights - Union Station (**CH-US**)
- Dupont Cir. - Georgetown Rosslyn (**DP-RS**)
- Eastern Market - 1st Tenant Plaza (**EM-LP**)
- Georgetown - Union Station (**GT-US**)
- National Mall (**NMS**)
- Woody Park - Adams Morgan (**WP-AM**)

Tipping Point Temperature

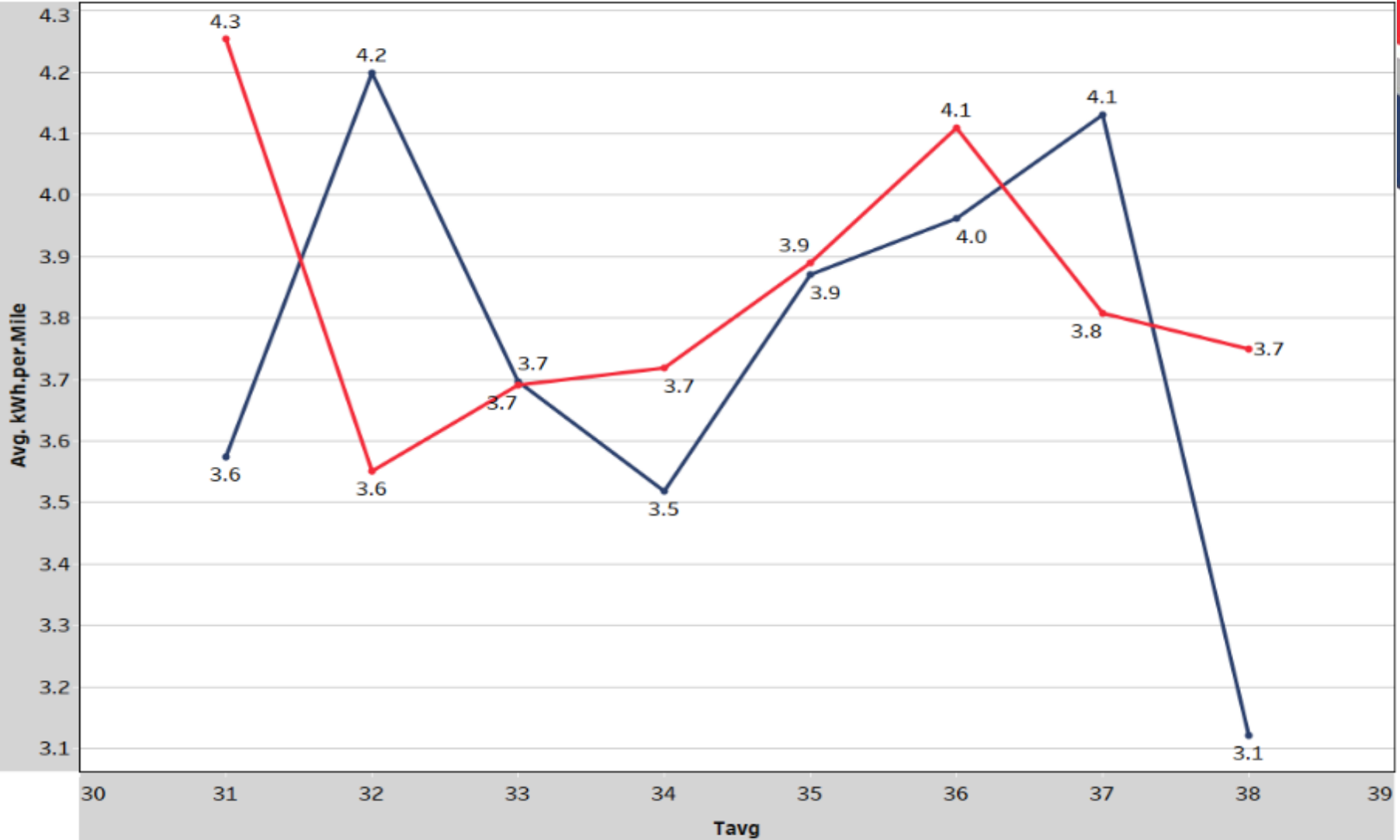
Seasonality and Energy Consumption

Average Temperature



Snow Events

Energy Consumed During Snow and Non-Snow Events



Snow Event/Non-Snow Event

■ Snow Event

■ Non-Snow Event

OPPORTUNITIES AND LESSONS LEARNED



Lessons Learned

- Data collection and its implications are an evolutionary process
- Determine if you “need to” purchase electric buses or “want to” purchase electric buses
- Plan the procurement tool you will use
- Assemble a support team that understands the type of technology under consideration
- Ensure close coordination with the manufacturer
- Infrastructure installation is complex, ensure to work with your power company, environmental agency, and licensing division
- Electric bus acceptance is unique, ensure the expertise are there
- Carefully plan training for maintenance and operations staff
- Closely monitor charging infrastructure performance
- Plan for winter
- Carefully select the source of your data

Future Projects



Circulator
Sustainability
Plan

Electric Bus
Procurement

d.

District Department of Transportation