



Battery Electric Bus (BEB) Revenue Performance July 2019 – February 2020

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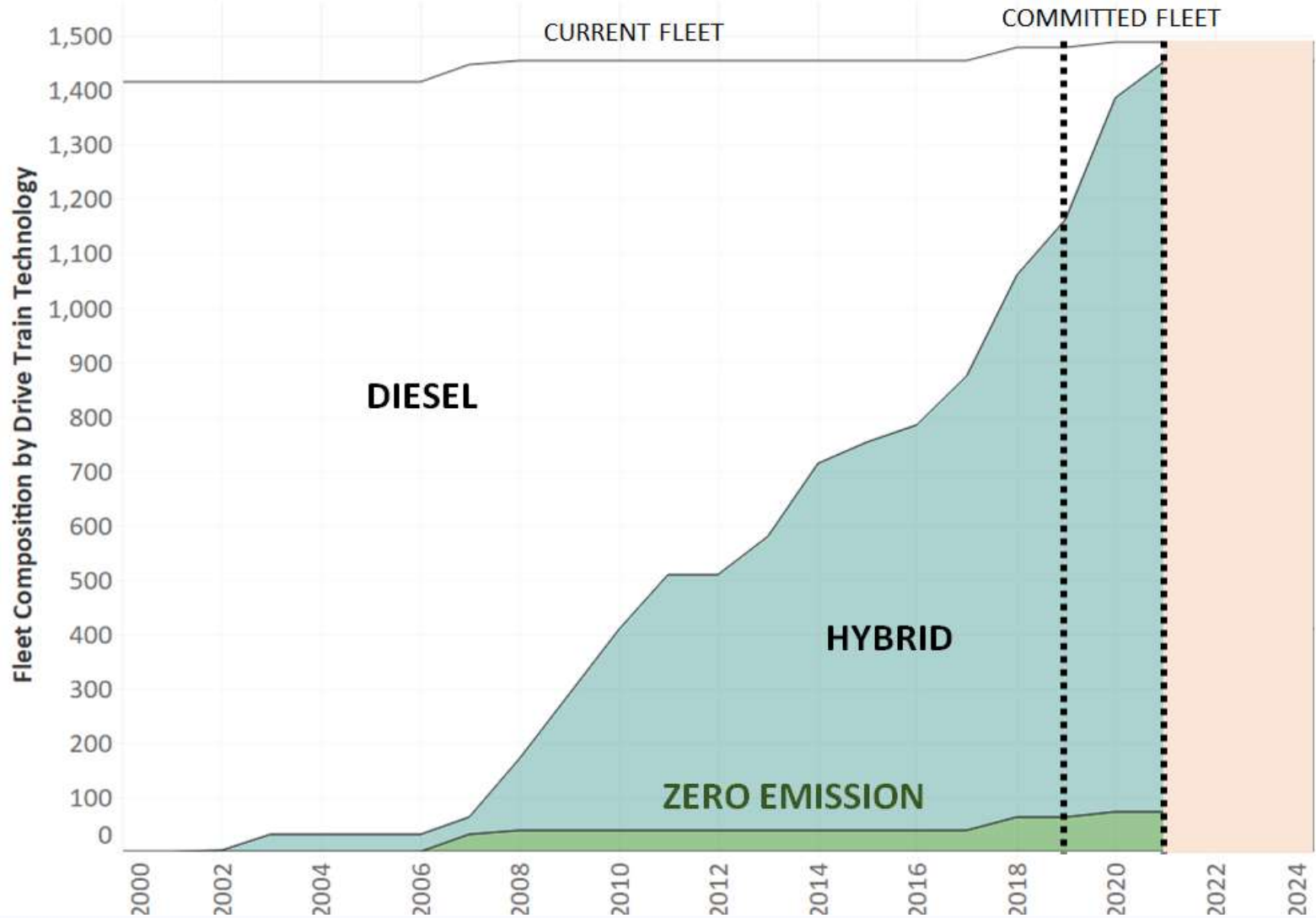
SEPTA at a Glance

- 6th Largest Transit System in U.S.
- Multimodal “Legacy System”
- Created by PA State Legislature in 1964
- Philadelphia Region (Five Counties)

- 1 Million Daily Riders
- 300 Million Annual Riders
- 2,800 Vehicles
- 9,500 Employees
- \$1.4B Operating Budget
- \$675M Capital Budget



Bus Fleet Technology Trend



History of Zero Emission Buses @ SEPTA

- **2007:** 38 Trolley Buses (“Trackless Trolleys”) Procured
- **2012:** Fleet Technology Evaluation in Favor of Hybrid-Electric (& Potential of BEB)
- **2016:** FTA LoNo Grant Received for 25 Battery-Electric Buses (BEB) (Vendor: Proterra)
- **2017:** Change Order to Proterra for “Extended Range” Buses
- **2018 (Spring):** BEB Depot Charging Infrastructure Installed
- **2018 (Summer):** FTA LoNo Grant Received for 10 BEB (Vendor: New Flyer)
- **2018 (Fall):** BEB Readiness Planning Initiated with PECO + SEPTA Engineering, Facilities, Service Planning, Finance, Operations, Innovation
- **2019 (Summer):** Proterra Buses Delivered & Enter Revenue Operation

BEB Revenue Operation

- **25** ProTerra electric buses, E900-E924
 - 350 kWh stated range (80% of 440 kwh nameplate)
- **~4,100** revenue service trips (blocks)
 - July 1, 2019 – February 10, 2020
 - Routes 29 and 79 only – short (3.5 mi), flat, close to district



BEB Performance Data Sources

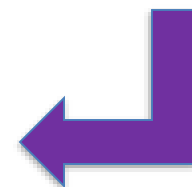
- Daily performance data from ProTerra Apex
- Daily average temp & precipitation from NOAA
- Seasonal picking (block length)
- Daily state of charge (SOC) from VEM

SEPTA - Surface Transportation
 Weekday Southern District
 Vehicle Pull-Out Sheet
 Fall 2019 Schedule Effective: 9-2-2019

DEC 9 2019

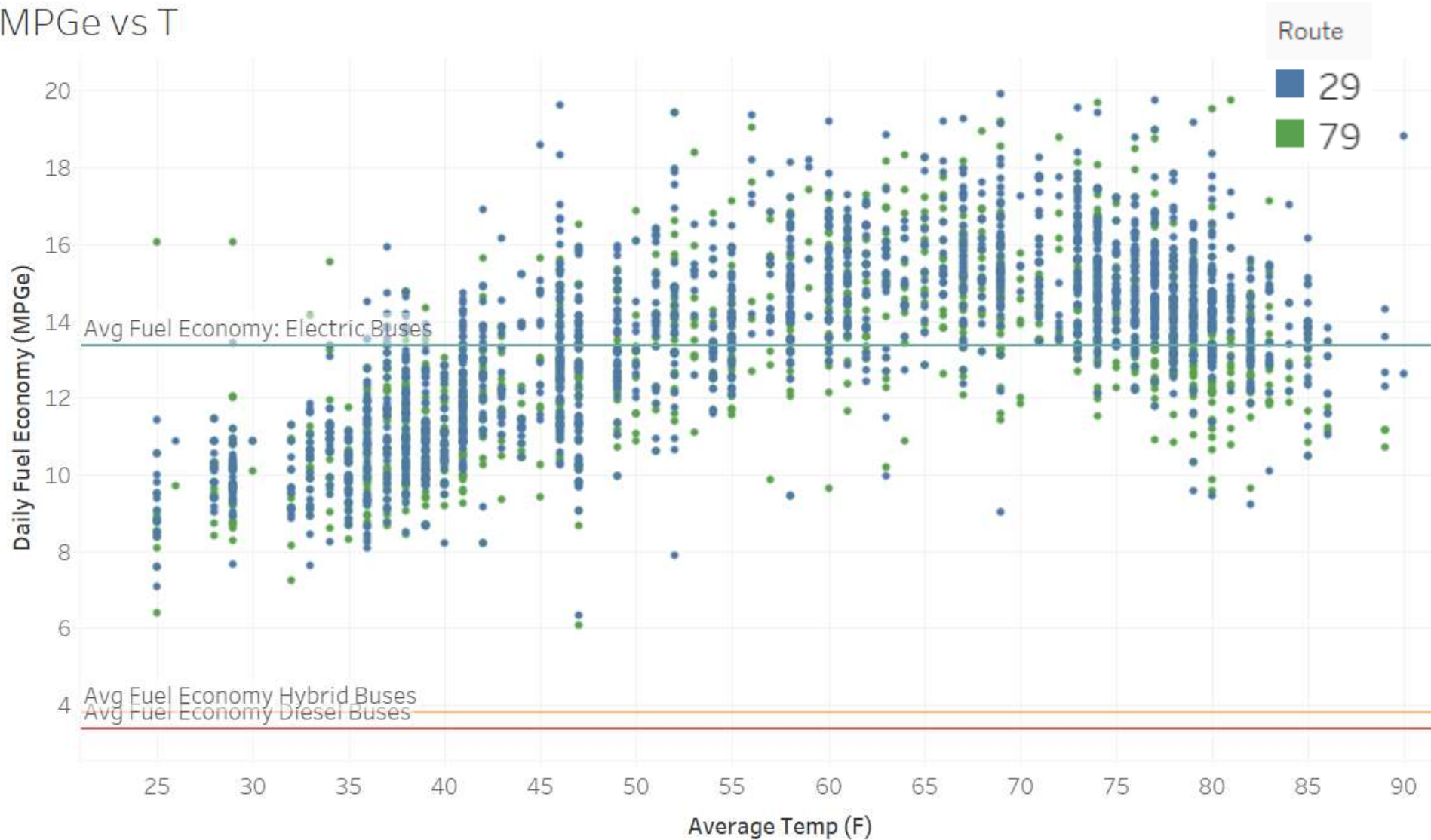
Run	Route	Block	Pull-Out	Pull-In	Vehicle	Misc.	Vehicle Assignment
452	BSO	7275	12:07a	9:42a	8433		
451	BSO	7276	12:14a	9:30a	8437	1016	o/c 3160 @ 5262
453	37	7351	12:23a	8:51a	8043	↑	B/C 8041 @ 1453p
454	BSO	7277	12:24a	9:28a	8444		
201	17	7301	12:27a	8:44a A	7465		
455	BSO	7278	12:34a	9:51a	8013		
456	BSO	7279	12:44a	9:54a	8445		
202	17	7302	12:57a	10:28a A	7483		
951	79	7601	1:07a	9:11a P	823		
601	G	7651	1:50a	11:38a	8031		
602	G	7652	2:25a	12:09p	8040		

- Daily “pullout sheets” from Southern Depot

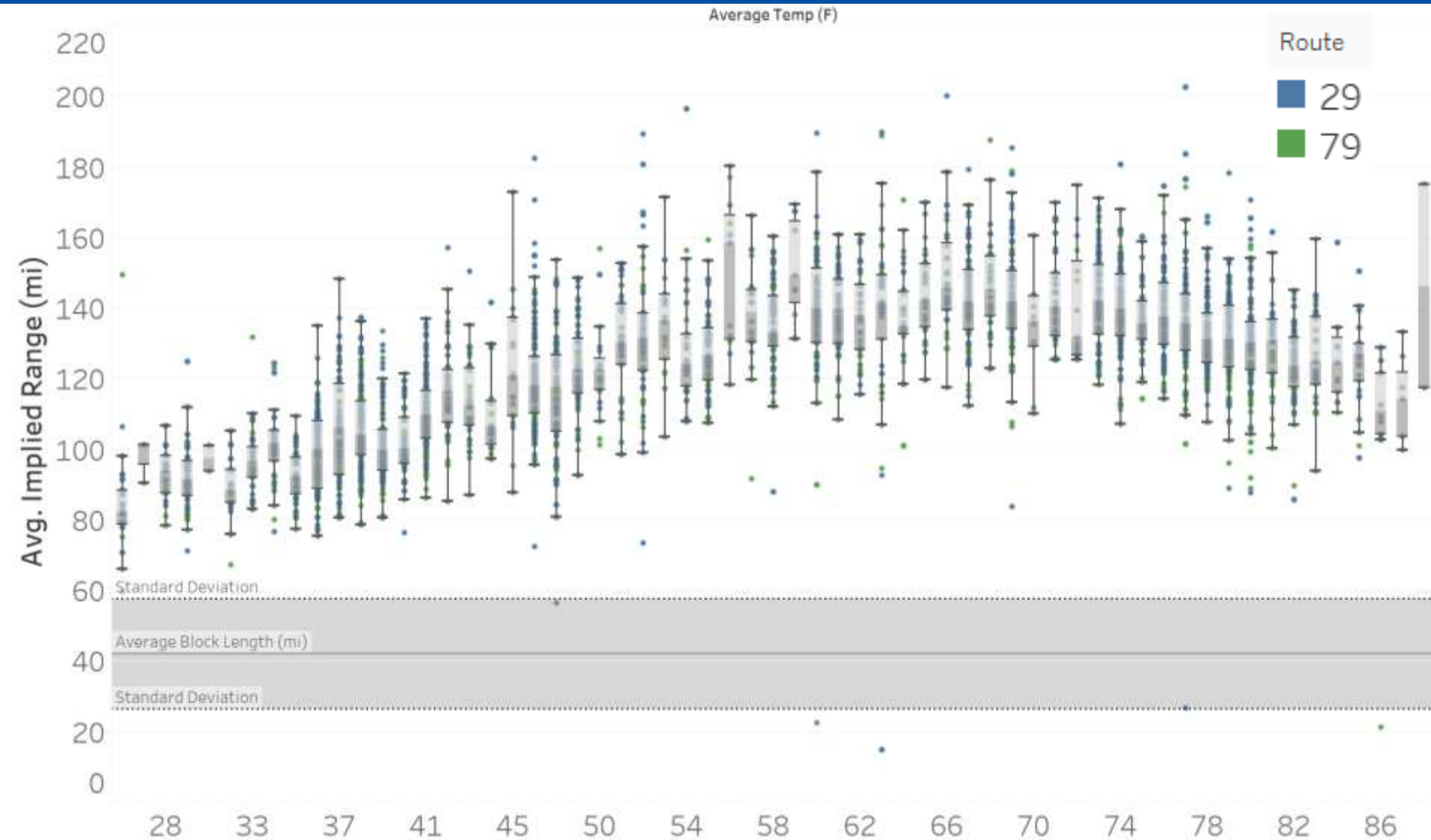


Daily Avg MPGe vs. Daily Average Temp

MPGe vs T

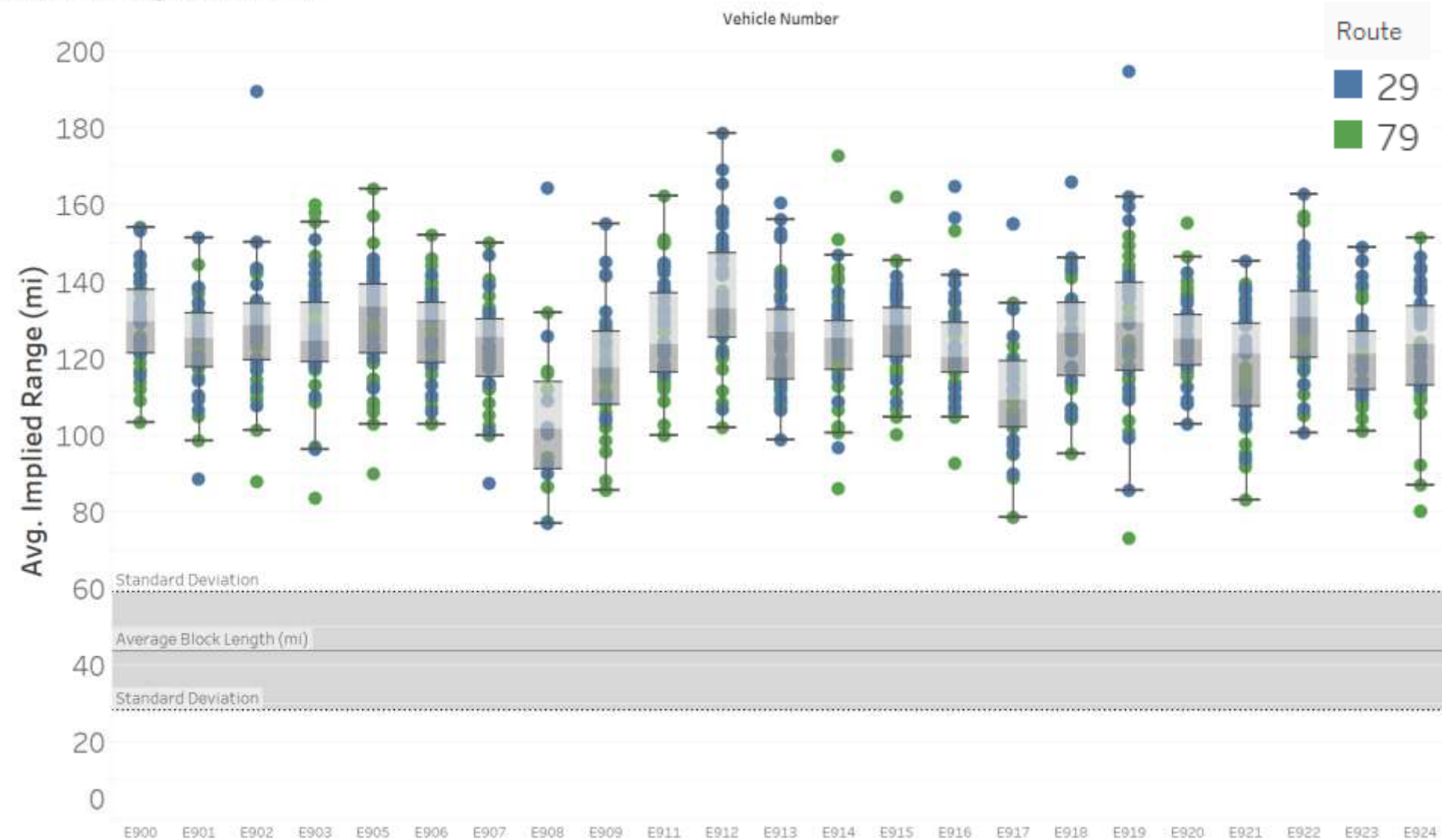


Implied Range vs. Daily Average Temp



Implied Range per Individual Vehicle

Implied Range per Vehicle



Takeaways

ProTerra BEBs have the range (100+ miles) to do the work.

We can extend usefulness by:

- Intelligently combining blocks based on length
- Incorporating mid-day charging

Unknowns

- Non-range bus performance issues
- Data quality – 25% missing
- Battery degradation over time
- Charging options & flexibility
 - Slow vs. fast
 - En-route vs. district
 - Plug-in, induction, pantograph
- Space considerations

Next Steps

- SEPTA BEB Master Plan in development
- Received 2018 FTD LoNo Grant for 10 more BEBs
- Applied for 2020 FTD LoNo Grant to increase power capacity for charging at Midvale bus district



Questions?