## Driving the Shift to Electric Buses in Hot Climates

Battery Electric Buses in the Phoenix Metropolitan Area



#### Agenda

- 1. The Trials-and-Errors of Electric Buses
- 2. Lessons Learned in Extreme Heat
- 3. Looking to the Future





# The Journey to Electric Buses

#### Timeline

#### 2020



2006

#### 1993

Phoenix **demonstrates first** electric buses in the region

#### Tempe **electric buses removed from service** (delays, performance issues, mechanical failures, supplier bankruptcy, and inability to correct deficiencies)

Valley Metro and Tempe **tested Proterra, BYD, and New Flyer buses** in multi-day simulated testing along two routes. Results were satisfactory.



1998

Tempe **procures battery-electric buses** for neighborhood circulator service





2016





Valley Metro **tested BYD electric buses for four weeks**. Buses were tested inservice on neighborhood circulators. Valley Metro, City of Tempe, and City of Phoenix **began applying for federal funding to procure battery electric buses.** 

2021

## Summer 2020 Testing



- Three manufacturers and vehicles
  - Proterra 35' Bus
  - BYD 40' Bus
  - New Flyer 35' Bus
- Simulated revenue service
  - Two routes
  - Various loading conditions
  - Simulated schedules and stops
- Favorable results: 2 of 3 vehicles completed testing with satisfactory performance



## Range During Phoenix Summers





# Lessons Learned. Extreme Heat Edition

Lessons Learned: Charging

- 1. Heat prolongs time needed to charge buses
- 2. ALWAYS shade charging stations
- 3. Air condition charging stations
- 4. Redundancy is helpful install more charging stations than you think you need
- 5. Partner with utility provider and engage them early and often

Lessons Learned: Buses

- 1. Test buses in summer before purchase
- 2. Determine routes based off testing results
- 3. Plan to operate on routes close to charging stations
- 4. Train subset of operators to drive electric buses the way the buses are driven will impact the range
- 5. Consider extended warranties for batteries

# 2021 Electric Bus Initial Investment (Third Time's the Charm!)

- 30 University Dr
- 40 Main St
- 45 Broadway Rd
- 61 Southern Ave
- 67 Starfighter
- 72 Scottsdale Rd / Rural Rd
- 77 Baseline Rd
- 💻 96 Dobson Rd
- 108 Elliot Rd / 48th St
- 112 Country Club Dr / Arizona Ave
- 128 Stapley Dr
- Downtown BUZZ
- Flash



itrus

U.S. city and place boundaries.

#### endale Phoenix Paradise Valley Glendale Scottsdale Phoenix Tempe Bus Yard Mesa Tempe Maricopa Colony Guadalupe Gilbert Estrella Mountain Regional Park Chandler Avondale St. Johns Santa Cruz mapbox > remix Sun Lakes

#### Electric Bus Initial Investment

- 16 electric buses split between Valley Metro and the City of Phoenix
- Depot charging at bus yards in ۲ **Tempe and Phoenix**
- Partners •
  - Valley Metro
  - City of Phoenix
  - City of Tempe
  - Salt River Project (local utility provider)

#### Questions to be Answered in Initial Investment



- Heat-Related
  - How will the heat impact the longevity of the buses and charging equipment?
  - How will prolonged exposure to heat impact range over time?
  - How will the effects of climate change impact electric buses?
- Other Questions
  - What are the lifecycle costs of the vehicles for our operations?
  - Will electric buses improve the rider experience?

## Summary and Takeaways



- The extreme heat and sprawl of the Phoenix Metropolitan Area presents challenges for adopting battery electric transit buses
- With comprehensive planning, it is possible to operate electric buses successfully in these conditions
- Valley Metro remains engaged in providing the most sustainable transportation options for our riders and we look forward to adding electric buses to our fleet

### **Thank You!**

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