Range Anxiety for Operators

Norm Hickling
Chief Operating Officer

American Public Transportation Association – Bus and Paratransit Conference

Full *Green* By 2018

Pilot Program

Data Data Data

What will our fleet look like past 2018

How will we run them in route all day?

Training

Convert the parts room

Procure 2 BYD 40’ Battery Electric Buses

Collect incredible amounts of data

50 Local & 35 Commuter

Charging Infrastructure

Operators and Technicians

Say goodbye to Diesel Parts!!!

AVTA
Antelope Valley Transit Authority

Pilot Test

September 2014	Took delivery of 2 BYD electric buses
September 2014	Began training Operators and Technicians
September 2014	Initiated installation of 2 Depot Chargers
November 2014	Rolled out pilot bus for revenue service
Nov. 14~ongoing	Began collecting massive amounts of data

Antelope Valley Transit Authority

Results Were Favorable

- Two BYD 40’ battery electric buses
- 90% availability for service
- Average range 180 miles @ 1.8kw/mile
- 15,000 Miles between service interruptions
- Average operating cost:

  Maintenance + Electricity $.32/mile

Antelope Valley Transit Authority

Hold On, Here We Go!!
February 2016 Board of Directors meeting

- AVTA awarded a contract for 85 Battery Electric Buses to BYD
  - *35 – 45’ Commuter Coaches*
  - *14 – 60’ Articulated Buses*
  - *36 – 40’ Local Transit Buses*
- $5 Million infrastructure project for 89 Depot Charging Stations at main facility
- $10 Million infrastructure project for High Power Wireless Inductive Charging Systems

Antelope Valley Transit Authority

Antelope Valley Transit Authority

Mitigating the "ANXIETY" Factor

- Infrastructure
- Route Planning and Execution
- Operations
- Organizational Change

Antelope Valley Transit Authority

Infrastructure

- Four inductive chargers at main transit centers
  - Owen Memorial Park
  - Palmdale Transportation Center
- Additional chargers will be installed to support regional service routes structure

Antelope Valley Transit Authority

Infrastructure Inductive/Enroute Charging

AVTA's 1200 square mile service area means that it has longer than average local transit routes; inductive chargers extend mileage ranges sufficient to cover all routes

50kWh Chargers…one located at each transit center

324kW – 10 min charge times = 4 miles of range

4mr X 10 = 40 miles of range extension

180+40=220 potential miles of range

250kWh Chargers…3 located at each transit center

324kW – 10 min charge times = 20 miles of range

20mr X 10 = 200 miles of daily range extension

180+200 = 380 potential miles of range

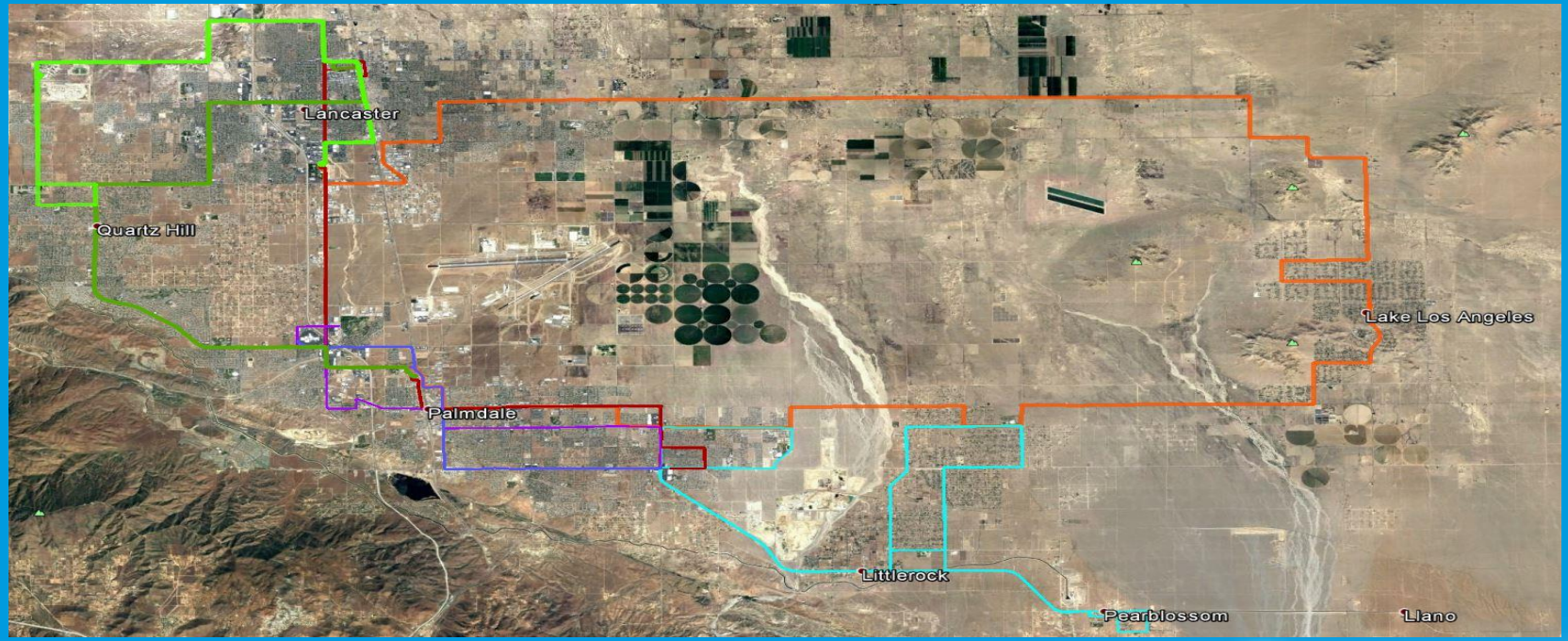
Antelope Valley Transit Authority

Infrastructure Depot Charging

- 89 Depot Chargers…49) 200kWh / 40) 100kWh
- Energy Required Daily…12,500V / 40,500kW
- Peak Available…12,500V / 10,000A
- Emergency standby power…1.5MW (25 buses)

Antelope Valley Transit Authority

Route Planning



Antelope Valley Transit Authority

Route Planning

- Planning principles become critical
  - Long-term view
  - Charging facilities must be carefully located for support of routes today and into the future
- Must incorporate careful timing of schedule
  - Allow for appropriate time in service schedule for charging process
  - Minimize wasted deadhead miles, excessive dwell time, etc.
- Plan for growth patterns within the region

Antelope Valley Transit Authority

Operations

- Battery Electric Buses need to be driven differently
  - *Acceleration & Braking*
  - *Driving technique*
  - *"Anxiety" @ 25% Charge*
- Operations Procedures
- Training for Success
- Technicians vs. Mechanics
- Recognize performance

Antelope Valley Transit Authority

Organization

- Organizations must have a clear vision for operating electric buses in their fleet
- Change the mindset of every person within the organization
  - Transit Agency
  - Contractor, Consultants, Vendors, etc.
  - Work in progress
- Do it for the right reasons

Antelope Valley Transit Authority

Summary

- "Anxiety" is a part of the process. *Well worth it!*
- Bus procurement is the "easy" part of the process
- Plan the infrastructure
- Adjust route planning
- Align the organization to a new "Mindset"
- Reach out to those agencies that have taken the leap…

Antelope Valley Transit Authority

Come visit the Antelope Valley

Our doors are always open to our friends!!

Antelope Valley Transit Authority