

AVTA's Journey to Fleet Electrification

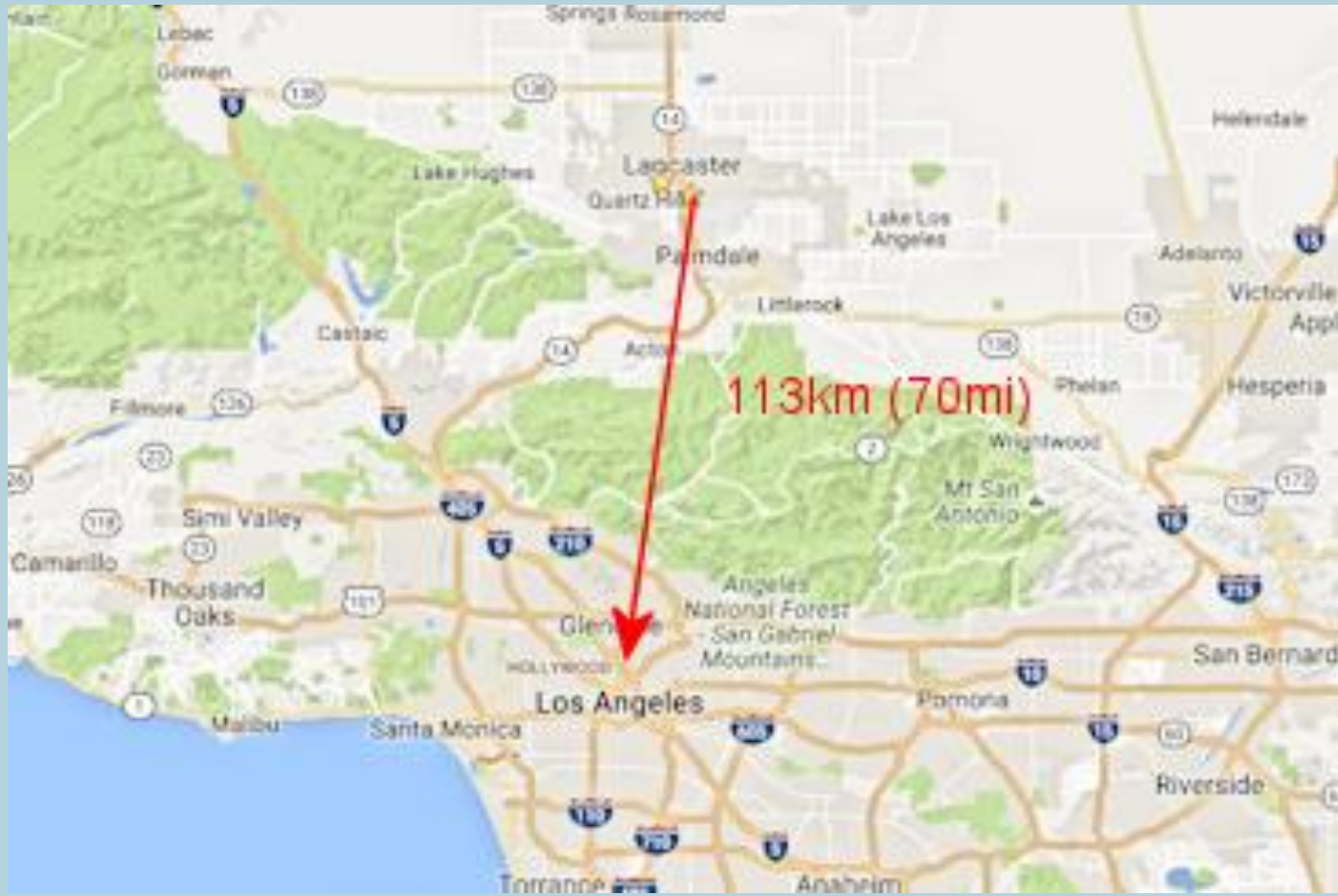
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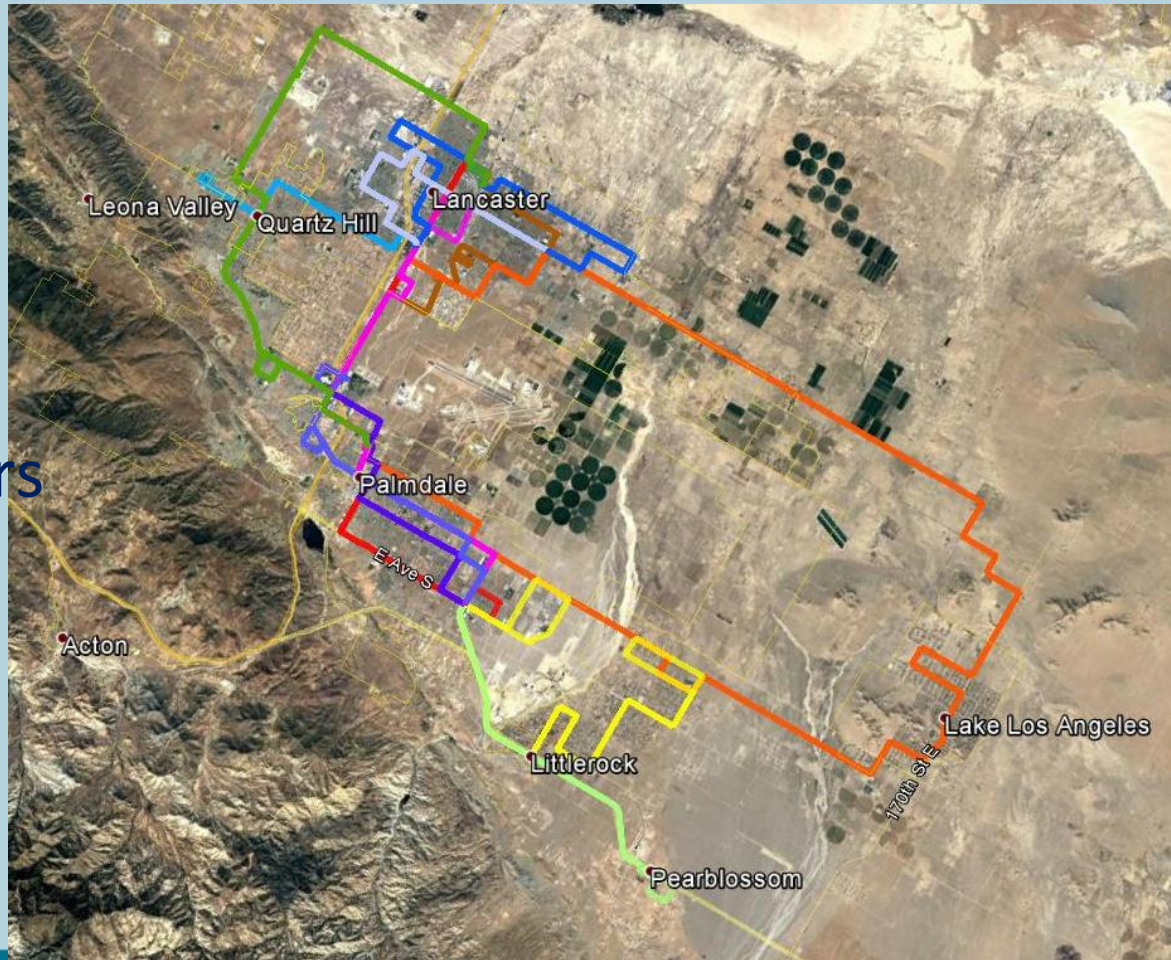
*BYD Heavy Industries
Director of Government Relations
Los Angeles, CA*

Where the Heck?



What Are we About?

- Local, Commuter & DAR service
- 76 Bus Fleet
 - 46 - 40' Transits
 - 30 – 45' Commuters
- 3.6M annual riders
- FY 2018
 - \$26.6M Operating
 - \$46.3M Capital



What About the end of 2018



- 13 of these beauties
- 44 – 40' Local Transit Buses
- 30 – 45' Commuter Coaches

It's Been a Journey or "You Want it by When?"

- Generous grant – 10/2013
- Shortest demo project in the history of transit
- Are you back? (Nov. '14)
- RFP December 2015
- Board approved contract February 2016
- First bus delivered July 2017



Our Experience

- Two 40' WAVE Ready BYD 40' battery electric buses available for service 90%.
 - 4370 – 83,804 life miles
 - 4371 – 90,601 life miles
- Average range 180 miles and 1.8kw per mile
- 15,000 miles between service interruptions
- Average Cost Per Mile including Maintenance and Electricity \$0.38

What are the Challenges?

- How many BEBs are we going to operate?
- Range Anxiety – routes that require 400+ miles per day.
- How much power do you need to charge 77 buses at the same time?
- What about demand charges?
- What happens when you lose power?
- Oh, and where we gonna get the \$95M?

The Pay for It Part

- \$56.5M Project to Date
 - 13 – 60' \$31.1M California \$ 17M FTA \$8.4M AVTA
 - Battery Electric Articulated Buses
 - 25 – 45' Battery Electric Commuter Coaches
 - 24 – 40' Battery Electric Transit Buses
 - 11 – Primary 250+kw inductive charger
 - 34 – Secondary “receivers” (on the bus)

The Depot

- Two redundant lines at 12,500 volts each
 - Toasty!
- 89 charging positions
 - 80kW (40') – 200kW 45' & 60'
 - 50 activated during phase 1
- “Wire” maintained by SCE
- Generator (Big Glen) 1.5MW – 36T fueled
- Total Cost: \$4,955,223

Depot Charging



Depot Charging



Electrical Load Management System

I/O Controls



Max Vehicle 3
Max SOC (%) 100
Max Current(A) 500
Total Current(A) 0
Start 2016-03-11 09:00:00
End 2016-03-11 19:00:00
Running Days 1

Run Tips

- 9:14:12 AM 001840 S 2002
- 9:14:12 AM 001840 S 2001
- 9:14:12 AM 001840 R 2003 87
- 9:14:15 AM 001842 R 2002 87
- 9:14:15 AM 001842 R 2001 88
- 9:14:15 AM 001842 S 2003
- 9:14:18 AM 001843 S 2002
- 9:14:18 AM 001843 S 2001
- 9:14:18 AM 001843 R 2003 87
- 9:14:21 AM 001846 R 2002 87
- 9:14:21 AM 001846 R 2001 97
- 9:14:21 AM 001846 S 2003
- 9:14:24 AM 001847 S 2002
- 9:14:24 AM 001847 R 2003 87
- 9:14:27 AM 001848 R 2002 87
- 9:14:27 AM 001848 S 2003
- 9:14:30 AM 001849 S 2002
- 9:14:30 AM 001849 R 2003 87
- 9:14:33 AM 001850 R 2002 87
- 9:14:33 AM 001850 S 2001
- 9:14:33 AM 001850 S 2003

8:50:16 AM S
8:50:20 AM S
8:50:22 AM S
8:50:24 AM S
8:50:28 AM S
8:50:28 AM S
8:50:29 AM S
8:50:29 AM S
8:50:29 AM S
8:50:29 AM S
8:50:30 AM @
20:F8:5E:B5:F9:B0=2001
8:50:30 AM S
8:50:32 AM S_Error
8:50:33 AM --- Colsed
8:50:33 AM @
20:F8:5E:B9:58:71=2003
8:50:34 AM S_Error
8:50:35 AM --- Colsed
9:00:50 AM Settings changed
9:05:50 AM Settings changed
9:14:16 AM Settings changed

Vehicles: 10

Charging 1		L R O
Alert 1		L R O
Waiting 0		L R O
Pause 0		L R O
Complete 1		L R O
Disconnect 7		L R O L R O L R O L R O L R O

Charging

Alert

Waiting

Pause

Complete

L
R
O

Left charge gun

Right charge gun

Override switch

Disconnected

If the bus has no alert or charging complete, **Alert** and **Complete** automatically hide.

Time 3/11/2016 9:14:32 AM Local IP 192



Wireless Charging

- Four inductive chargers at each of our transit centers (1 50kW / 3 250kW)
 - Palmdale Transit Center & Sgt. Owens Memorial Park.
- Two additional chargers near 47th East & Ave S (South Palmdale) and two at Lancaster Metrolink Station.
- Location of the final charger has yet to be determined.

High Power Wireless Charging

250kW Chargers

- 324kW - 10min Charge = 20 miles of additional range
- 12 trips/day = 240 miles of range extension
- 185 miles (our historic average) +240 miles = potential range 425 miles.

Sgt. Owens Memorial Park 50kW WAVE Installation







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