Livin' the California Dream!

Mark Perry
Director of Operations & Maintenance

California Transit Association
2018 Fall Conference

Pilot Test

September 2014,	Took delivery of 2 BYD electric buses
September 2014,	Begin training Operators and Technicians
September 2014,	Install 2 Depot Chargers
October 2014,	Unveil 1st BYD bus built in USA at Houston APTA
November 2014,	Roll out pilot bus on route 10
Nov. 14~Nov. 15,	Collect massive amounts of Data

AVTA
Antelope Valley Transit Authority

What Have We Learned?

- Range anxiety is REAL!

  Average year round range 150 miles and 2.2kw per mile
- Operator driving techniques dictate ranges
- Data and planning are the key to succeed
- Your team must be 100% committed to succeed

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Assemble our team!

Energy	Talk to your utility provider
Planning	when do we need to charge and how often
Engineering	put our crazy plan on paper
Finance	we are going to need a lot of money
Maintenance	Technician's are now E-technician's
Operations	Need Bus Operator buy in
Training	by far the most important part of the infrastructure

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What Will Our Fleet Look Like?

Buses	Qty. now	Qty. 5-10 yrs.
Commuter	30	40
Local 40’	45	37-43
60’ Artic	0	13

Antelope Valley Transit Authority

Charging Infrastructure

- 85 Stall Depot Charging Station.
- Four inductive chargers at each of our transit centers
  - Sargent Steve Owen Park and Palmdale Transit Center.
- Next Phase, additional chargers near Lancaster
  Metrolink Station and Southeastern Palmdale.

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Depot Charging

89 Depot Chargers	52) 200kWh / 37) 100kWh
Energy Required Daily	12,500V / 40,500kW
Peak Available	12,500V / 10,000A
Controlling Peak Energy	E.L.M.S.
Monitor SOC/ Energy Consumption	H.A.M.S.
Monitor Performance	H.A.M.S.
Emergency standby power	1.5mw (25 buses)

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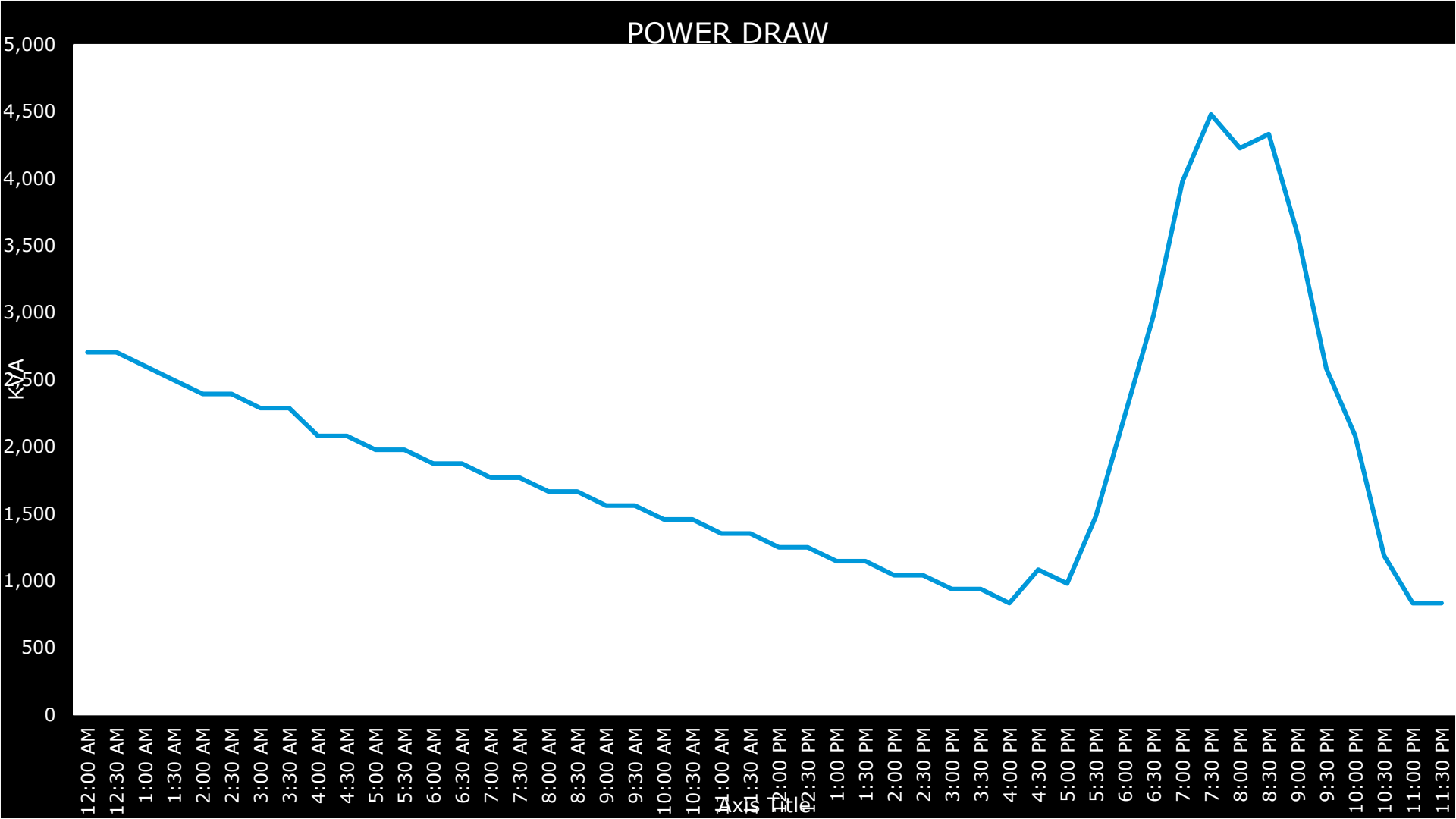
route	Returned to Yard	Leaves Yard	Time in Yard	Plug in Time	Est Charge Completion	Charger
1	5:57:00 PM	5:45:00 AM	11:48	6:27 PM	11:27 PM	250A
1	6:40:00 PM	6:57:00 AM	12:17	7:10 PM	12:10 AM	250A
1	6:57:00 PM	5:05:00 AM	10:08	7:27 PM	12:27 AM	250A
1	11:27:00 PM	6:35:00 AM	7:08	11:57 PM	4:57 AM	250A
1	12:10:00 AM	5:35:00 AM	5:25	12:40 AM	5:40 AM	250A
1	11:10:00 AM	6:15:00 AM	19:05	11:40 AM	4:40 PM	250A
2	6:33:00 PM	6:15:00 AM	11:42	7:03 PM	12:03 AM	125A
2	6:39:00 PM	6:05:00 AM	11:26	7:09 PM	12:09 AM	125A
2	11:03:00 PM	5:35:00 AM	6:32	11:33 PM	4:33 AM	125A
2	11:10:00 PM	5:45:00 AM	6:35	11:40 PM	4:40 AM	125A
3	6:33:00 PM	6:15:00 AM	11:42	7:03 PM	12:03 AM	125A
3	6:40:00 PM	6:05:00 AM	11:25	7:10 PM	12:10 AM	125A


POWER DRAW
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
KVA
12:00 AM
12:30 AM
1:00 AM
1:30 AM
2:00 AM
2:30 AM
3:00 AM
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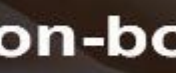
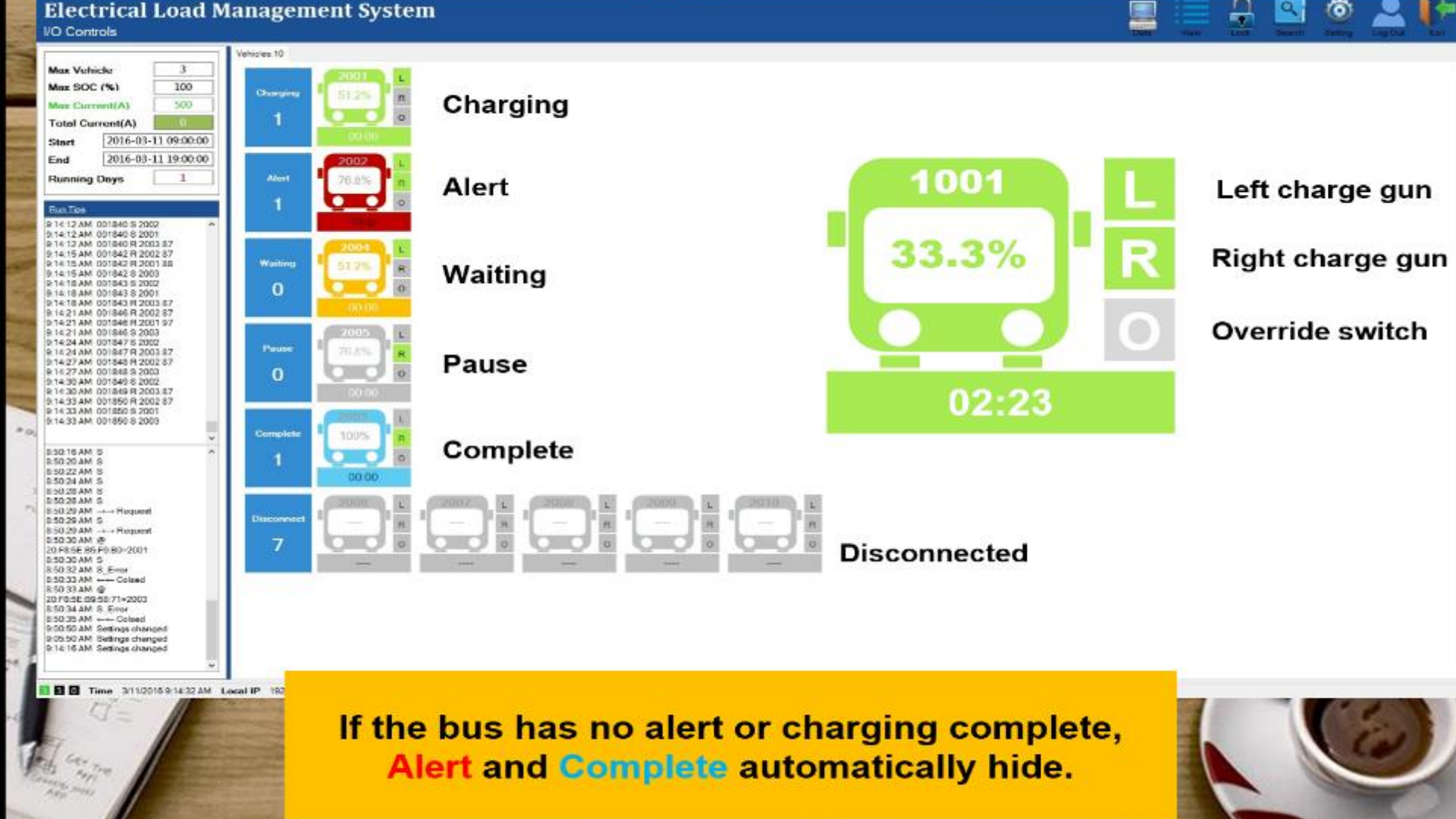
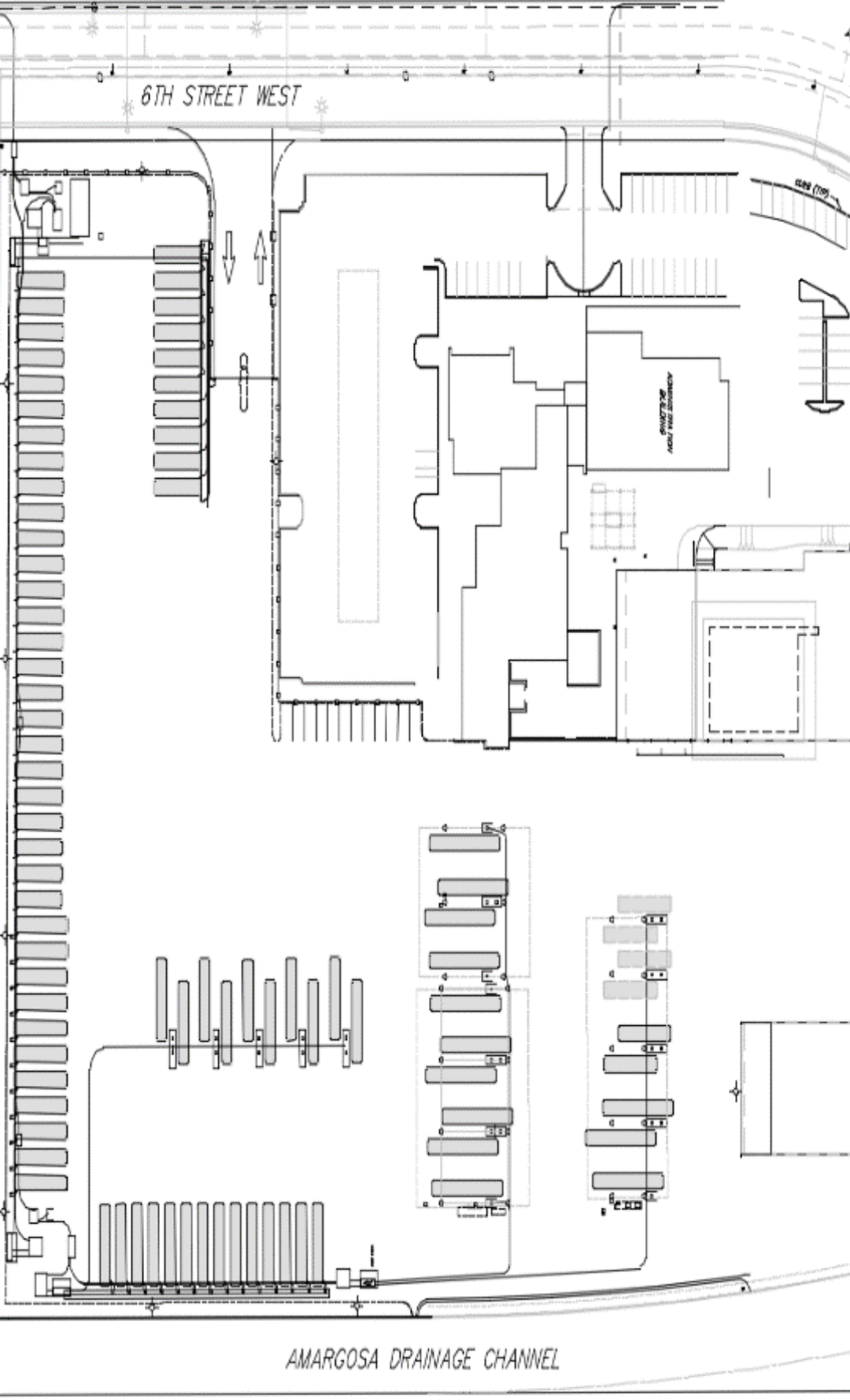
Axis Title

ELMS
Features

HAMS Module on-board (BCM ↔ HAMS ↔ )

1. Control charging from remote computer terminal
2. Based on available power, limit the maximum no of buses being charged at once
3. Prioritize buses charging based on pre-determined parameters (SOC, time, route etc.) or manual override
4. Peak-time avoidance


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
Vehicles:10
Charging 1
Alert 1
Waiting 0
Pause 0
Complete 1
Disconnect 7
Charging
Alert
Waiting
Pause
Complete
Disconnected
1001
33.3%
02:23
L
R
O
Left charge gun
Right charge gun
Override switch
If the bus has no alert or charging complete,
Alert and Complete automatically hide.


6TH STREET WEST
AMARGOSA DRAINAGE CHANNEL

In Route / Opportunity Charging

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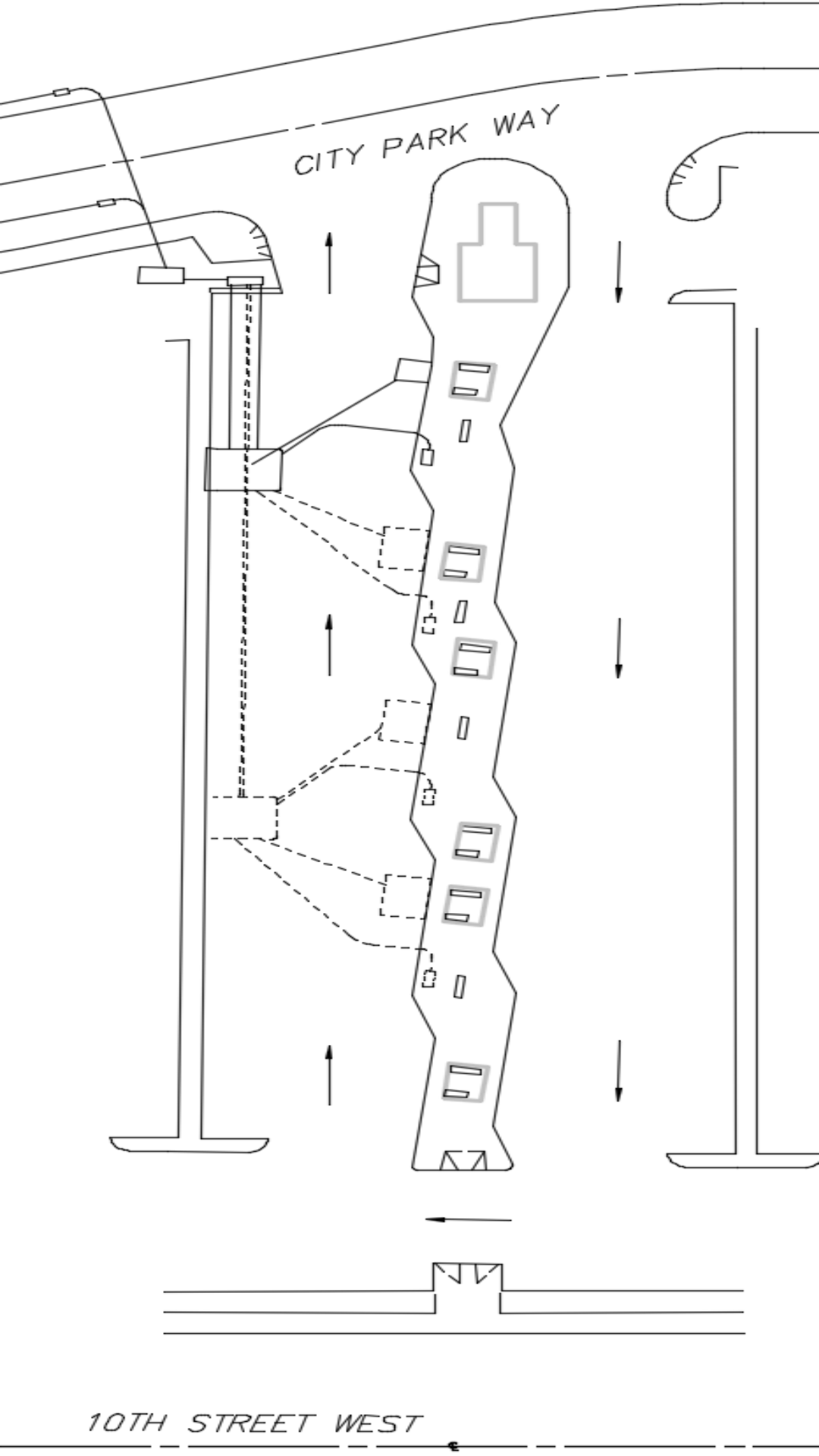
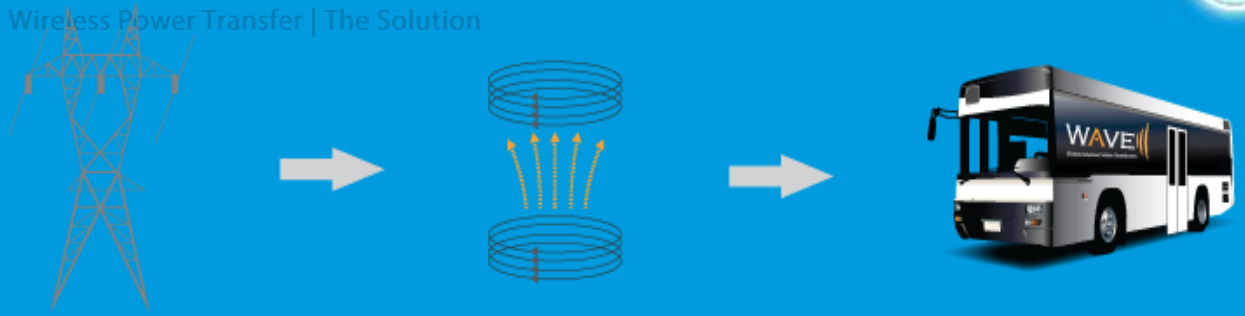

CITY PARK WAY
10TH STREET WEST

Wireless Power Transfer | The Solution



Electric Grid Wireless Charger Vehicle

Technology:

- ☑ Safe Power Transfer through Road & Weather
- ☑ Fast Charging
- ☑ Large Air Gap – No Mechanical Movement
- ☑ Efficient > 90%+

Inductive/Opportunity Charging

50kWh Chargers

K9M BYD /10 min charge times = 4 miles of range

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Inductive/Opportunity Charging

250kWh Chargers

K9M BYD 10 min charge = 15-18 miles of range

K11M BYD 10 min charge = 12-16 miles of range

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Monitoring Technology

- Automate data collection
- Export data to reporting software
- Control energy grid's peak demand limits
- Export data to key staff
- Notify staff of any charging malfunctions
- Live data for training and performance
- Charge at key times for lower energy rates

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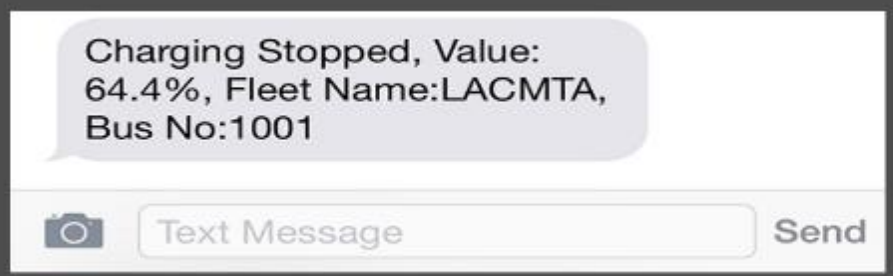
ALERT TYPES



- Stop Charging
- Slow Charging
- Charger System
- Battery Temperature
- Battery Leakage
- Braking System
- ABS
- Electrical Motor

Lessons Learned

- Plan Long term 10 years plus
- Start with an electrical engineer then your utility
- Your team must have buy in!
- Plan before you build it will save time and money
- Reach out to other transit agency's that have made the plunge
- Trust your data!

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Come visit the Antelope Valley

Our doors are always open to our friends!!

AVTA
Antelope Valley Transit Authority