NC STATE UNIVERSITY

SUSTAINABLE FLEET TECHNOLOGY

VIRTUAL CONFERENCE 2020

Session 7: Best Practices & Lesson Learned in Charging Infrastructure Deployment

September 23, 2020

NC CLEAN ENERGY TECHNOLOGY CENTER

STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

https://www.sustainablefleetexpo.com/

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Better. Cleaner. Now!

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GILBARCO VEEDER-ROOT

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SUSTAINABLE FLEET TECHNOLOGY

VIRTUAL CONFERENCE 2020

Next Series Dates & Topics:

September 30: Transportation Electrification & Climate Impact, Featuring a Statement from NC Governor Roy Cooper

October 07: Electric Vehicle Options for Fleets

October 14: Best Practices of the Top Green Fleets

October 21: Renewable Fuels, Lubricants & Other Bio-Based Products

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Format

- Q&A at the end
- Submit questions and comments to “Panelists”
- Scheduled for 2:00p-3:30p
- Slide handout
- Recording

Best Practices & Lessons Learned in Charging Infrastructure Deployment
September 23, 2020

2:00-2:10 **Rick Sapienza, NC Clean Energy Technology Center**—Welcome & Introduction

2:10-2:25 **Matthew Stephens-Rich, Electrification Coalition**—EVSE Best Practices Overview

2:25-2:35 **Andrew Varuzzo, Port Authority NYNJ**—Fleet Experience Story, Site Placement

2:35-2:41 **Desmond Wheatley, Beam Global**—Solar Charging Solution

2:42-2:47 **Richard Battersby, City Of Oakland**—Solar Charger Deployment

2:47-2:57 **Allen Goetz, Gilbarco Veeder-Root**—Installation & Service Considerations

2:57-3:10 **Sean Yentsch,**—MD/HD Charging Considerations & Planning

3:10-3:30 **Q&A**

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Rick Sapienza
resapienza@ncsu.edu
Phone: 919-515-2788

- **Clean Transportation Program Director NC Clean Energy Technology Center at NC State University**
- **8 years with NC State**
- **30+ years experience including General Motors, Draper Lab and Great Lakes Pulp & Fibre in both engineering and business management roles**

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The Electrification Coalition

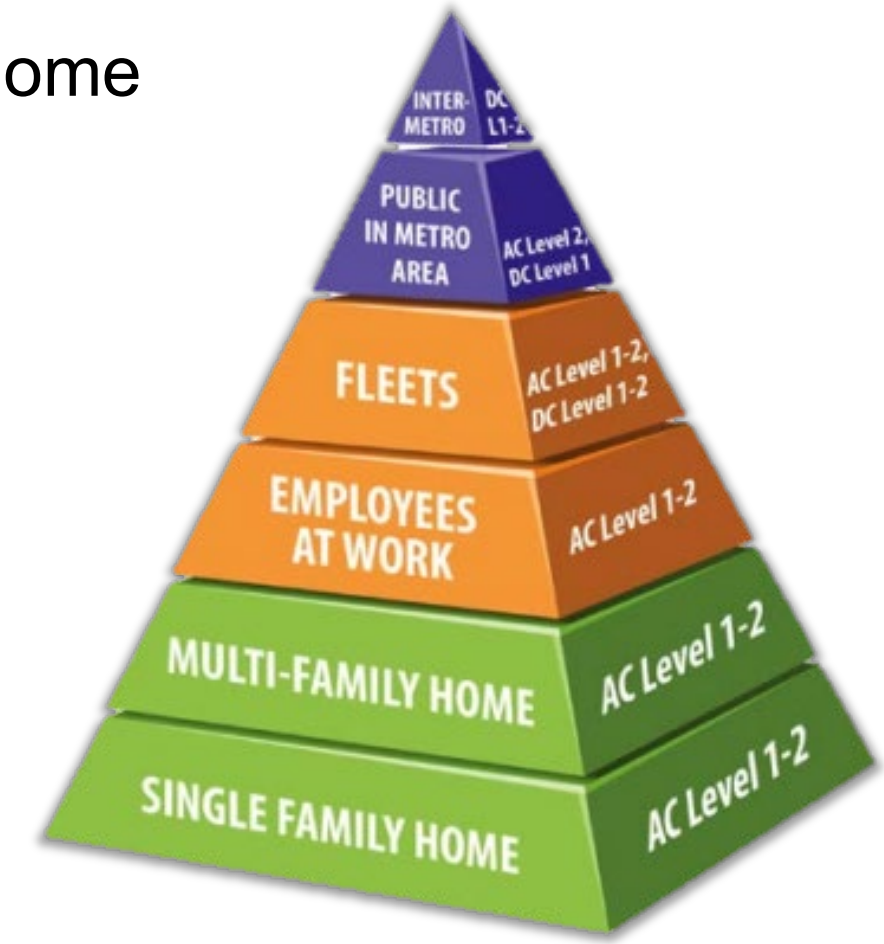
The Electrification Coalition (EC) is a nonpartisan, non-for-profit group of business leaders committed to promoting policies and actions that facilitate the deployment of electric vehicles on a mass scale in order to combat the economic, environmental, and national security dangers caused by our nation’s dependence on oil.

Matthew Stephens-Rich
mstephensrich@electrificationcoalition.org

- **Program Manager for the Electrification Coalition**
- **Oversees implementation of projects across the country, focused on rapid electric vehicle and charging adoption across public and private sectors**
- **Involved with Bloomberg American Cities Climate Challenge, Smart Columbus**
- **Previously with Clean Fuels Ohio**
- **MPA in Energy Policy Ohio State University, John Glenn College of Public Affairs**

Workplace and Fleet Charging

- Majority of consumer charging occurs at home
- Workplace often next most popular
- Rarely charging from empty to full



Smart Chargers

- **Networked** - WIFI or cellular connection required.
- **Payment** - Capable of accepting credit card or RFID card payment.
- **Data collection** - Track information on usage, meter, driver, etc.

Developing an EV Charger Policy

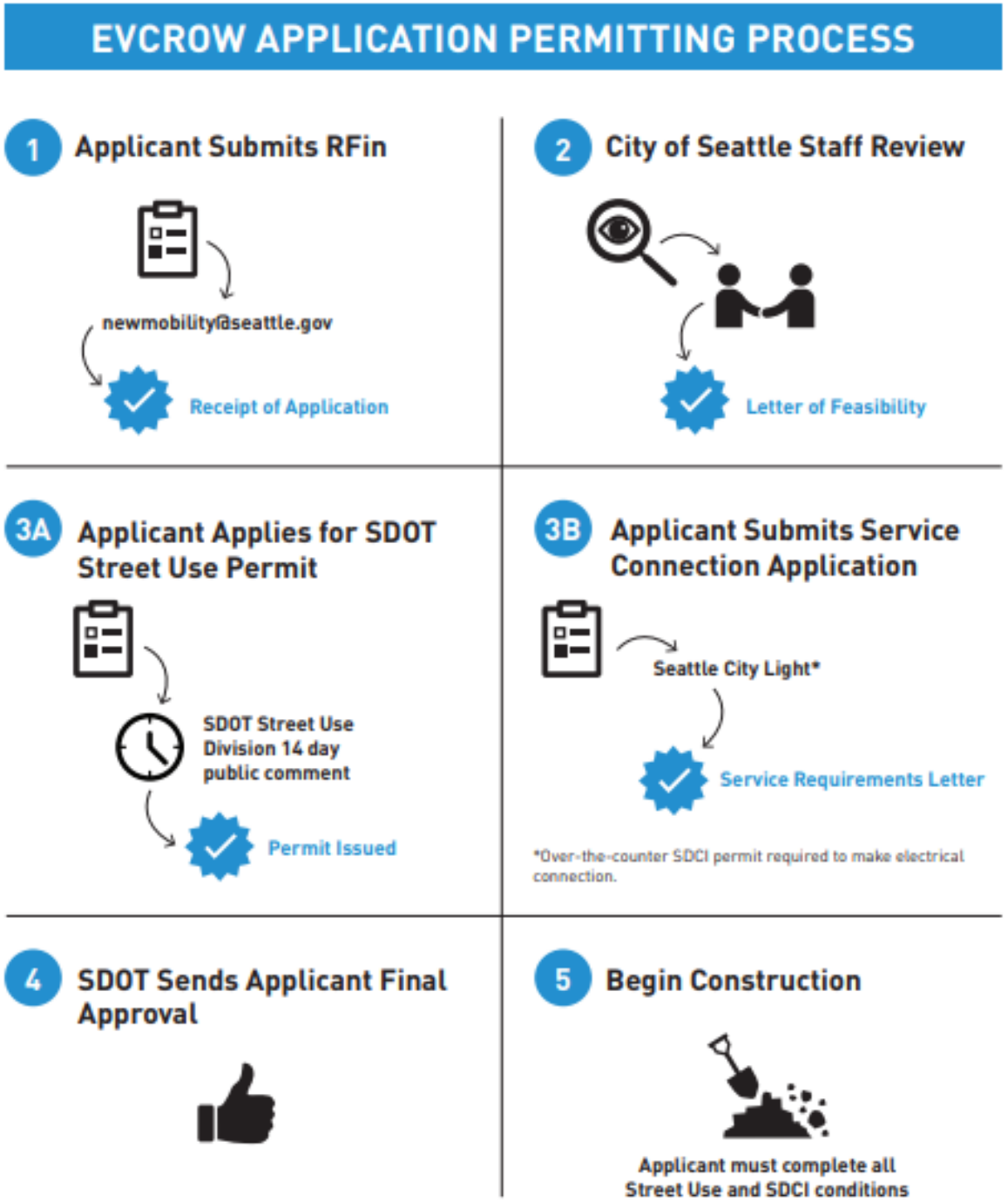
- Will chargers be designated Fleet only? Will they be available to non-fleet vehicles?
- Will drivers need to charge on route? Who sets up and owns charging network accounts?
- Where are questions and maintenance requests directed?

Future Proofing EV Charging

- Align charging installation and EV deployment – Consider internal timelines such as procurement and building renovations.
- Plan ahead – How many EVs will your fleet have in 5 years? 15 years? Does your number of chargers and electric supply meet these needs?
- EV Readiness – What electrical work can be done now to lower costs and prepare for chargers that will be purchased later?

Step by Step permitting process

ELECTRIC VEHICLE CHARGING IN THE PUBLIC RIGHT OF WAY (EVCROW) PILOT PERMIT PROGRAM – Seattle



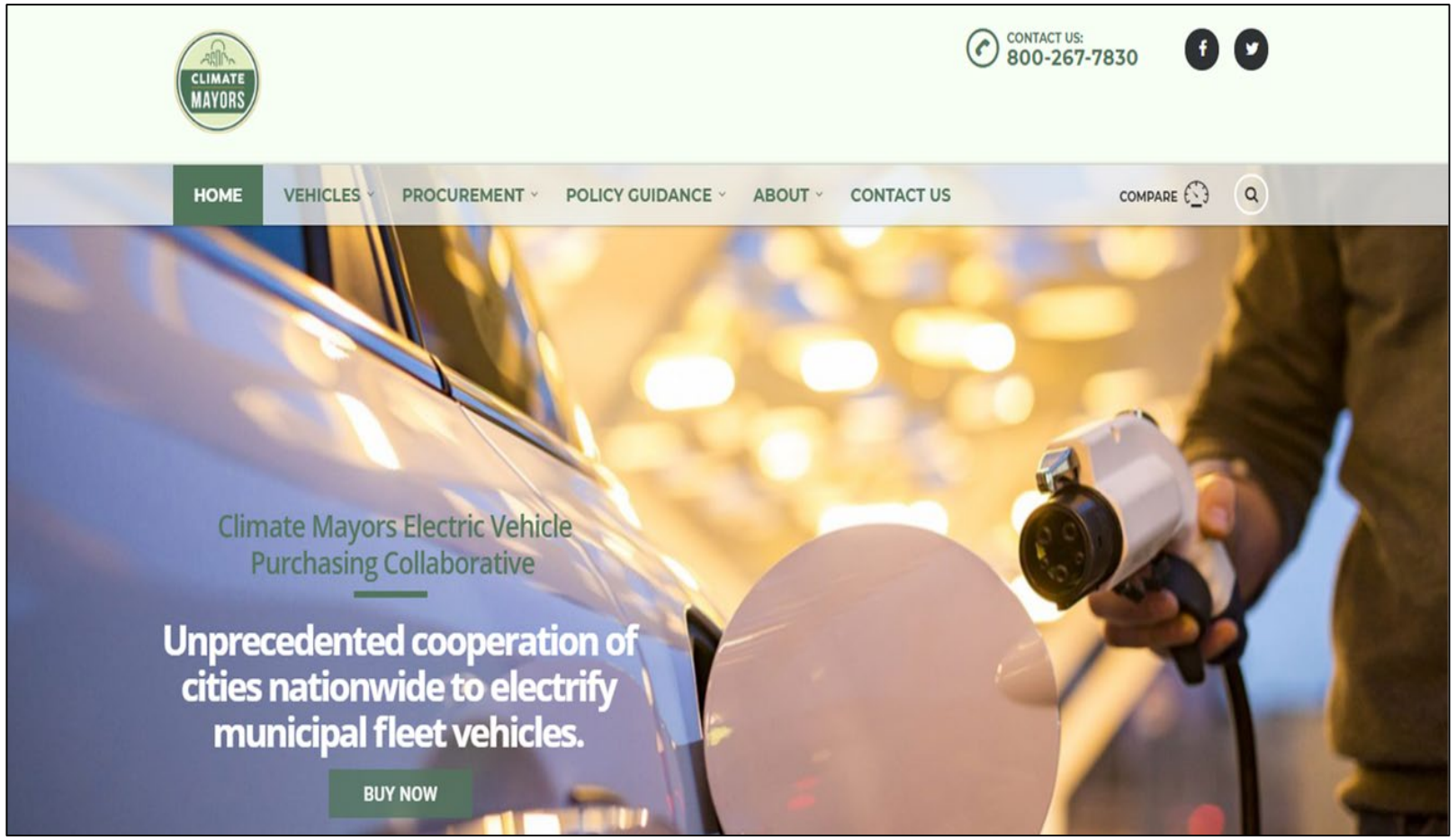
Permitting process timeline

EVCROW Application Permitting Process Timeline

	MONTH 1	MONTH 2	MONTH 3	MONTH 4	MONTH 5
Step 1	48 hours				
Step 2	2 weeks				
Step 3A		4-6 weeks			
Step 3B			8-12 weeks		
Step 4				1 week	
Step 5					Construction

These are estimated times and assume the applicant submits all materials and is readily available to answer questions/make changes to the application as needed.

Climate Mayors EV Purchasing Collaborative



www.DriveEVfleets.org

The Electrification Coalition

Revolutionizing Transportation and Achieving Energy Security

Online:
www.electrificationcoalition.org

Contact:
Matt Stephens-Rich
Program Manager
MStephensRich@ElectrificationCoalition.org

Electrification Coalition

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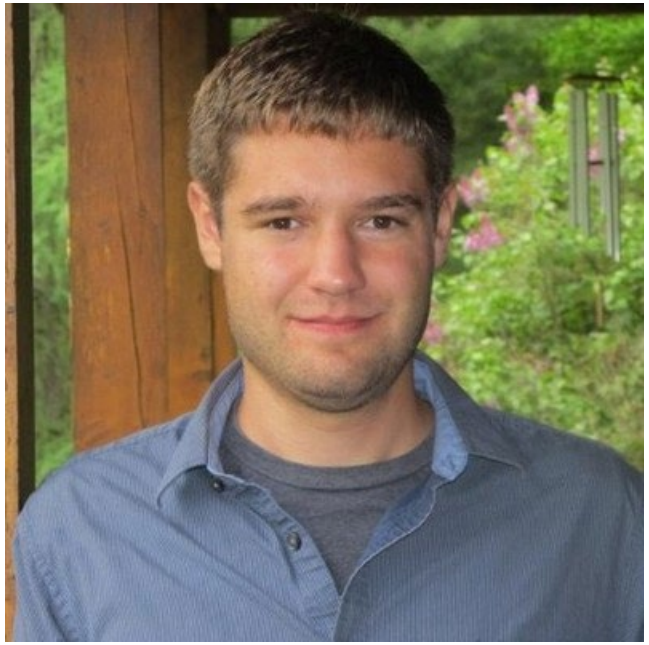
WASHINGTON, DC 20036

TEL: 202-461-2360
FAX: 202-318-8934
ELECTRIFICATIONCOALITION.ORG



Andrew Varuzzo
avaruzzo@panynj.gov

- Telematics Program Manager Port Authority NYNJ
- Port Authority Port Leadership Fellow Program, a distinguished program for leadership and public service in the New York/New Jersey Metropolitan region
- Masters of Regional Planning from Cornell University and BA from College of Holy Cross

BEAM

EV ARC™ 2020

World’s Fastest EV Charging Deployment

BeamForAll.com

BEAM

- President, CEO & Board Chairman Beam Global
- 20 years executive experience from start-ups to publically traded companies

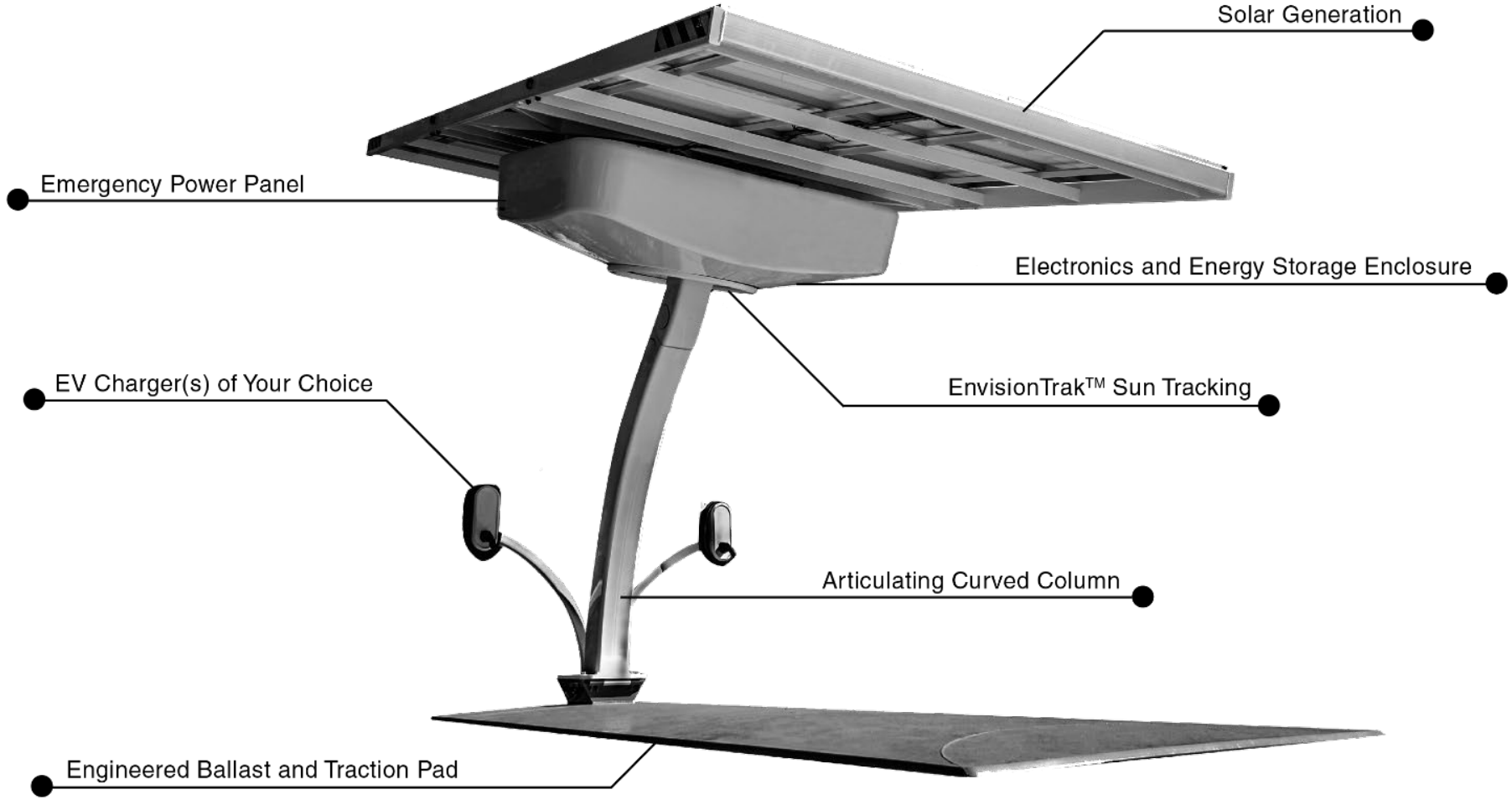
Desmond Wheatley
Desmond.Wheatley@beamforall.com
BeamForAll.com

BEAM in Action

Get the EV Charger of Your Choice, Deployed in Minutes not Months

- No Permitting
- No Construction
- No Electrical Work
- $0 No Utility Bill

EV ARC™ 2020



BEAM

Installing Grid-Tied EV Charging Includes

- Engineering
- Construction
- Trenching
- Foundation
- Permitting
- Electrical circuit work
- Project management
- Transformer / switchgear upgrades
- Utility metering / monthly bills
- Utility interconnect agreements
- Demand charges
- Carbon Footprint

EV ARC™ 2020
Solves Your Problems

No Permitting, No Construction, No Utility Bill

- Fastest and easiest to deploy solution on the market
- The EV charger and service of your choice
- Deploys in minutes, zero-contact delivery
- Avoided costs = Lowest total cost of ownership (TCO)
- Transportable
- Off-grid EV charging and emergency power
- Highly visible sustainability initiative
- Drive on sunshine

BEAM

EV ARC™ 2020
Fits in a Standard Parking Spot

- Maintain full parking capacity
- Cars park on the base pad
- ADA compliant
- Reach as many as 10 parking spaces
- Charge up to 6 vehicles at the same time

BEAM

EV ARC™ 2020

Transportability = Flexibility

Drop and charge. Can be moved any time.

- Permanent yet transportable
- Scalable
- Can be moved short distances with a forklift
- Can be moved longer distances with the ARC Mobility™ Trailer, truck or in a 20 ft. container
- Ideal for leased or owned properties

BEAM

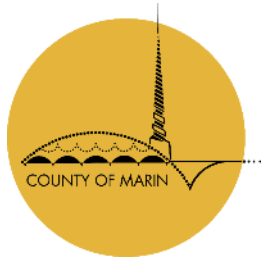
EV ARC™ 2020
Off-Grid Emergency Power

Energy when and where you need…

- Charge during blackouts, utility outages, weather events
- Relocate to high risk locations, hospitals, shelters…
- Wind-rated up to 120mph
- Flood-proof up to 9.5 feet
- Working asset during prosperity and emergencies
- Integrated emergency power panel

BEAM

Our Customers Have a Lot to Beam About



BEAM

Drive on Sunshine!

Thank You

BeamForAll.com

CITY OF OAKLAND
PUBLIC WORKS

Richard Battersby
rbattersby@oaklandca.gov

- Assistant Director of Public Works for the City of Oakland, CA
- Director of the East Bay Clean Cities Coalition
- More than 25 years fleet experience with public and private fleets
- Active and recognized by professional and industry organizations—APWA, NAFA, Government Fleet, Best Fleets, . . .
- Inductee to Clean Cities and Public Fleet Manager Halls of Fame

SUSTAINABLE FLEET TECHNOLOGY
VIRTUAL CONFERENCE 2020

MAY 20, 2020

CITY OF OAKLAND
PUBLIC WORKS

City of Oakland

EQUIPMENT SERVICES DIVISION, OAKLAND PUBLIC WORKS

BEST PRACTICES & LESSON LEARNED IN CHARGING INFRASTRUCTURE DEPLOYMENT-

SUSTAINABLE FLEET TECHNOLOGY
VIRTUAL CONFERENCE 2020

MAY 20, 2020

The City of Oakland, CA

Located in the East Bay of San Francisco Bay region
Population of approx. 400,000 citizens

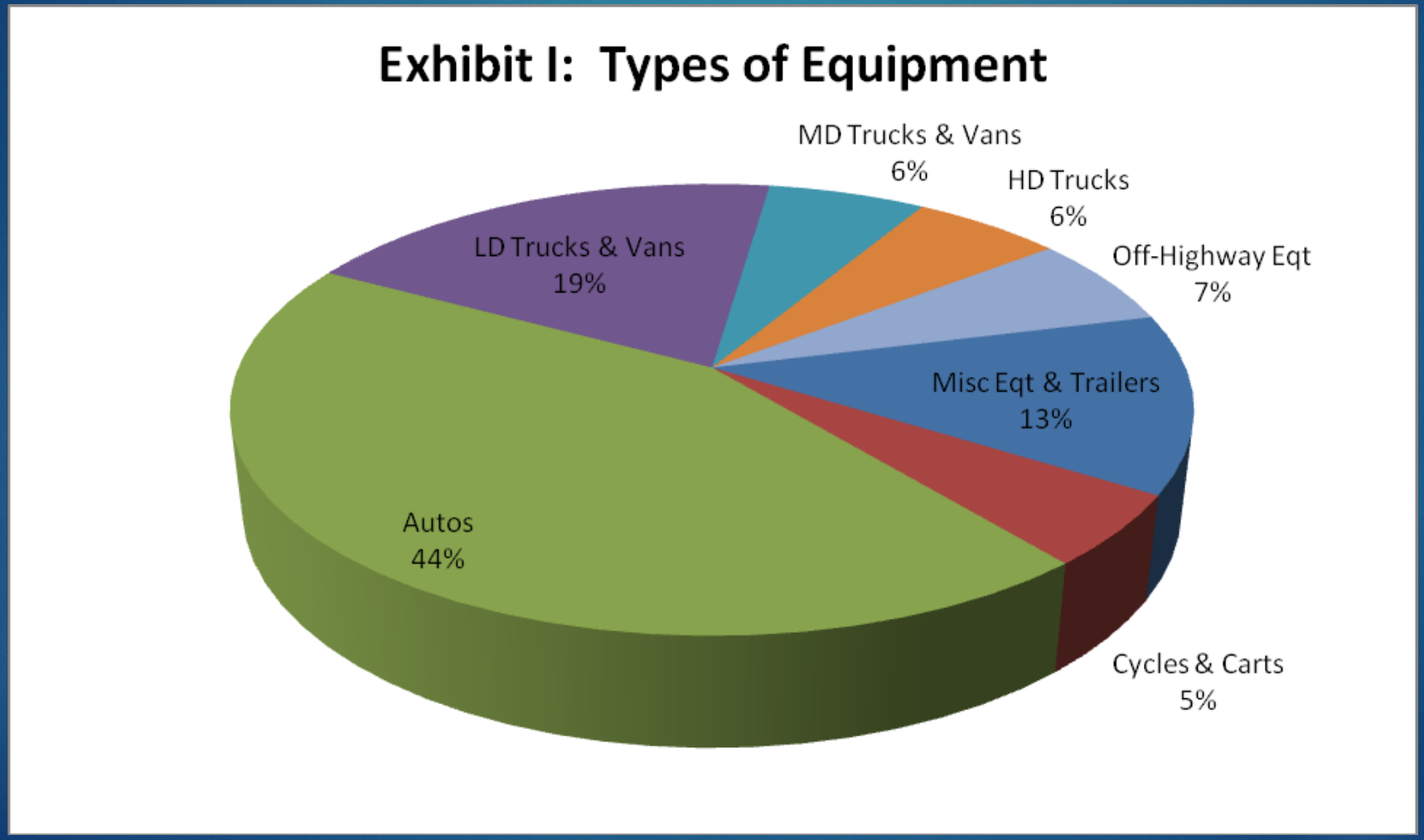
Equipment Services part of Oakland Public Works
- Full service municipal fleet 1500 vehicle/s equipment
- Supports all City departments (no curbside refuse or transit)

60 FTE, 45 of these Mechanic and Service Worker
6 Functional shop areas:
- Light Duty
- Heavy Duty (day and swing shifts)
- Emergency vehicle
- Motorcycle Shop
- Body Shop
- Machine Shop

City of Oakland's most recent notable Achievements

- 2020 – HEROES 2020 Award
- 2019 – "In It for the Long Haul" Award from ACT Expo
- 2019 – Ranked 3rd in top 50 Green Fleets North America
- 2017 – Clean Air Champion Award- East Bay Clean Cities
- 2017 – Ranked 19th in 100 Best Fleets North America

Fleet Composition
1500 total - 1200 vehicles, 300 equip.



City of Oakland Fuel Diversity

725,000 gallons total

Gasoline

400,000 gallons

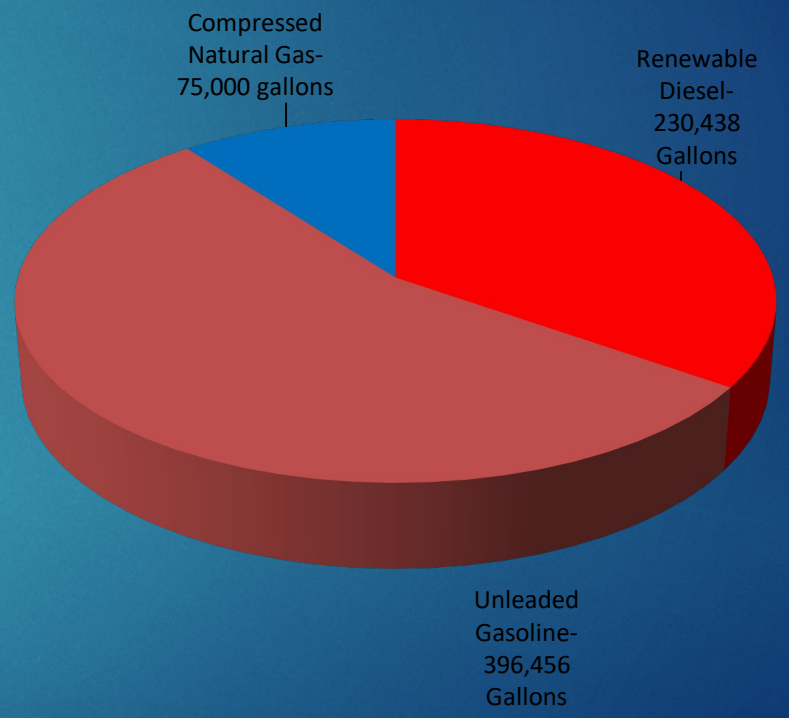
Renewable Diesel

250,000 gallons

Renewable Natural Gas (RNG)

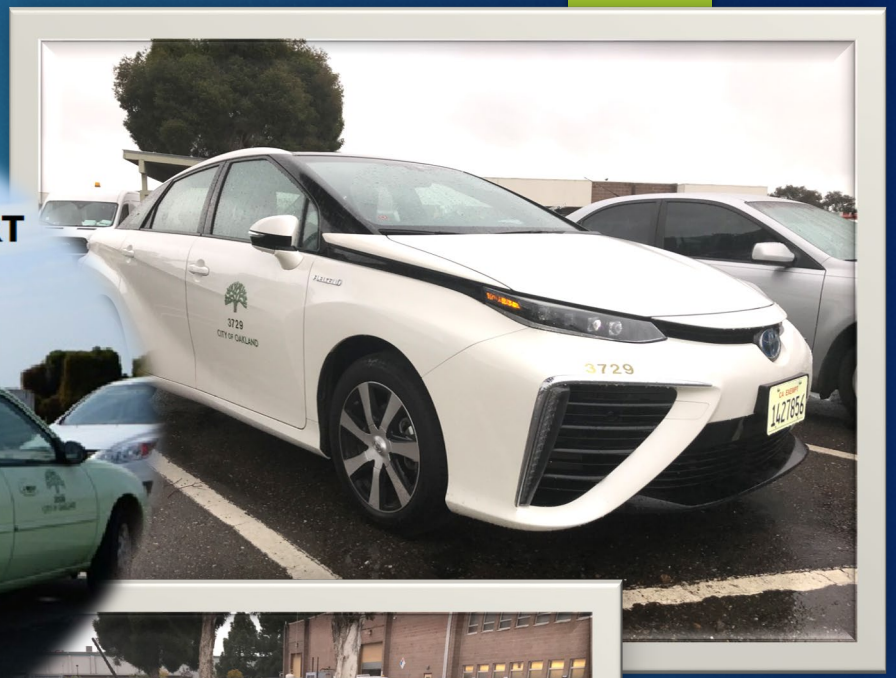
75,000 gasoline gallon equivalents

Electricity and Hydrogen

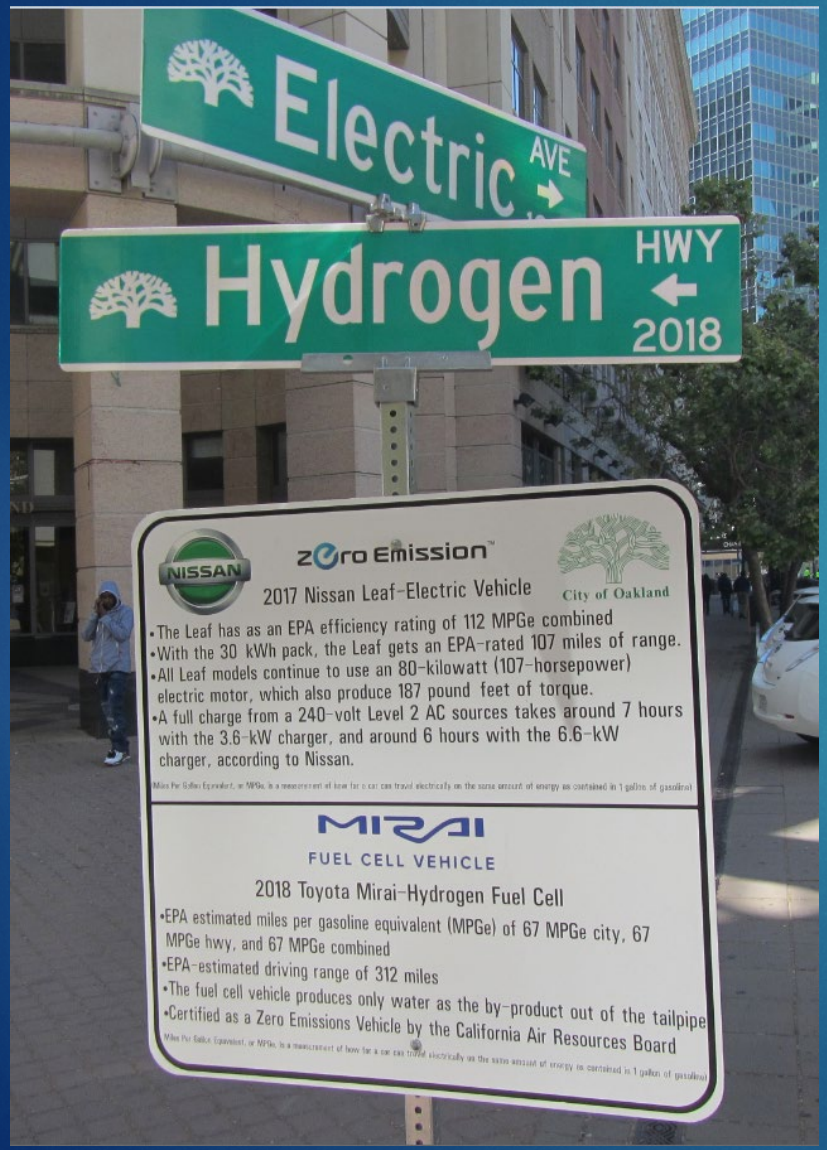


WhitEv is the new Green in Oakland

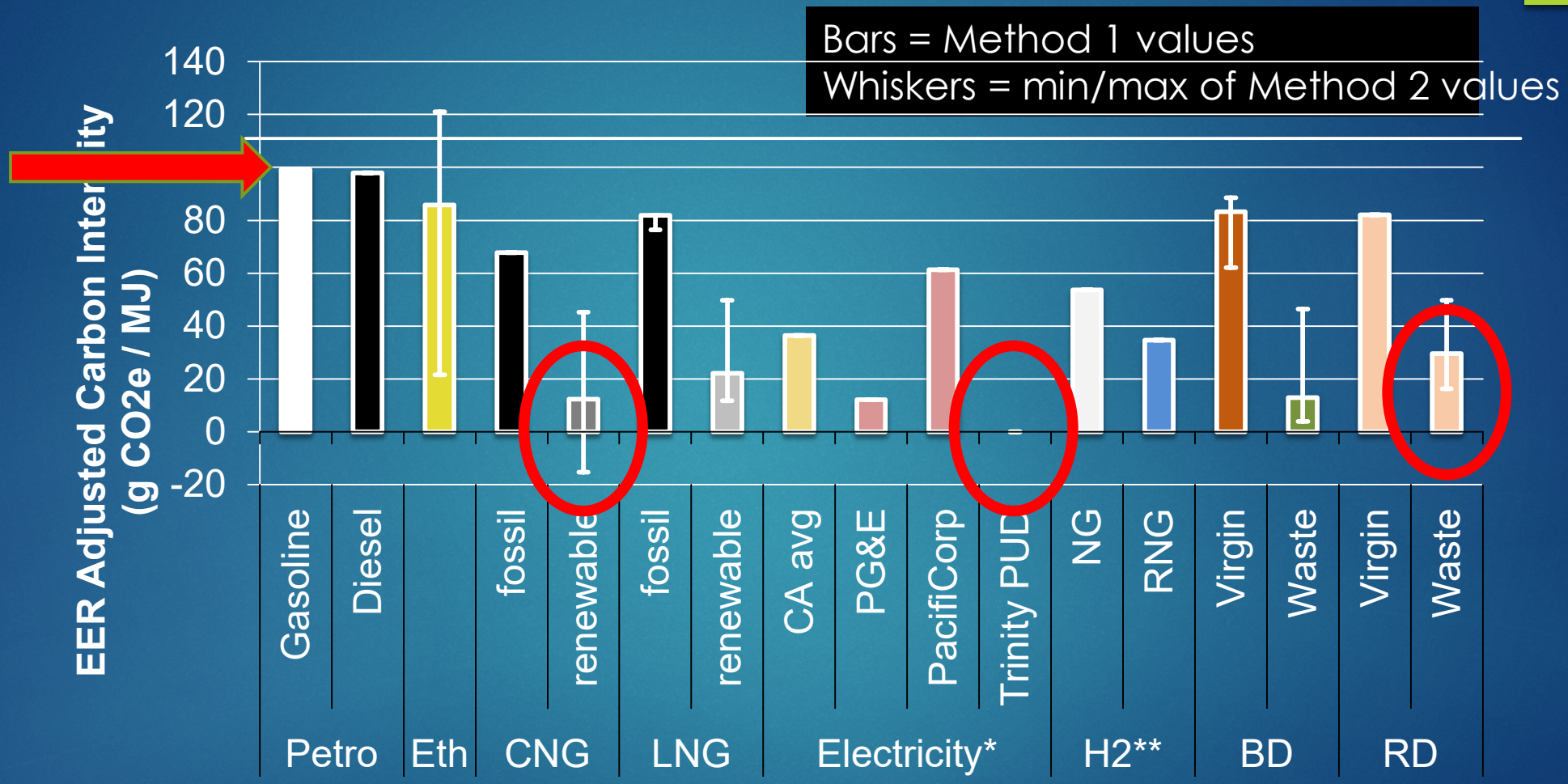
Electric
CNG
Hydrogen
Plug-In Hybrid
Renewable Diesel



Zero Emission (or better?)



LCFS Carbon Intensities of Fuels



* Scaled by EER of 3.4. Utility values use utility specific reported carbon intensities.
** Scaled by EER of 2.2.

Source: SERC, 2016

Data Source: http://www.arb.ca.gov/fuels/lcfs/lcfs.htm (accessed 4/23/16)

Solar Envision Stand Alone EV Arc Charging Stations

Solar Envision Stand Alone EV Arc Charging Stations

Solar Envision Stand Alone EV Arc Charging Stations

Solar EV Charging Stations Powering COVID-19 Response Sites

- Transportable (not portable)
- Independent from grid
- No emissions
- Silent

Questions?

Richard E. Battersby, Assistant Director
Bureau of Maintenance and Internal Services
City of Oakland | Oakland Public Works | APWA Accredited Agency
7101 Edgewater Dr., Bldg. 4 | Oakland, CA 94621
(510) 615-5856 | (510) 615-5588 Fax
rbattersby@oaklandca.gov

Allen Goetz
allen.goetz@gilbarco.com

- Market Development Manager at Gilbarco e-Mobility
- 14+ years of fleet/transportation industry experience
- Focused on bringing solutions to the vehicle electrification space
- Pervious positions with major fuel card companies, software providers, and leaders in manufacturing

TRITIUM EVerse Amps2Go

Fueling the future, today.

GILBARCO VEEDER-ROOT

2020

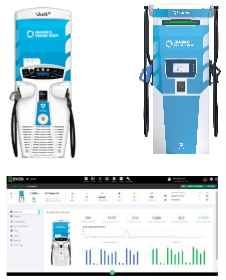
e-Mobility Solutions

TRITIUM EVerse Amps2Go

Fueling the future, today.

GILBARCO VEEDER-ROOT

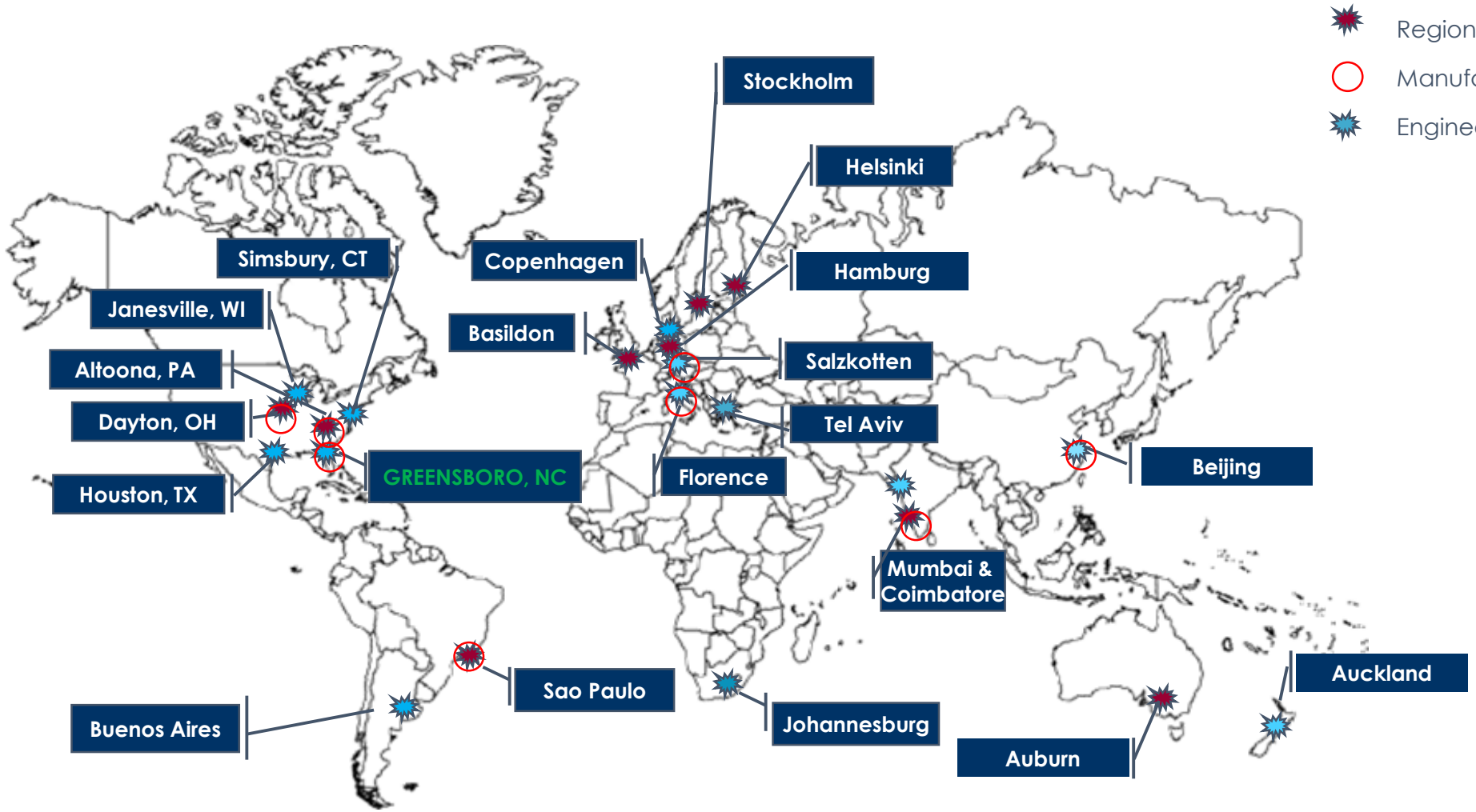
Gilbarco Veeder-Root… The Global Leader in Fueling Control

Segments	Automation				Environmental		
Products, Services & Technology	e-Mobility	Dispensers	Retail Solutions	Forecourt Control	Tank Gauging Vapor Submersible Pumps		Services
							

- #1 position in the retail petroleum market with the greatest breadth of products and services
  - Leading share in North America, Latin America, Eastern Europe, Asia and ANZ
- Multi-Billion $$ revenue, significant % outside of NA
- ~5500 employees, 500+ engineers – 60% SW
- Dedicated innovation and architecture teams and dedicated cloud team
- Demonstrated history of leadership in innovation and driving organic growth
- Founded in the 1860s

We keep the world moving with the best fueling technology and services.

Gilbarco Veeder-Root Footprint: *Innovation & best practices from around the world*



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Fleet Customer Highlights

Bulk Freight

Walmart

Sysco

FedEx Freight

ABF Freight

Government

Pennsylvania Department of Transportation (PENNDOT)

NDOR Nebraska Department of Roads

City of Knoxville

City of Alexandria Virginia

Utilities

conEdison

OG&E

Brunswick Electric Membership Corporation (BEMC)

C&L Electric Cooperative Corporation
A Touchstone Energy® Cooperative
The power of human connections®

Gilbarco Veeder-Root

Fleet Focus

Fleets only account for 5% of the US vehicles market …

… yet, they represent the ideal target for EV

Scale, with sophisticated needs

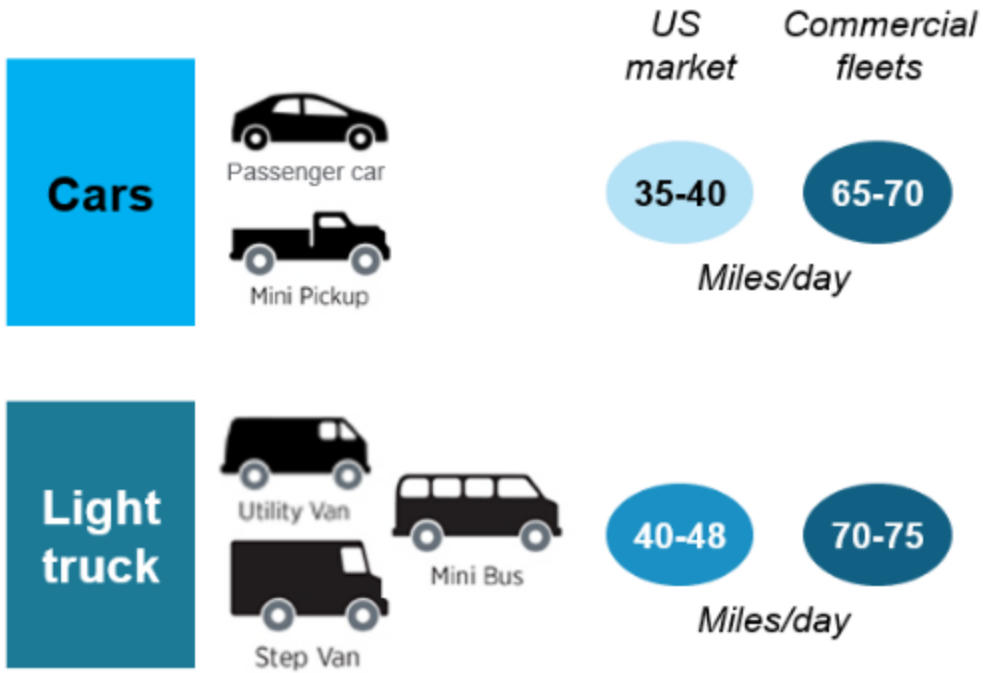
- Large number of vehicles to be electrified across multiple sites, with particular requirements
  (e.g. reliability, resilience)

Predictable/repetitive driving patterns

- Itineraries / Routes planned in advance
- Huge amount of data available on fleet operations (location, miles, stops, hours) to assess electrification needs

Opportunities across multiple use cases

- Beyond moving people:
  - Trucking/Haulage
  - Airports
  - Port Vehicles
  - Buses



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FLEXIBLE, SCLABLE TECHNOLOGIES

L2 Charging Solutions

GILBARCO VEEDER-ROOT

Amps2Go Level 2 Charger — The Series 6

Compact Design | Easy Installation | Simple Service Fee | Easy to Manage | Generate Revenue | Smart Grid Ready

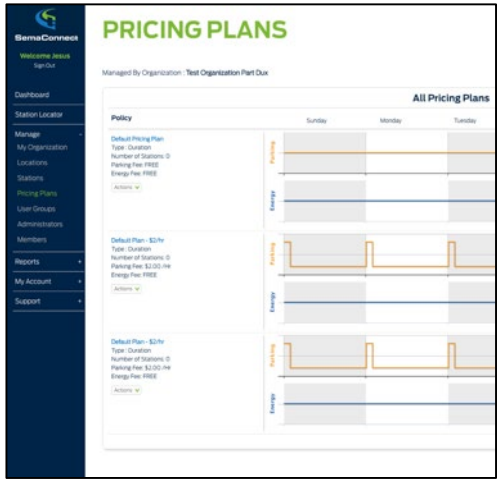
Sleek Features

- ✓ Sleek, elegant design
- ✓ Compact form factor
- ✓ Commercial-grade aluminum body
- ✓ "At-a-Glance" LED status
- ✓ Rugged outdoor-rated enclosure
- ✓ Full Warranty Replacement Policy
- ✓ "No Assembly Required"

Smart Features

- ✓ Station Owner Web Portal
- ✓ Access, Pricing and Reporting
- ✓ Station Owner Portal
- ✓ EV Driver App
- ✓ Automatic Billing and Payment
- ✓ Fleet Management
- ✓ Load Management
- ✓ Open to leading driver programs: PlugShare, ChargeHub, etc.

The Solution – Management Software



1. Set Access Policy:
   - Public - listed in mapping services
   - Private
   - Multi-group access

2. Set Pricing Policy:
   - Duration-based Pricing
   - Time-of-Use Pricing
   - kWh Pricing

3. Monitor Program with Usage Reports:
   - Transactions per session
   - Energy: kWh's delivered & electricity cost
   - Driver revenue
   - Station utilization:
   - Usage Analysis
   - Sustainability reporting

Fleet Management

Smart Charging for Fleets

Amps2Go makes it easy to charge your EV fleets and make sure they are ready to go. Smart charging for your fleets ensures you have all the information you need, like built-in alerts and a smart dashboard to visualize detailed reports on electricity used, carbon offset, fuel savings and more.

Enables fleet managers to:

- Vehicle Registration
  - Set-up vehicle groups for fleet managers & chargers
  - Configure vehicles – make/model/VIN and access card
- Set-up Charge Policy
  - Set-up departure and return times
  - Set total electricity needed by each car
  - Schedule fuel start and stop times
- Set-up Alerts
  - Return/departure times, low/high energy

Load Management

Multi-Level Control

- **Site**
  Control peak power across all chargers installed at a property
- **Electrical Panel**
  Control peak power for group of chargers installed on a specific electrical panel
- **Circuit**
  Control peak power when multiple chargers are installed on one dedicated circuit

Peak Power Management

- **Type 1: Constant Peak Power**
  Set constant peak power for group of chargers at or below capacity level
- **Type 2: Time-of-Use Peak Power**
  Configure peak power to vary (by time-of-day, day-of-week)
- **Type 3: Demand Response**
  Set peak power to very in response to external control signals - Electrical Utility (via ADR2.0b) or Energy Management Software

Power Sharing Management

- **Type 1: Set Charge**
  Each charger has a fixed maximum power level
- **Type 2: Equal Charge**
  Each active charging session receives equal power, and power level varies by number of vehicles plugged in to charger group
- **Type 3: First In First Out**
  Each vehicle will receive max power until fully charged on a first arrival basis

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FLEXIBLE , SCALABLE TECHNOLOGIES

DC Charging Solutions

GILBARCO VEEDER-ROOT

Gilbarco Veeder-Root & Tritium Partnership

- Gilbarco Veeder-Root is a strategic investor in Tritium – announced Oct 2018
- Tritium selected for world leading DCFC technology & position
- Commercial partnership brings EV charging to the fleet and retail petroleum markets

GILBARCO VEEDER-ROOT

Veefil DC Fast Chargers

Veefil-RT

World's smallest 50 kW DC Fast Charger

The Veefil-RT from Tritium is a reliable, robust electric vehicle fast charger with an attractive design, that is easy to own and operate.

- ✓ Liquid cooling
- ✓ Compact design & small footprint
- ✓ Low weight (165kg)
- ✓ Reduced installation cost
- ✓ Increased reliability & low maintenance
- ✓ Robust and durable
- ✓ IP65 rating
- ✓ CHAdeMO and CCS connectors
- ✓ Custom branding
- ✓ Cloud based data access via Veefil Pulse

GILBARCO VEEDER-ROOT

Veefil DC Fast Chargers

Veefil-RT 175-S

Ultra High Power Charging

The Veefil-RT 175-S is a highly reliable high power charger enabled by liquid cooling.

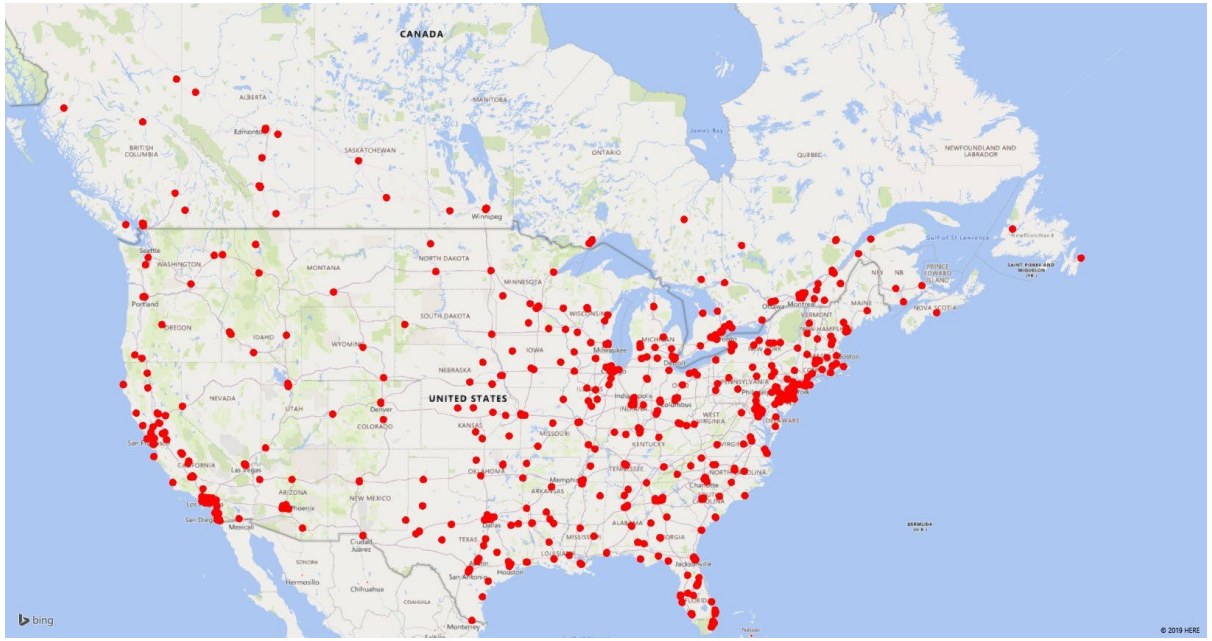
- ✓ Liquid cooling
- ✓ Compact design & small footprint
- ✓ Low weight (165kg)
- ✓ Reduced installation cost
- ✓ Increased reliability & low maintenance
- ✓ Robust and durable
- ✓ IP65 rating
- ✓ CHAdeMO and CCS connectors
- ✓ Custom branding
- ✓ Cloud based data access via Veefil Pulse

GILBARCO VEEDER-ROOT

Service Providers & Technicians

Gilbarco Veeder-Root's industry leading service and support team

- 600+ Gilbarco Service Contractors in North America
- Certified Technician Base
  - 2375+ Certified Techs



GILBARCO VEEDER-ROOT

Veefil-RT Installations

GILBARCO VEEDER-ROOT

Thank you

Fueling the future, today.

GILBARCO VEEDER-ROOT

PENSKE

Rental | Leasing | Logistics

Sean Yentsch
sean.yentsch@penske.com

- Director of Facilities for Penske Transportation Solutions
- Responsible for the capital planning, engineering, site selection and construction for the company's Northeast, Western and North Central regions, including Canada
- 28 years industry experience
- Previous experience with civil engineering consulting firm
- BS in Structural Engineering and Construction Management from Penn State University

PENSKE

Rental | Leasing | Logistics

MD/HD COMMERCIAL FLEET ELECTRIFICATON

September 23, 2020

Penske Transportation Solutions

PENSKE TRUCK LEASING

Offers leading transportation services in North America including:

- Full-Service Leasing
- Contract Maintenance
- Commercial and Consumer Rental

PENSKE LOGISTICS

Services in North & South America, Europe and Asia including:

- Dedicated Contract Carriage (DCC)
- Transportation Management (TM) & Brokerage
- Distribution Center Management (DCM)

EPES TRANSPORT SYSTEMS

Truckload carrier providing companies timely, high quality service

Essential Partners

Penske has partnered with Daimler Trucks North America to co-create and operate the Freightliner Electric Innovation Fleet of eCascadia™ heavy-duty trucks and eM2 medium-duty trucks.

The Freightliner Innovation Fleet is supported by a partnership between:

- Daimler Trucks North America
- South Coast Air Quality Management District
- EPA
- Ports of Los Angeles and Long Beach

DAIMLER

THE PORT OF LOS ANGELES

South Coast AQMD

The Port of LONG BEACH

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Where to start:

- Schedule – Path of least resistance

- Site selection
  - Areas of Opportunity – grants, rates, etc.
  - Charging multiple vehicles requires dedicated space
  - Power Consideration - future growth of EV fleet(MW capacity)

- Equipment Selection
  - Speed vs. Quantity??
  - Demand vs. Storage??

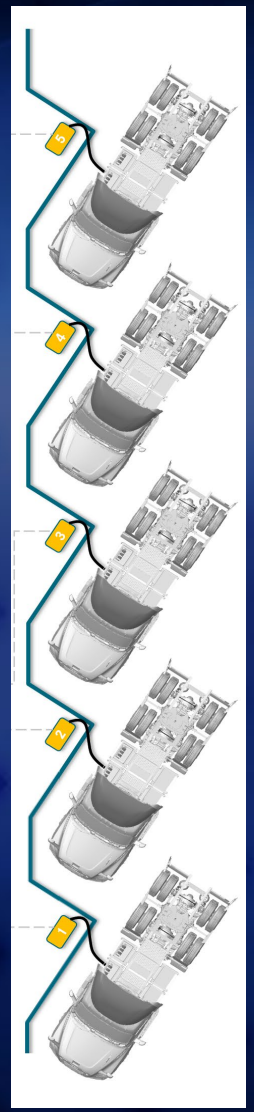
- Design & Permitting
  - In-house or consultant??

Site Infrastructure

- Proper planning for site configuration – Parallel, Angled, Drive-thru
- Charging multiple vehicles requires dedicated space – Public vs Private
- Proximity to Utility, Separate Metering, Vehicle Adapt
- Safety Aspects and proximity

Chino, CA

La Mirada, CA



A Strong Finish…

Most are not thinking about …

- Service & Parts availability
- Network monitoring
- OCPP, LAN vs cellular, Security
- Annual Fees & charges
- Grants and incentives
- Education and training
- Range, routes, opportunity charging

EV Lessons & Conclusions

- Be patient, this is all new. There is no wrong answer…
- EVSE, Battery technology, costs are ever changing.
- Costs, Period. Need grants/incentives to drive down cost/mile.
- Infrastructure/Equipment to maximize investment and fleet.
- Communication between EVSE and vehicles is key.
- Leverage key partners in fleet charging, monitoring
- Service/warranty to keep charging.

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SUSTAINABLE FLEET TECHNOLOGY

VIRTUAL CONFERENCE 2020

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STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION