



**Session #9: Avoiding the Potholes in the Road to Fleet Electrification**

**September 15, 2022**



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# Format

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



# Avoiding the Potholes in the Road to Fleet Electrification

## September 29, 2022

2:00-2:05 **Rick Sapienza, NCCETC**--Introduction and Welcome

2:05-2:25 **James Tillman, Brytemove Energy**—EV Infrastructure Tips & Tricks

2:25-2:35 **Philip Saunders, City of Portland Oregon**—City of Portland Approach to Electrification

2:35-2:45 **Robert Gordon, DeKalb County GA**—DeKalb County's Lessons Learned in Fleet Electrification

2:45-2:47 **Steve Benjamin, Department of Agriculture & Consumer Services**—Retail Charging Equipment Weights & Measures Compliance

2:45-3:00 **Q&A**





North Carolina State University  
NC Clean Energy Technology Center  
Clean Transportation Program  
[www.cleantransportation.org](http://www.cleantransportation.org)

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James Tillman

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713.894.7994

- Executive VP of Business Development for brytemove energy
- 20 years in the Automotive and mobility space
- Pioneer in Mobility as a Service and the optimization and electrification of fleets
- One of the early employees for NRG's Evgo
- Previously with City of Houston, responsible for Fleet Operations (13k units) and Capital Improvement Plan (\$5B)
- Walks the walk as a BMW Electronaut and driving only electric vehicles since 2012
- Also, owns an 11kW residential solar system, currently adding battery storage
- MBA from Rice University and Bachelor's Degree from Georgia Southern

# EV Infrastructure Tips and Tricks

September 29, 2022



brýt*move*  
energy

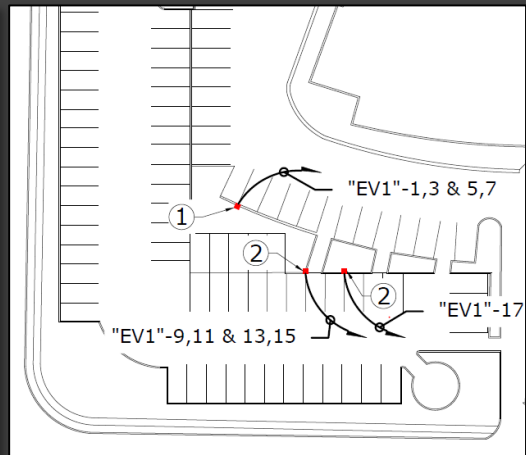


# Agenda

- **Who is brytemove energy**
- **Begin with the end in mind**
  - **Station selection**
  - **Networking/software**
- **Utility coordination**
  - **Understanding tariffs**
  - **Delivering power**
  - **Easements**
- **Future proofing**



# BME Service Offering



# Begin With The End In Mind

- Vehicle use case analysis
  - Duty cycle
  - Dwell times
  - Battery capacity
  - Efficiency
  - Charging capability

	consumption (kWh)	18	charging rate (kWh)				13			
	Vehicle	Daily utilization	9A	10A	11A	12P	1P	2P	3P	4P
in/out service	Vehicle 1	8	1	1	1	1	1			
hourly consumption	Vehicle 1	8	18	18	18	18	18	0	0	0
charging rate	Vehicle 1	8	0	0	0	0	0	13	13	13
SOC	Vehicle 1	125	107	89	71	53	35	48	61	74

	Vehicle	5P	6P	7P	8P	9P	10P	11P	12P	1A
in/out service	Vehicle 1		1	1	1					
hourly consumption	Vehicle 1	0	18	18	18	0	0	0	0	0
charging rate	Vehicle 1	13	0	0	0	13	13	13	13	13
SOC	Vehicle 1	87	69	51	33	46	59	72	85	98

	Vehicle	1A	2A	3A	4A	5A	6A	7A	8A
in/out service	Vehicle 1								
hourly consumption	Vehicle 1	0	0	0	0	0	0	0	0
charging rate	Vehicle 1	13	13	13	13	13	13	13	13
SOC	Vehicle 1	98	111	124	125	125	125	125	125

# Begin With The End In Mind

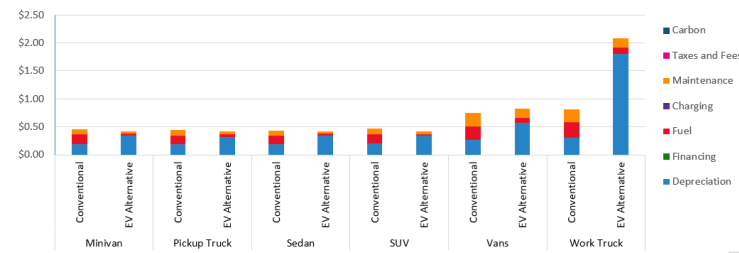
- Vehicle use case analysis
  - Duty cycle
  - Dwell times
  - Battery capacity
  - Efficiency
  - Charging capability

## DRVE Results Dashboard

This dashboard allows you to explore the results of your analysis by drilling down on the various setting that were input into the tool. Use the slicers to filter your results for different settings. View the **Report** and **Vehicle Summary** pages for pre-generated reports, or create your own in the **Sandbox** tab. Save your results and explore them later by clicking "Save Results".

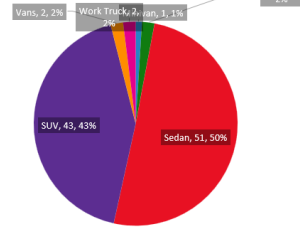
Save Results

Nominal Cost Per Mile per Vehicle Use Case

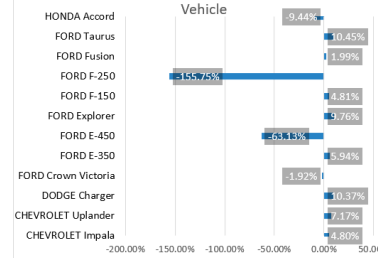


Row Labels	Average Total NPV Cost (\$/Mile)	Total NPV Cost
<b>Minivan</b>		
Conventional	\$0.46	\$38,373.62
EV Alternative	\$0.42	\$35,620.36
<b>Pickup Truck</b>		
Conventional	\$0.44	\$36,972.35
EV Alternative	\$0.42	\$35,194.68
<b>Sedan</b>		
Conventional	\$0.44	\$36,565.12
EV Alternative	\$0.42	\$35,509.79
<b>SUV</b>		
Conventional	\$0.46	\$39,027.39
EV Alternative	\$0.42	\$35,217.57
<b>Vans</b>		
Conventional	\$0.74	\$62,502.72
EV Alternative	\$0.82	\$69,180.58
<b>Work Truck</b>		
Conventional	\$0.82	\$68,547.35
EV Alternative	\$2.09	\$175,307.17
<b>Grand Total</b>	<b>\$0.47</b>	<b>\$39,511.88</b>

Fleet Breakdown



Average Percent Savings by Original Fleet Vehicle



**Vehicle Class**

- Medium Duty Vehicles (Class 3-6)
- Passenger Vehicles (Light-Duty)

**Vehicle Scenario**

- Conventional
- EV Alternative

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**Vehicle Make**

- Chevrolet
- Dodge
- Ford
- Honda
- Lightning Systems
- Phoenix Motorcars

**Vehicle Model**

- Accord
- Charger
- E-350
- E-450
- E450 Cab & Chassis
- eTransit - Cargo Van
- Explorer AWD

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**Charging Mix Name**

- (blank)
- Default

**Forecast Year**

- 2020

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**VIN**

- CHEVROLET Impala: 1FAPF5323XG252879
- CHEVROLET Uplander: 1FAHP2MK9EG182520
- DODGE Charger: 1FDXE4059XHB09590
- FORD Crown Victoria: 1FM5K8AR0EGA28516
- FORD E-350: 1FM5K8AR0HGA17228
- FORD E-450: 1FM5K8AR0HGA17231
- FORD Explorer: 1FM5K8AR1EGA28511



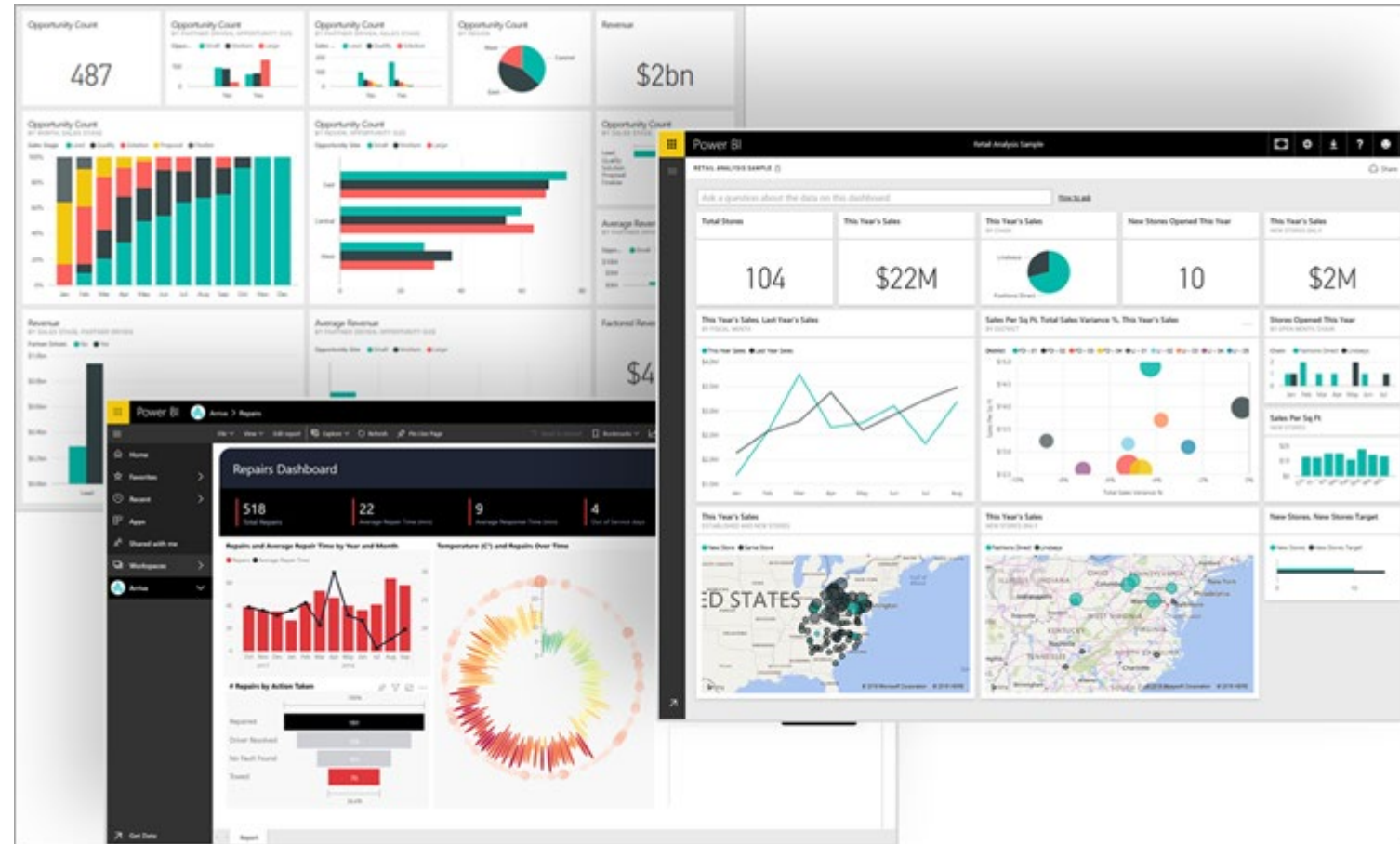
# Begin With The End In Mind

- Vehicle use case analysis
  - Duty cycle
  - Dwell times
  - Battery capacity
  - Efficiency
  - Charging capability
- Customer facing vs. fleet
  - Smart vs dumb chargers
  - Feature rich vs industrial
  - Restricted access



# Begin With The End In Mind

- Vehicle use case analysis
  - Duty cycle
  - Dwell times
  - Battery capacity
  - Efficiency
  - Charging capability
- Customer facing vs. fleet
  - Smart vs dumb chargers
  - Feature rich vs industrial
  - Restricted access
- Software Requirements
  - Networking
  - Reporting
  - Load Management\*



# Utility Coordination

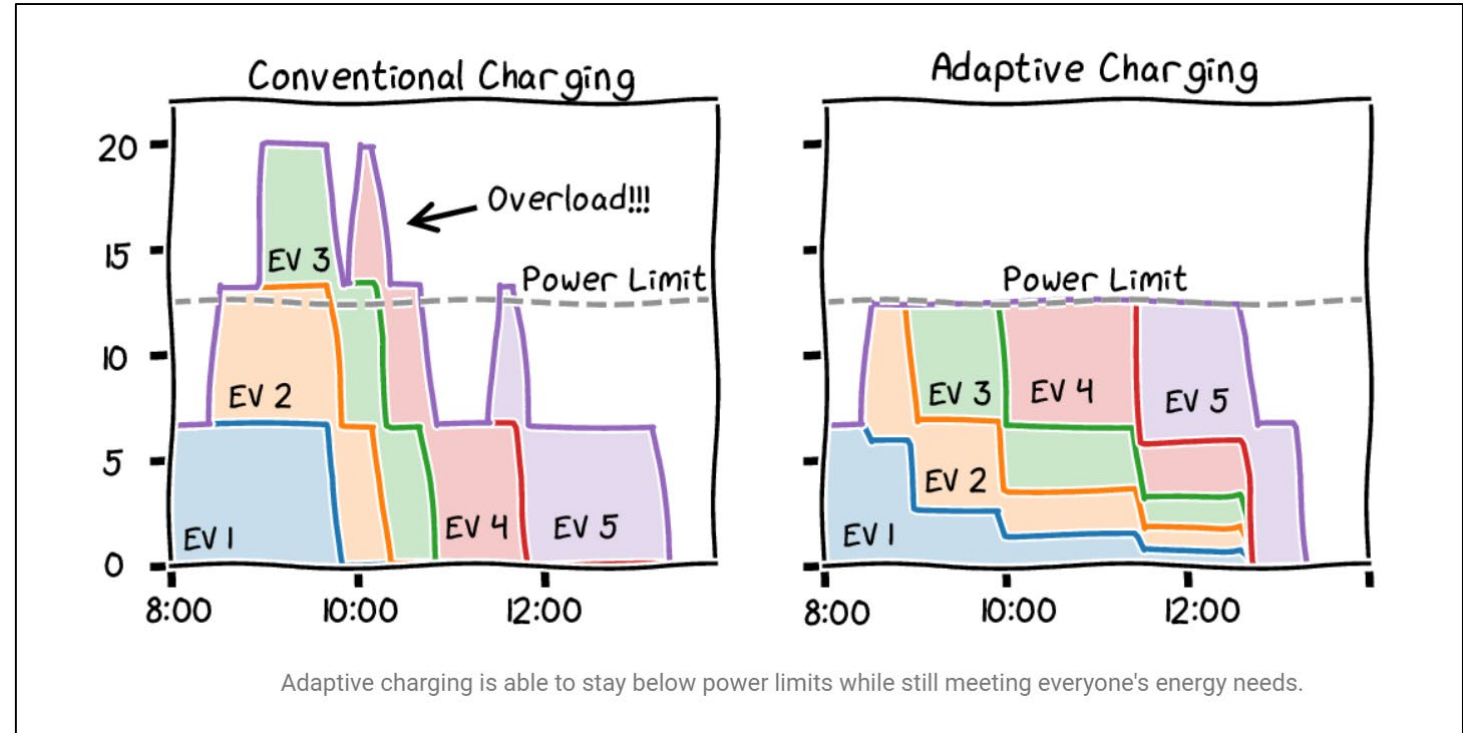
- Demand charges
  - Fee levied to large customers to pay for T&D required to service load

Utility demand charge per kW	\$7.50
TOU off peak rate	\$0.10
Efficiency miles/kWh	3.5
Number of EVs in fleet	100
Miles driven per day	120
L2 charging rate (kW)	10
Total Peak demand	1,000
Days of monthly operation	22
Typical kWh to recharge	34.29
Total kWh	75,429
Electricity Bill	
Demand Charge	\$7,500
kWh charge	\$7,543
Total bill	\$15,043
ultimate \$/kWh	\$0.20
price per mile	\$0.06



# Utility Coordination

- Demand charges
  - Fee levied to large customers to pay for T&D required to service load
- Load Management



Source: CalTech

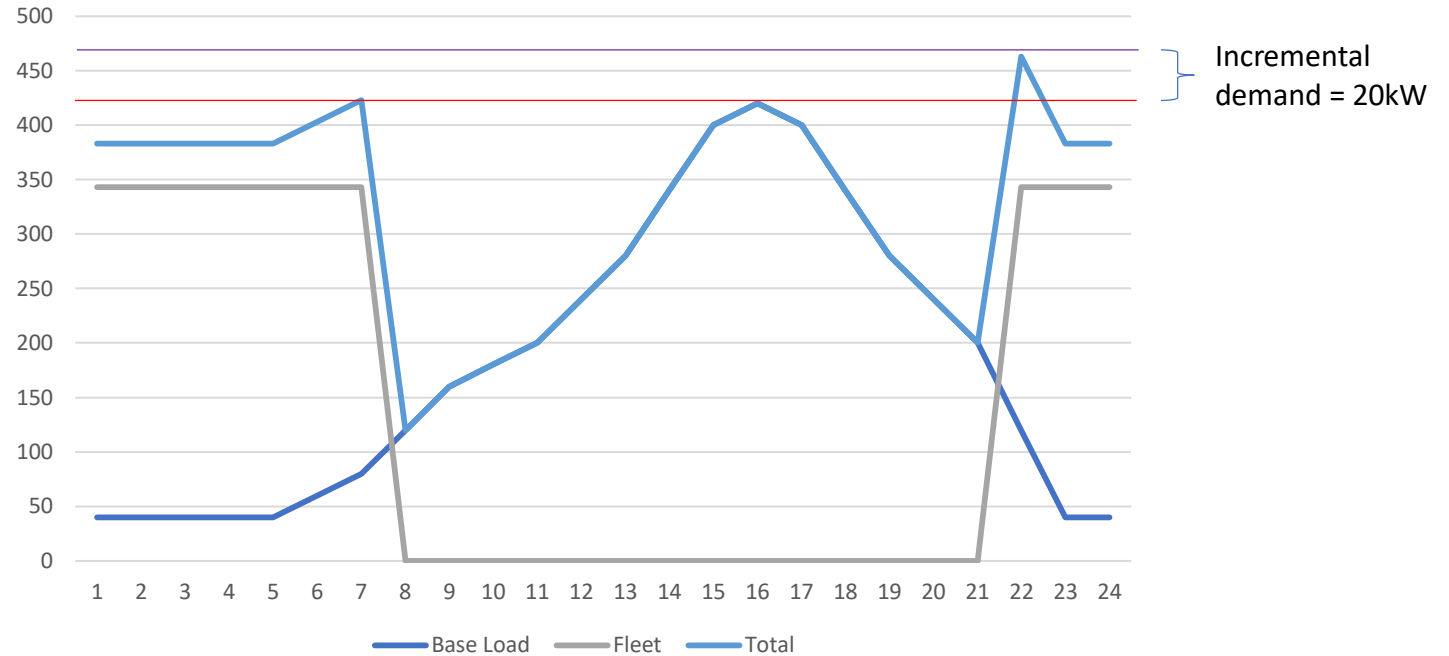
# Utility Coordination

- Demand charges
  - Fee levied to large customers to pay for T&D required to service load
- Load Management
- New service vs. existing

	No load management	with load management
Utility demand charge per kW	\$7.50	\$7.50
TOU off peak rate	\$0.10	\$0.10
Efficiency miles/kWh	3.5	3.5
Number of EVs in fleet	100	100
Miles driven per day	120	120
L2 charging rate (kW)	10	3.43
<b>Total Peak demand</b>	<b>1,000</b>	<b>343</b>
Days of monthly operation	22	22
Typical kWh to recharge	34.29	34.29
Total kWh	75,429	75,429
total time to recharge (hrs)	3.43	10.00
<b>Electricity Bill</b>		
<b>Demand Charge</b>	<b>\$7,500</b>	<b>\$2,571</b>
kWh charge	\$7,543	\$7,543
<b>Total bill</b>	<b>\$15,043</b>	<b>\$10,114</b>

# Utility Coordination

- Demand charges
  - Fee levied to large customers to pay for T&D required to service load
- Load Management
- New service vs. existing



# Utility Coordination

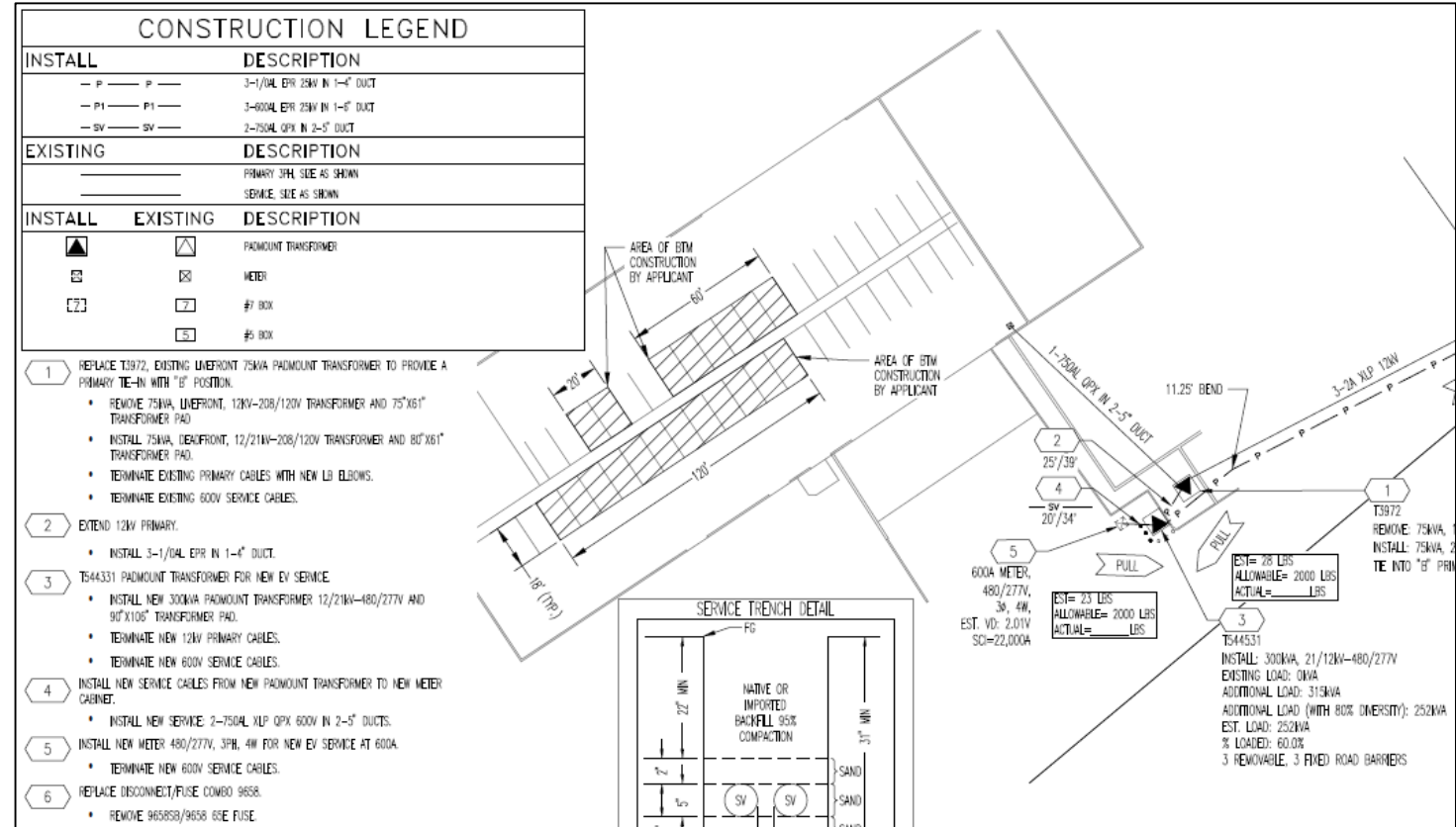
- Demand charges
  - Fee levied to large customers to pay for T&D required to service load
- Load Management
- New service vs. existing
  - Cost
  - Timing
  - Long lead items

	New Service		Existing
	No load management	with load management	with load management
Utility demand charge per kW	\$7.50	\$7.50	\$7.50
TOU off peak rate	\$0.10	\$0.10	\$0.10
Efficiency miles/kWh	3.5	3.5	3.5
Number of EVs in fleet	100	100	100
Miles driven per day	120	120	120
L2 charging rate (kW)	10	3.43	3.43
<b>Total Peak demand</b>	<b>1,000</b>	<b>343</b>	<b>20</b>
Days of monthly operation	22	22	22
Typical kWh to recharge	34.29	34.29	34.29
Total kWh	75,429	75,429	75,429
total time to recharge (hrs)	3.43	10.00	10.00
<b>Electricity Bill</b>			
<b>Demand Charge</b>	<b>\$7,500</b>	<b>\$2,571</b>	<b>\$150</b>
kWh charge	\$7,543	\$7,543	\$7,543
<b>Total bill</b>	<b>\$15,043</b>	<b>\$10,114</b>	<b>\$7,693</b>
ultimate \$/kWh	\$0.20	\$0.13	\$0.10
price per mile	\$0.06	\$0.04	\$0.03
gallons of gas saved			
price of gas	\$4.00	\$4.00	\$4.00
mpg comparable	30	30	30
price per mile	\$0.13	\$0.13	\$0.13
<b>total monthly savings</b>	<b>\$20,157.14</b>	<b>\$25,085.71</b>	<b>\$27,507.14</b>



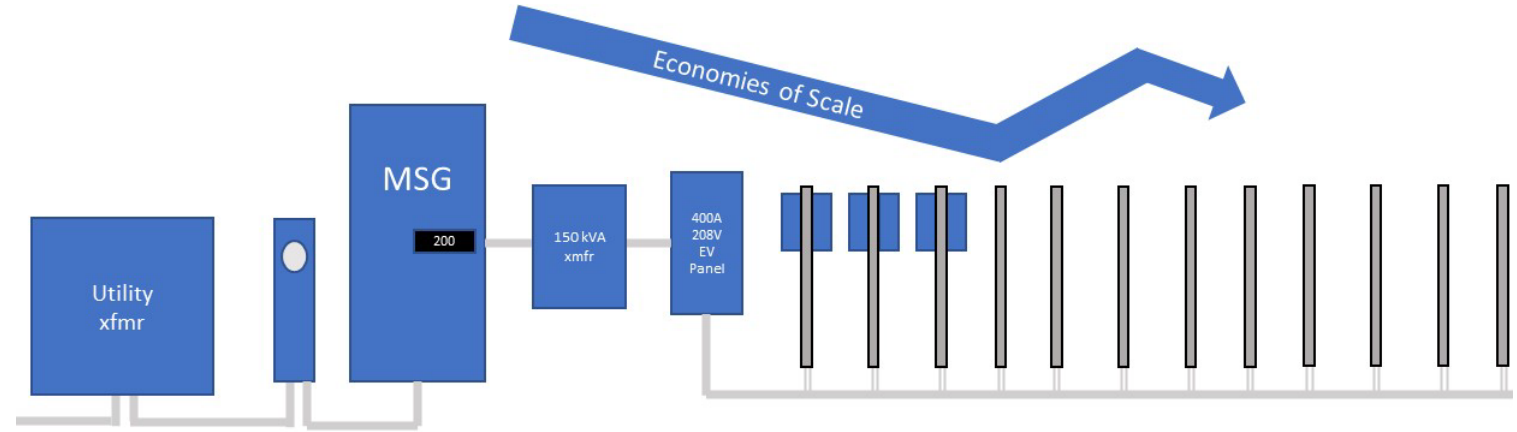
# Utility Coordination

- Demand charges
  - Fee levied to large customers to pay for T&D required to service load
- Load Management
- New service vs. existing
  - Cost
  - Timing
  - Long lead items
  - Easements
  - Flexibility



# Future Proofing

- Incremental cost of one more charging station
- Don't over do it
- Upsize gear
- Extra and large conduits
- Deliver conduit to an area near future deployment
  - Be sure before committing
- Take advantage of utility make ready programs



## Incremental expenses:

- Larger breaker
- Larger panel
- Larger Step-down Tx

## Additional installation:

- Distance from MSG to Tx and Tx to panel
- Larger conduit
- Larger conductor



**James Tillman**

EVP Business Development

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## City of Seattle



Philip Saunders

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206-684-0137

- Division Director of Logistics and Emergency Management with oversight of the Green Fleet Program
- Green Ambassador for City of Seattle
- Authored 2019 City of Seattle Green Fleet Action Plan
- Received Governor Award for Leadership in Management
- Western Washington Clean Cities Coalition Committee Chair and member National Institute of Governmental Purchasing
- #4 Green Fleet 2019
- BS in Business Administration, Lean Six Sigma Black Belt Certified
- Retired US Army Warrant Office 20 years as logistician and contract officer





# Avoiding the Potholes in the Road to Fleet Electrification

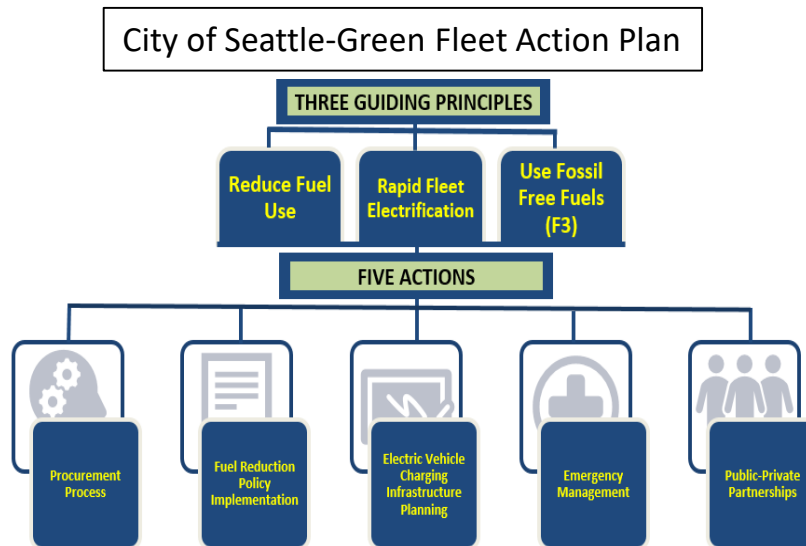




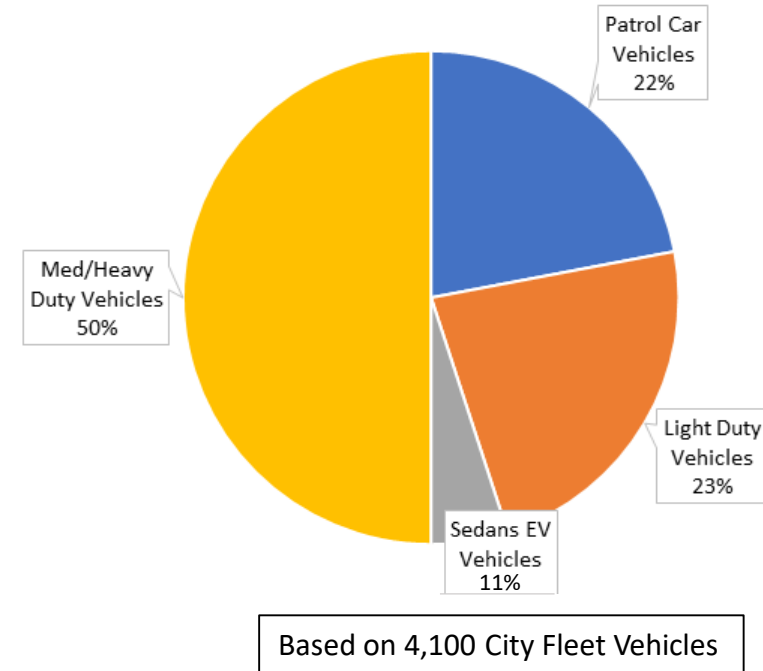
# How Does The City Avoid the Potholes in the Road to Fleet Electrification?



# Green Fleet Strategies



City Fleet Composition Overview



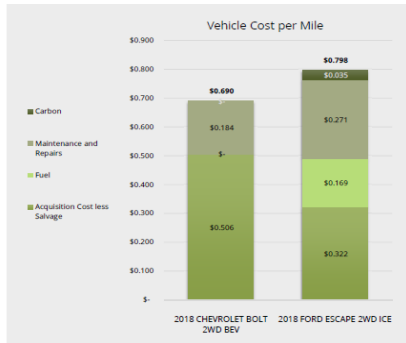
# Implement the City's Cost to Go Green

- **Develop an Action Plan (Including Costs)**
- **Funding:** ~\$28M over the next six years (Electrification Focus)
  - Fleet Electrification (increase in EV models costs means increased rates)
    - 300 BEV/138 PHEV and More Currently Being Purchased (TCO Tool)
  - Electric Vehicle Supply Equipment (EVSE)/Infrastructure
    - Over 300 Charging Stations (3 DCFC) over 17 locations
    - Master Project Complete to Determine Charging Stations Citywide for Fleets
  - Telematics
    - Include EVs



# Implement the City's Cost to Go Green cont'd

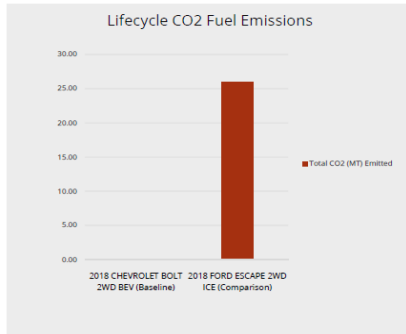
## Procurement Summary



	2018 CHEVROLET BOLT 2WD BEV (Baseline)	2018 FORD ESCAPE 2WD ICE (Comparison)
Number of Vehicles Procured	1	1
Years of Use/Ownership	10	10
Miles Procured	55,000	55,000
Acquisition Cost \$	(34,790)	(19,699)
Fuel \$	-	(9,294)
Maintenance and Repairs \$	(10,102)	(14,921)
Carbon \$	-	(1,943)
<b>Vehicle Total Cost \$</b>	<b>(44,892)</b>	<b>(45,858)</b>
Charging Infrastructure \$	-	-
Estimated Salvage \$	6,958	1,970
<b>Total Cost of Ownership \$</b>	<b>(37,934)</b>	<b>(43,888)</b>
Total Cost / Mile \$	(0.690)	(0.798)

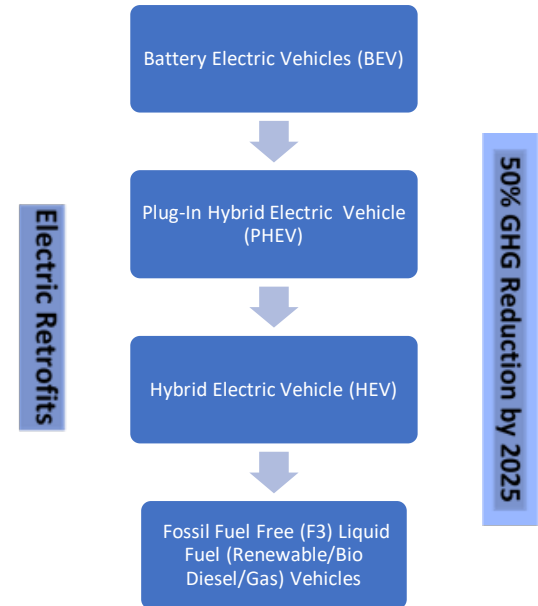
The greenest option (baseline) is 16% less expensive than the alternative (comparison) vehicle

## Societal Benefit Summary



2018 CHEVROLET BOLT 2WD BEV (Baseline)	VS	2018 FORD ESCAPE 2WD ICE (Comparison)
0 gallons		2,292 gallons

The greenest option (baseline) fleet uses 2,292 fewer gallons of gasoline than the alternative option (comparison) fleet



Electric Retrofits

Acquisition + Life Maintenance + Life Fuel + Cost of Carbon (\$75 per MTCO2e) – Salvage Cost=





# Current and Future Electrification

- Budget to accommodate increased EVSE investment needed to meet policy goals
- Pursue grant funding opportunities
- Prioritize investments aligned with EVSE
  - Align phasing with planned EV replacement
  - Service citywide fleet and shore up emergency response capabilities by investing in fast charging hubs and backup systems at hub locations
  - Prioritize sites with high fleet count and light duty fleet percentages
  - Build-out police precincts
  - Build-out sites with low fleet count and/or high medium/heavy duty fleet percentages
  - Build-out remaining fire stations
  - Complete lower cost interim investments annually where budget allows



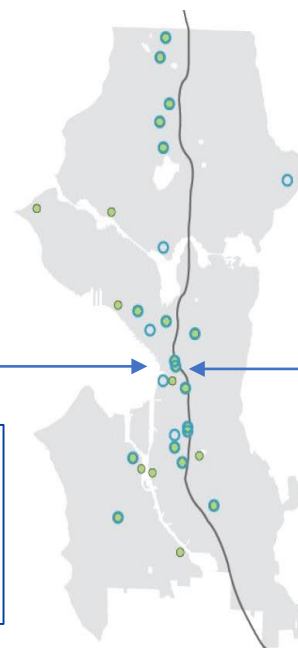
# Current and Future Electrification cont'd

- 17 SITES WITH ELECTRIC VEHICLES AND CHARGERS
- 12 SITES WITH ELECTRIC VEHICLES BUT NO CHARGERS
- 8 SITES WITH CHARGERS AND NO ELECTRIC VEHICLES



### Seattle Municipal Tower

- EVSE-160 City Fleet Only
- VW Grant
- Cost-\$200K
- 1 DCFC and 6 Level 2 for Employee/Public Use



### SeaPark Parking Garage

- EVSE-150 Installation Complete
- Cost-\$5 Million
- EVMC
- 90 EVSE for Public Use

# Questions

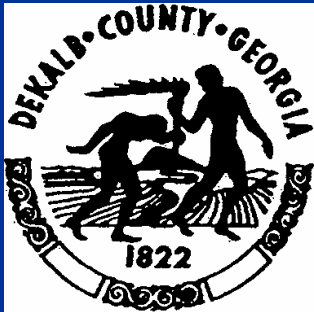




Robert Gordon

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404-297-3280



- Deputy Director of Fleet Management DeKalb County GA
- More than 35 years in Fleet Management
- One of the top Leaders in the industry—driving himself and his organization
- Earned Associate's Degree in Business Management at 49
- Involved in a number of industry professional organizations--100 Best Fleet, Green Fleet, NAFA, Georgia Motor Trucking Association, American Public Works Association, Georgia Municipal Association, Southeast Diesel Collaborative, and Southeast Governmental Fleet Managers Association
- Serves on the Board of Directors for GA Clean Cities
- Recognized by the 100 Best Fleets over the past 10 years and in the Top 10 for the last 5 years
- 2018 was the #1 in The 100 Best Fleets and received NAFA's FLEXY award for Outstanding Achievement in Public Fleet Management

# DeKalb County



## Fleet Electrification





# Fleet Management

- 152 Positions 138 Filled
- \$30 million Annual Operating Budget
- \$33 million Annual Vehicle Replacement
- Fleet averages 30,000,000 miles Annually
- Fleet Management maintains 3622 Vehicles
- 437 Alternative Fuel Vehicles 12%







# *Green Fleet Awards*

2021 – 24 <sup>th</sup> place	2016 – 25 <sup>th</sup> place
2020 – 6 <sup>th</sup> place	2015 – 22 <sup>nd</sup> place
2019 – 10 <sup>th</sup> place	2014 – 22 <sup>nd</sup> place
2018 – 18 <sup>th</sup> place	2013 – 7 <sup>th</sup> place
2017 – 22 <sup>nd</sup> place	



# Electric Vehicles in our Fleet

- 10 Chevrolet Bolts Total Electric (BEV)
- 2 Chevrolet Volts Plug-in Hybrid (PHEV)
- 2 Ford Focus Total Electric (BEV)
- 8 Ford Fusions Plug-in Hybrid (PHEV)
- 8 Plug-in Hybrid Bucket Trucks
- 10 Ford Lightnings on order
- 100 Electric Vehicles scheduled to order in 2023  
Sedans, Pickups & Vans

# Charging Sites

- 10 Level 2 Charging Stations
- 8 Level 1 Mounted Plug-in Chargers
- Ga Power Make Ready Program (In progress)
  - 72 Level 2 Chargers at Sam's Street
  - 68 Level 2 Chargers and 2 Level 3 Chargers at Road Haven
- Working to develop 3 more Charging Sites
  - 50 to 60 Chargers each







# What type Chargers Do you Need?

- Network Chargers (Smart Chargers)
  - What will you do with the data?
- Non-Network Chargers (Dumb Chargers)
- Level 1, 2 or 3 Chargers
- How many Chargers Do you Need?

## Lesson Learned

- Installation can be very expensive
- Ask for help from Facilities Management
- Ask for help from Sustainability Department

# Chargers



# Best Practices

- Network with Fleet Managers
- Do you have Electric Charging Stations in your Area?
- Do you have Service Providers in your Area?
- Touch & Feel
- Test Drive Electric Vehicles
- Become a Subject Matter Expert on EV's



# Best Practices

- Communicate with your Customers/ Department
  - How many miles traveled per day?
  - Trust but Verify
  - Do they want Electric Vehicles?
  - What do they do?
  - How much weight do they haul?

# Training

- Start Safety Training Early (Drivers & Techs)
- Dedicated Trainer
- Basic Troubleshooting & Repair
- In-House
- Vendor (Paid for by Vendor)
- Ongoing / Never Stop



**Robert Gordon**

**DeKalb County Fleet Management**

**Deputy Director**

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**Stone Mountain, GA 30083**

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**Cell 770-652-6972**

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# Retail Electric Vehicle Supply Equipment (EVSE)

- ▶ National Institute of Standards and Technology (NIST) handbooks used in NC, adopted through regulation.
- ▶ Method of Sale for electricity sold as vehicle fuel is the kilowatt-hour (kWh), as found in NIST Handbook 130
- ▶ Specifications for retail devices are found in NIST Handbook 44, Specifications, Tolerances and Other Technical Requirements for Weighing and Measuring Devices

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