CLEAN CITIES COALITION NETWORK WEBINAR

AFLEET TOOL 2023 UPDATES

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OUTLINE OF PRESENTATION

- **AFLEET Introduction**
- **AFLEET Demo #1**
  - Excel EV Utility Rate Calculator
- **AFLEET Demo #2**
  - Excel EV Charger TCO Calculator
- **AFLEET Demo #3**
  - New Online Calculators
- **Future Work**

AFLEET Suite of Tools

AFLEET Spreadsheet

Detailed energy, emission, and cost data for light- and heavy-duty AFVs

AFLEET Online

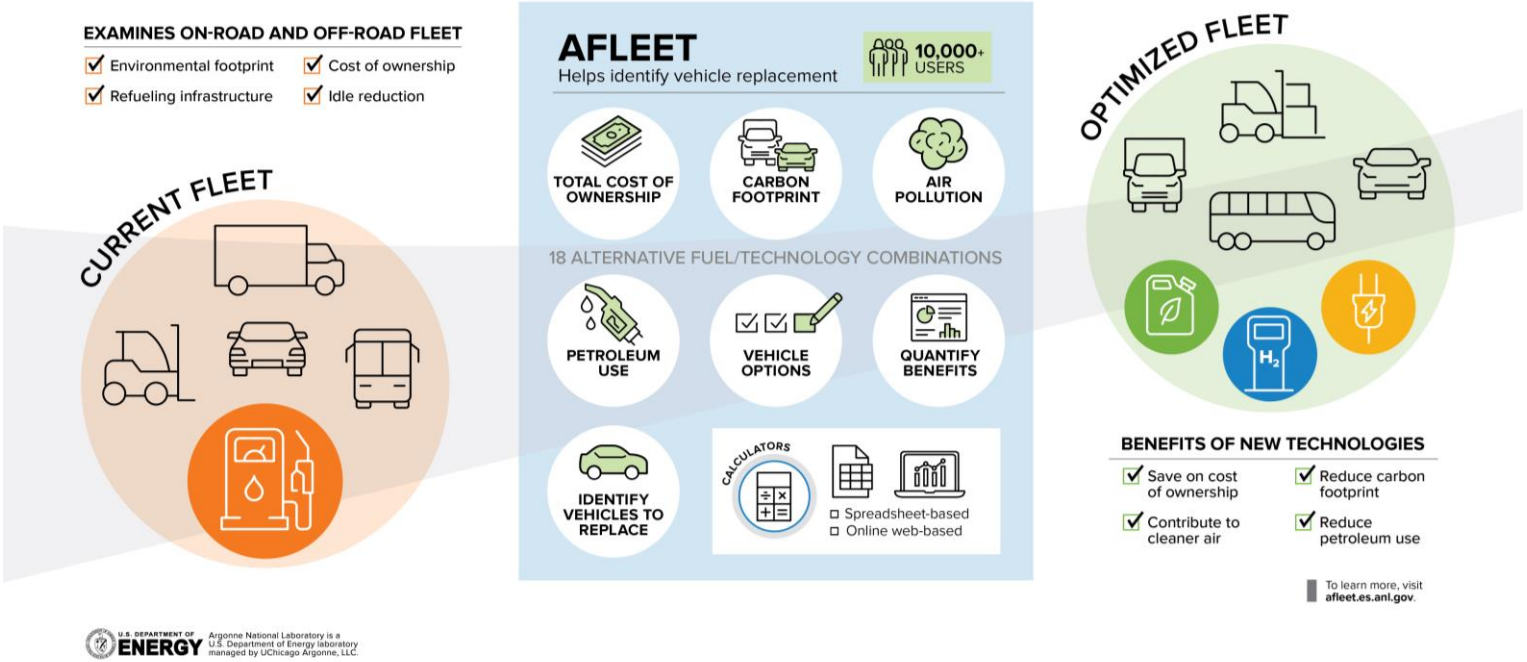
User-friendly interface analyzes petroleum use, emissions, simple payback and TCO

Heavy Duty Vehicle Emissions Calculator

Compares NOx, PM, GHGs and cost-effectiveness

afleet.es.anl.gov

AFLEET INTRODUCTION



AFLEET TOOL

- **Examines light-duty, heavy-duty, & off-road vehicle:**
  - Petroleum use
  - GHGs
  - Air pollutants
  - Cost of ownership

- **Contains 18 fuel/vehicle technologies**
  - Conventional
  - Hybrids
  - Plug-in electrics
  - Alternative fuels: CNG, LNG, LPG, H_2, ethanol, biodiesel, renewable diesel

- **AFLEET Spreadsheet and Online; HDVEC: afleet.es.anl.gov**
  - AFLEET Online and HDVEC updated as well

AFLEET CALCULATION METHODS (SPREADSHEET)

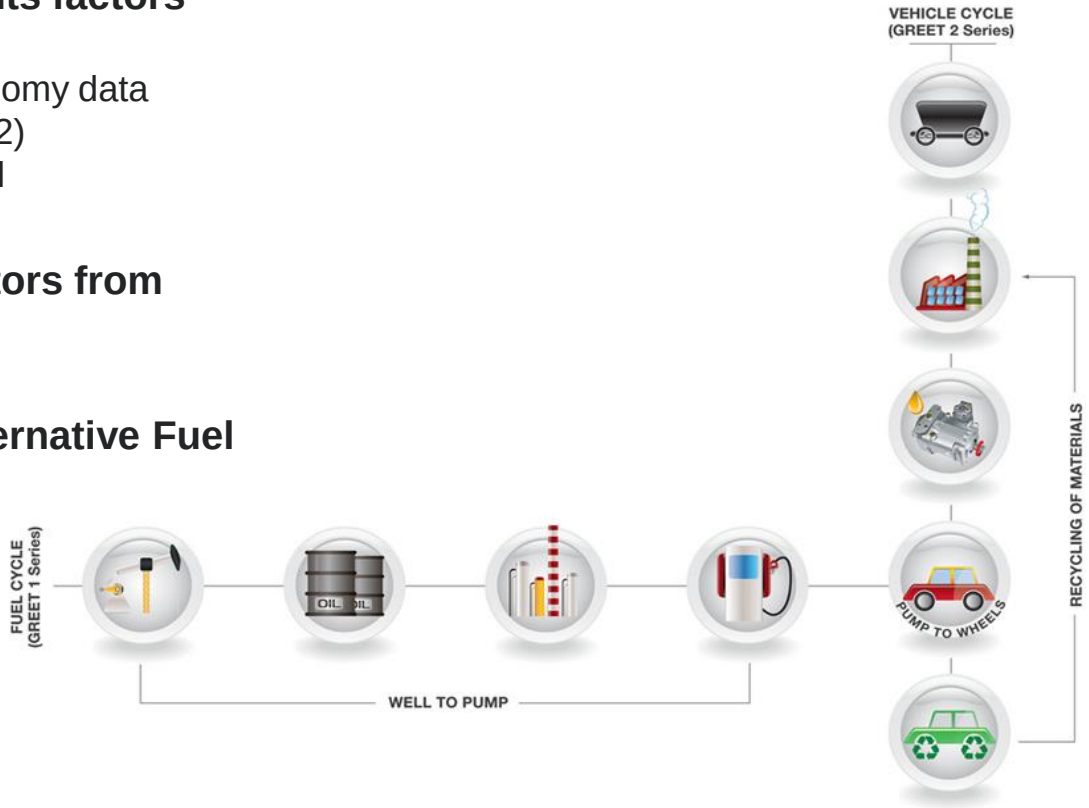
1. **Simple Payback Calculator**
   - On-Road
   - Off-Road
2. **Total Cost of Ownership Calculator**
3. **Idle Reduction Calculator**
4. **On-Road Fleet Footprint Calculator**
5. **Off-Road Fleet Footprint Calculator**
6. **EV Utility Rate Calculator**
7. **EV Charger TCO Calculator**
8. **Charging and Fueling Infrastructure Calculator**

KEY DATA SOURCES

- **Petroleum use, GHGs, air pollutants factors from Argonne's GREET Model**
  - Light-duty and heavy-duty fuel economy data
  - HDV vehicle-cycle results (GREET 2)
  - Renewable LPG and UCO biodiesel

- **Vehicle air pollutant emission factors from EPA's MOVES3**

- **Fuel prices using Clean Cities Alternative Fuel Price Reports**



NEW FEATURES

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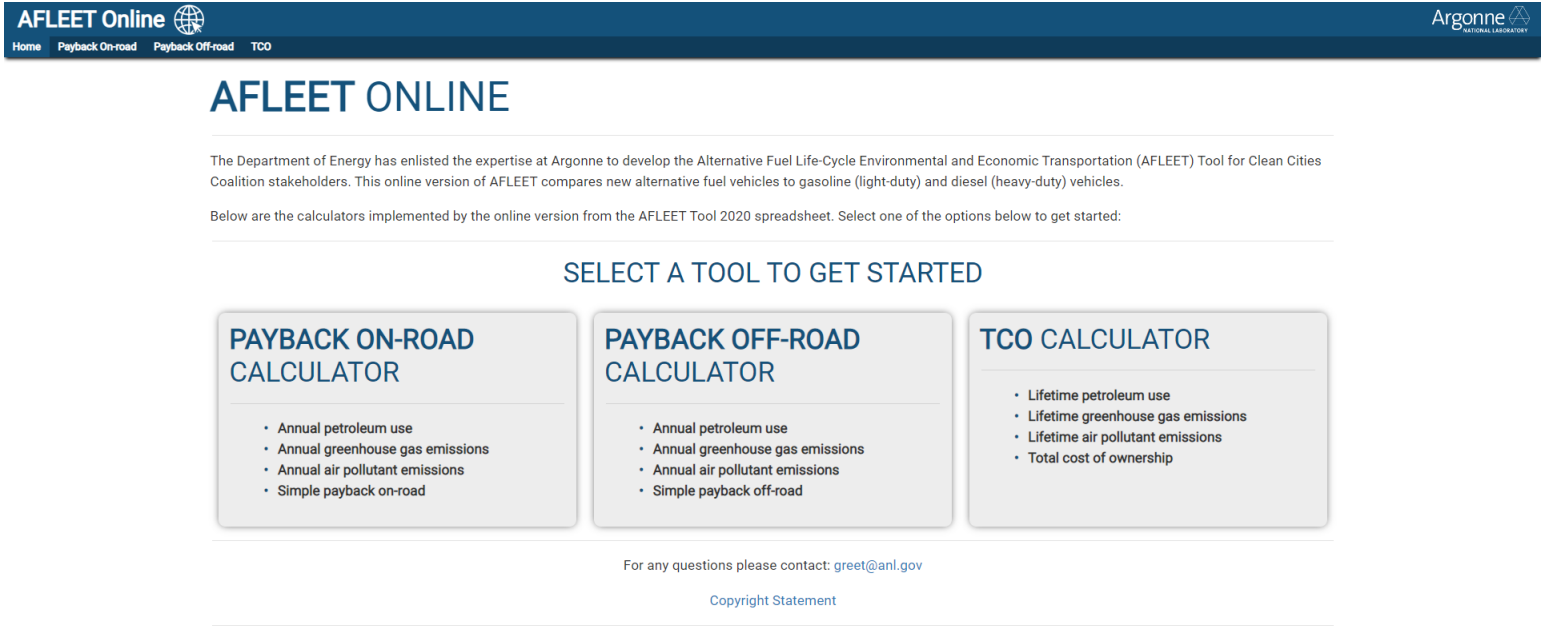
AFLEET ONLINE: ON-ROAD TCO & OFF-ROAD PAYBACK CALCULATORS



EV UTILITY RATE CALCULATOR

- **Regional utility electricity rates for EV residential, public, and fleet charging**
  - Rate type
  - Charger rating
  - Charging period/strategy
  - Vehicle requirements
- **Energy, demand, and fixed charges**
  - Summer/winter
  - Off-/mid-/on-peak

Inputs - Rate 1

State	ALABAMA
Rate Type	Commercial
Utility Rate Name	Alabama Power: AGRICULTURAL SERVICE - LARGE (Flat, >0 kW)
Charging Strategy	Unmanaged
Charging Period: Start Time	6:00 PM
Charging Period: End Time	5:00 AM
Charger Rating (kW)	50
Charging Days per Week	5
Number of EVs	1
Daily EV Mileage	30
EV Electricity Use (kWh/mi)	1.7

Outputs - Rate 1

Electricity Dispensed	Annual
Energy Dispensed (kWh)	14,774
Max Monthly Demand (kW	50
Charge Time per EV (hr)	1.5
Charging Period (hr)	2.0
Costs	**Annual**
Energy Charge ($)	$1,719
Demand Charge ($)	$0
Fixed Charge ($)	$246
Total Bill ($)	**$1,965**
Cost per kWh ($/kWh)	**$0.13**

12 'Winter' Non-Peak Rate Months Per Year

Time of Day:	12:00 AM	1:00 AM	2:00 AM	3:00 AM	4:00 AM	5:00 AM	6:00 AM	7:00 AM	8:00 AM	9:00 AM	10:00 AM	11:00 AM	12:00 PM	1:00 PM	2:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM	7:00 PM	8:00 PM	9:00 PM	10:00 PM	11:00 PM
Energy (kWh):	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	38	19	0	0	0	0
Demand (kW):	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	50	50	0	0	0	0
Energy TOU:																								
Demand TOU:																								

0 'Summer' Peak Rate Months						12 'Winter' Non-Peak Rate Months				
Energy per Month	**Flat**	**On-peak**	**Mid-peak**	**Off-peak**	**Total**	**Flat**	**On-peak**	**Mid-peak**	**Off-peak**	**Total**
Energy Distribution		0%	0%	0%			0%	0%	100%	
Energy Dispensed (kWh)		0	0	0	0		0	0	1,231	1,231
Energy Rate ($/kWh)							$0.00	$0.00	$0.12	
Energy Charge ($)		$0	$0	$0	$0		$0	$0	$143	$143
Demand per Month	**Flat**	**On-peak**	**Mid-peak**	**Off-peak**	**Total**	**Flat**	**On-peak**	**Mid-peak**	**Off-peak**	**Total**
Demand (kW)	0	0	0	0	0	50	0	0	50	50
Demand Rate ($/kW)						$0.00	$0.00	$0.00	$0.00	
Demand Charge ($)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Fixed Costs per Month					**Total**					**Total**
Fixed Charge ($)					$0					$21

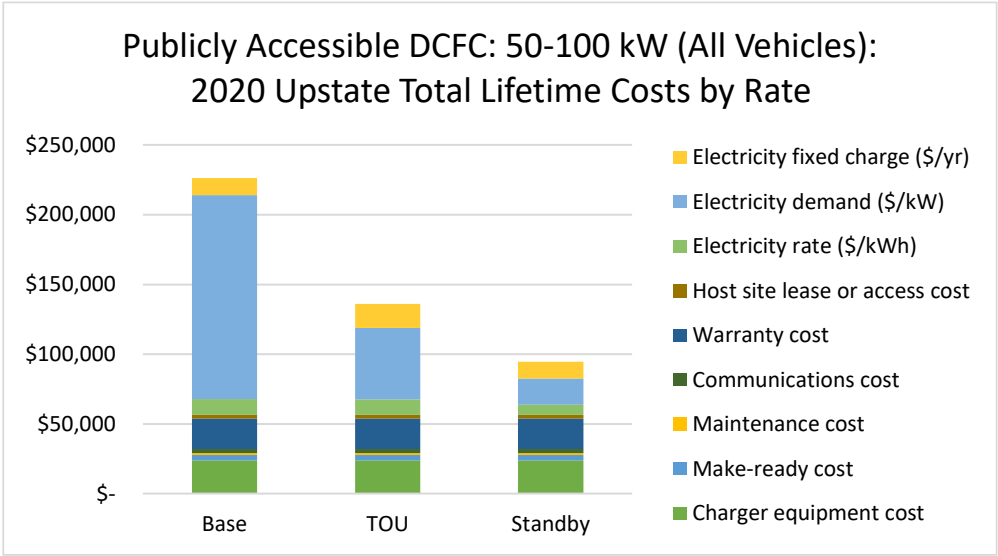
EV CHARGING COST CALCULATOR

- **Levelized and NPV cost of charging**
- **Utilization**
- **Capital costs**
  - Charger and make ready
- **Annual operating costs**
  - Communications, warranty, maintenance
- **Electricity costs**
  - Uses EV Utility Rate Calculator

Inputs - Charger Assumptions

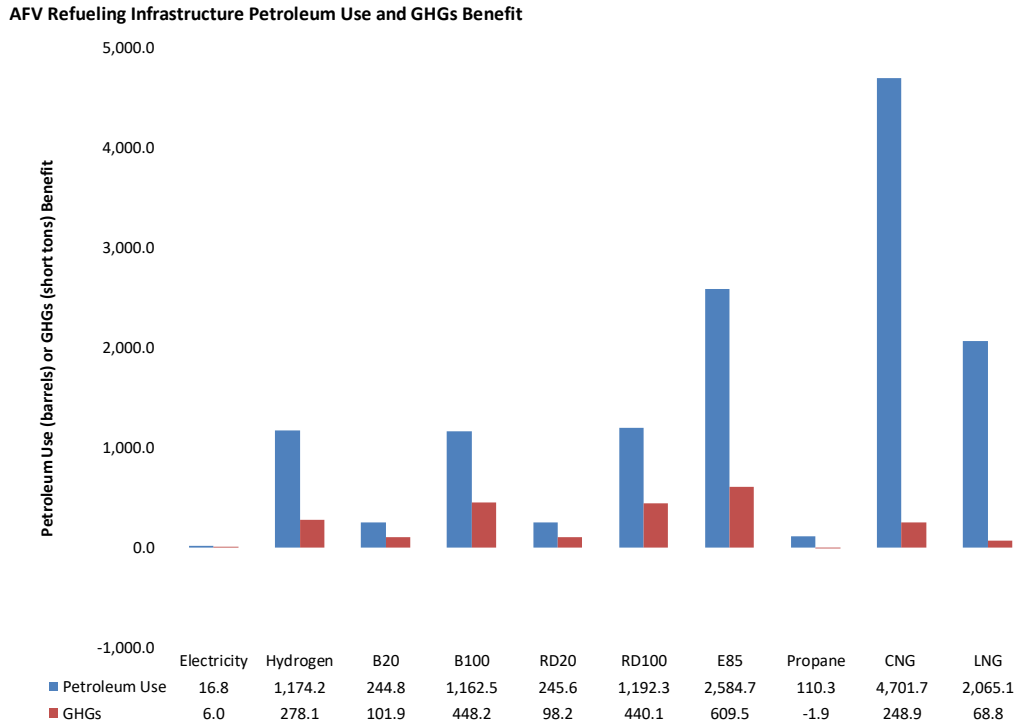
Charger Lifetime	year	10
Make-Ready Lifetime	year	30
Fleet DCFC Power Type		Fleet DCFC: 100-300 kW

Charger Type	Use Type	Utilization sessions/week	Charging time hr/session	Charger equipment cost $	Make-ready cost $
Residential Level 1	Light-Duty Vehicle	6	8.5	$380	$0
Residential Level 2	Light-Duty Vehicle	6	2.1	$689	$480
Publicly Accessible Level 2	Light-Duty Vehicle	5	1.5	$4,900	$4,500
Publicly Accessible DCFC: 50-100 kW	All Vehicles	15	0.4	$27,900	$68,250
Publicly Accessible DCFC: 100-300 kW	All Vehicles	26	0.3	$87,800	$91,000
Publicly Accessible DCFC: 300+ kW	All Vehicles	26	0.1	$139,000	$121,333
Fleet DCFC: 100-300 kW	School Bus	6	0.6	$87,800	$91,000
Fleet DCFC: 100-300 kW	Transit Bus	6	2.6	$87,800	$91,000
Fleet DCFC: 100-300 kW	Refuse Truck	6	3.9	$87,800	$91,000
Fleet DCFC: 100-300 kW	Single Unit Short-Haul Truck	6	0.6	$87,800	$91,000
Fleet DCFC: 100-300 kW	Single Unit Long-Haul Truck	6	0.9	$87,800	$91,000
Fleet DCFC: 100-300 kW	Combination Short-Haul Truck	6	4.9	$87,800	$91,000
Fleet DCFC: 100-300 kW	Combination Long-Haul Truck	6	14.9	$87,800	$91,000



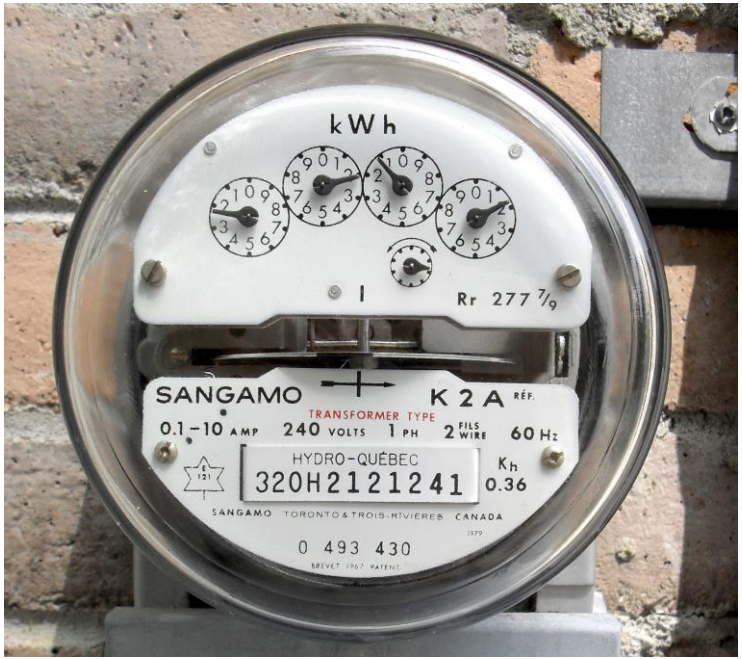
CHARGING AND FUELING INFRASTRUCTURE CALCULATOR

- **Developed in collaboration w/ TI and JO**
  - Standalone tool developed for BIL CFI proposals
- **Analyze emissions benefits by comparing counterfactual conventional fuel station (gasoline/diesel) vs alternative fuel station based on:**
  - Utilization
  - Vehicle mix
  - Upstream fuel production



	Electricity	Hydrogen	B20	B100	RD20	RD100	E85	Propane	CNG	LNG
Petroleum Use	16.8	1,174.2	244.8	1,162.5	245.6	1,192.3	2,584.7	110.3	4,701.7	2,065.1
GHGs	6.0	278.1	101.9	448.2	98.2	440.1	609.5	-1.9	248.9	68.8

Using the EV Utility Rate Calculator



File: Kristoferb at English Wikipedia
https://commons.wikimedia.org/wiki/File:Hydro_quebec_meter.JPG

AFLEET TUTORIAL – EV UTILITY RATE CALCULATOR

- **1st step: adjust charging assumptions on "EV Rate" sheet**
  - Can analyze up to 3 rates on sheet
  - State, rate type, utility rate name, charging strategy, charging period: start time, charging period: end time (via dropdown)
  - Charger rating, charging days per week, number of EVs, daily EV mileage, EV electricity use

State	ALABAMA
Rate Type	Commercial
Utility Rate Name	Alabama Power: Business Electric Vehicle- Time of Use (EV, >0 kW)
Charging Strategy	Managed
Charging Period: Start Time	6:00 PM
Charging Period: End Time	5:00 AM
Charger Rating (kW)	50
Charging Days per Week	5
Number of EVs	5
Daily EV Mileage	30
EV Electricity Use (kWh/mi)	1.7

AFLEET TUTORIAL – EV UTILITY RATE CALCULATOR

- **2nd step: view "Helpful Comments" on "EV Rate" sheet**
  - Shows the default rate based on the state chosen
  - Provides charging time if EV can be fully charged based on your parameters
  - Provides charging power throttling % if managed charging strategy selected
  - Will provide error message is charging scenario does not provide full charge

Helpful Comments - Rate 1

Default Rate Alabama Power: AGRICULTURAL SERVICE - LARGE (Flat, >0 kW)
ERROR: Charger rating is insufficient for fully charging your fleet within the charging period. EVs will only reach 16% of a full charge.
A managed charging strategy can lower demand by throttling charging power to 100%.

AFLEET TUTORIAL – EV UTILITY RATE CALCULATOR

- **3rd step: view charging visualization & rate data on "EV Rate" sheet**

Charging and Time-of-Use (TOU) Periods

0 'Summer' Peak Rate Months Per Year

On-Peak Mid-Peak Off-Peak

Time of Day:	12:00 AM	1:00 AM	2:00 AM	3:00 AM	4:00 AM	5:00 AM	6:00 AM	7:00 AM	8:00 AM	9:00 AM	10:00 AM	11:00 AM	12:00 PM	1:00 PM	2:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM	7:00 PM	8:00 PM	9:00 PM	10:00 PM	11:00 PM
Energy (kWh):	26	26	26	26	26	0	0	0	0	0	0	0	0	0	0	0	0	0	26	26	26	26	26	26
Demand (kW):	34	34	34	34	34	0	0	0	0	0	0	0	0	0	0	0	0	0	34	34	34	34	34	34
Energy TOU:																								
Demand TOU:																								

12 'Winter' Non-Peak Rate Months Per Year

Time of Day:	12:00 AM	1:00 AM	2:00 AM	3:00 AM	4:00 AM	5:00 AM	6:00 AM	7:00 AM	8:00 AM	9:00 AM	10:00 AM	11:00 AM	12:00 PM	1:00 PM	2:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM	7:00 PM	8:00 PM	9:00 PM	10:00 PM	11:00 PM
Energy (kWh):	26	26	26	26	26	0	0	0	0	0	0	0	0	0	0	0	0	0	26	26	26	26	26	26
Demand (kW):	34	34	34	34	34	0	0	0	0	0	0	0	0	0	0	0	0	0	34	34	34	34	34	34
Energy TOU:																								
Demand TOU:																								

	0 'Summer' Peak Rate Months						12 'Winter' Non-Peak Rate Months				
Energy per Month	**Flat**	**On-peak**	**Mid-peak**	**Off-peak**	**Total**		**Flat**	**On-peak**	**Mid-peak**	**Off-peak**	**Total**
Energy Distribution		0%	0%	0%				27%	0%	73%	
Energy Dispensed (kWh)		0	0	0	0			1,679	0	4,477	6,156
Energy Rate ($/kWh)								$0.13	$0.00	$0.11	
Energy Charge ($)		$0	$0	$0	$0			$224	$0	$472	$695
Demand per Month	**Flat**	**On-peak**	**Mid-peak**	**Off-peak**	**Total**		**Flat**	**On-peak**	**Mid-peak**	**Off-peak**	**Total**
Demand (kW)	0	0	0	0	0		34	0	0	34	34
Demand Rate ($/kW)							$0.00	$0.00	$0.00	$0.00	
Demand Charge ($)	$0	$0	$0	$0	$0		$0	$0	$0	$0	$0
Fixed Costs per Month					**Total**						**Total**
Fixed Charge ($)					$0						$102

Additional Charging Site Characteristics - Rate 1

Unmanaged Charge Time per EV (hr):	1.5	Max. Session Power (kW):	50	Max. EVs per Charger:	1	Managed Power Ratio:	14%	Summer Months/yr	0	Charging Efficiency 90%
Charge Time in Schedule (hr):	11.0	Avg. Session Power (kW):	37.5	Charger(s) per Location:	5	Fast Charge Demand Adjustment:	100%	Winter Months/yr:	12	

AFLEET TUTORIAL – EV UTILITY RATE CALCULATOR

- 4th step: view outputs for each rate on “EV Rate” sheet

Outputs - Rate 1

Electricity Dispensed	**Annual**
Energy Dispensed (kWh)	11,471
Max Monthly Demand (kW)	5
Charge Time per EV (hr)	70.8
Charging Period (hr)	11.0
Costs	**Annual**
Energy Charge ($)	$1,296
Demand Charge ($)	$0
Fixed Charge ($)	$1,222
Total Bill ($)	**$2,518**
Cost per kWh ($/kWh)	**$0.22**

AFLEET TUTORIAL – EV UTILITY RATE CALCULATOR

- **5th step: view summary for all rates on "EV Rate" sheet**

Summary

Outputs	Rate 1			Rate 2			Rate 3		
Electricity Dispensed	**Peak Months**	**Non-Peak Months**	**Annual**	**Peak Months**	**Non-Peak Months**	**Annual**	**Peak Months**	**Non-Peak Months**	**Annual**
Energy Dispensed (kWh)	0	11,471	11,471	0	14,774	14,774	1,724	1,231	2,955
Max Monthly Demand (kW)	0	5	5	0	11	11	8	8	8
Charge Time per EV (hr)	0.0	70.8	70.8	0.0	7.0	7.0	2.1	2.1	2.1
Daily Charging Period (hr)	0.0	11.0	11.0	0.0	7.0	7.0	3.0	3.0	3.0
Costs	**Peak Months**	**Non-Peak Months**	**Annual**	**Peak Months**	**Non-Peak Months**	**Annual**	**Peak Months**	**Non-Peak Months**	**Annual**
Energy Charge ($)	$0	$1,296	$1,296	$0	$1,719	$1,719	$130	$93	$222
Demand Charge ($)	$0	$0	$0	$0	$0	$0	$0	$0	$0
Fixed Charge ($)	$0	$1,222	$1,222	$0	$246	$246	$107	$76	$183
Total Bill ($)	**$0**	**$2,518**	**$2,518**	**$0**	**$1,965**	**$1,965**	**$236**	**$169**	**$405**
Cost per kWh ($/kWh)	**$0.000**	**$0.220**	**$0.220**	**$0.000**	**$0.133**	**$0.133**	**$0.137**	**$0.137**	**$0.137**

Using the EV Charger TCO Calculator

File: NREL
https://images.nrel.gov/MX/Profiles/en/default/#/main/single/77c95b38-81bc-41a6-b84f-ba88d2437e41

AFLEET TUTORIAL – EV CHARGER TCO CALCULATOR

- **1st step: enter key charger inputs on "Inputs" sheet**
  - # of chargers, charger rating, utilization, charge time, charger cost, charger incentive, infrastructure cost, infrastructure incentive.
  - Adjust fleet charger type (via dropdown)

Key Charger Inputs									
Fleet Charger Type	Fleet DCFC: 50-100 kW								
Charger Type	**Use Type**	**Number of Chargers**	**Charger Rating (kW)**	**Utilization (sessions/week/ charger)**	**Charge Time (hr/session)**	**Charger Cost ($/charger)**	**Charger Incentive ($/charger)**	**Infrastructure Cost ($/charger)**	**Infrastructure Incentive (% of costs)**
Residential Level 1	Light-Duty Vehicle	0	1.9	6	8.5	$380	$0	$0	0%
Residential Level 2	Light-Duty Vehicle	0	7.7	6	2.1	$689	$0	$480	0%
Publicly Accessible Level 2	Light-Duty Vehicle	0	16.8	5	1.0	$4,900	$0	$7,000	0%
Publicly Accessible DCFC: 50-100 kW	All Vehicles	0	50	15	0.3	$27,900	$0	$62,700	0%
Publicly Accessible DCFC: 100-300 kW	All Vehicles	0	150	26	0.1	$87,800	$0	$75,500	0%
Publicly Accessible DCFC: 300+ kW	All Vehicles	0	350	26	0.0	$139,000	$0	$138,200	0%
Fleet DCFC: 50-100 kW	School Bus	0	50	6	1.7	$27,900	$0	$62,700	0%
Fleet DCFC: 50-100 kW	Transit Bus	0	50	6	6.4	$27,900	$0	$62,700	0%
Fleet DCFC: 50-100 kW	Refuse Truck	0	50	6	3.5	$27,900	$0	$62,700	0%
Fleet DCFC: 50-100 kW	Single Unit Short-Haul Truck	0	50	6	1.0	$27,900	$0	$62,700	0%
Fleet DCFC: 50-100 kW	Single Unit Long-Haul Truck	0	50	6	1.9	$27,900	$0	$62,700	0%
Fleet DCFC: 50-100 kW	Combination Short-Haul Truck	0	50	6	8.9	$27,900	$0	$62,700	0%
Fleet DCFC: 50-100 kW	Combination Long-Haul Truck	0	50	6	22.2	$27,900	$0	$62,700	0%

AFLEET TUTORIAL – EV CHARGER TCO CALCULATOR

- **2nd step: enter additional charger assumptions on "Inputs" sheet**

Additional Charger Inputs				
		Residential	Publicly Accessible	Fleet
Warranty cost	% of equipment cost	0.0%	7.0%	7.0%
Maintenance cost	% of equipment cost	0.0%	0.5%	0.5%
Communications cost	$/yr/charger	$0	$255	$255
Host site access cost	$/yr/charger	$0	$500	$0
Charger Lifetime	years		15	
Infrastructure Lifetime	years		30	
Discount Factor	%		1.89%	

AFLEET TUTORIAL – EV CHARGER TCO CALCULATOR

- 3rd step: enter additional charger assumptions on “Inputs” sheet

Utility Rate Inputs

Charger Location	Rate Number	State	Rate Type	Rate Structure	Utility Rate Name	Charging Strategy	Charging Period: Start Time	Charging Period: End Time
Residential	1	ALABAMA	Residential	Flat	Alabama Power: Family Dwelling Service (Demand Option) (Flat, >0 kW)	Unmanaged	8:00 PM	7:00 AM
Residential	2	ALABAMA	Residential	TOU	Alabama Power: Rate PAE - Option B - Three Phase (TOU, >0 kW)	Unmanaged	8:00 PM	7:00 AM
Residential	3	ALABAMA	Residential	EV	Alabama Power: Plug-In Electric Vehicle (EV, >0 kW)	Unmanaged	8:00 PM	7:00 AM
Publicly Accessible	1	ALABAMA	Commercial	Flat	Alabama Power: AGRICULTURAL SERVICE - LARGE (Flat, >0 kW)	Unmanaged	10:00 AM	10:00 PM
Publicly Accessible	2	ALABAMA	Commercial	TOU	Alabama Power: BTA - BUSINESS TIME ADVANTAGE (OPTIONAL) - Primary (TOU, >0	Unmanaged	10:00 AM	10:00 PM
Publicly Accessible	3	ALABAMA	Commercial	EV	Alabama Power: Business Electric Vehicle- Time of Use (EV, >0 kW)	Unmanaged	10:00 AM	10:00 PM
Fleet	1	ALABAMA	Commercial	Flat	Alabama Power: AGRICULTURAL SERVICE - LARGE (Flat, >0 kW)	Unmanaged	6:00 PM	5:00 AM
Fleet	2	ALABAMA	Commercial	TOU	Alabama Power: BTA - BUSINESS TIME ADVANTAGE (OPTIONAL) - Primary (TOU, >0	Unmanaged	6:00 PM	5:00 AM
Fleet	3	ALABAMA	Commercial	EV	Alabama Power: Business Electric Vehicle- Time of Use (EV, >0 kW)	Unmanaged	6:00 PM	5:00 AM

AFLEET TUTORIAL – EV CHARGER TCO CALCULATOR

- 4th step: view outputs on “Charger TCO Output” sheet

Levelized Cost of Charging - $/kWh

Charger Type	Use Type	Rate 1	Rate 2	Rate 3
Residential Level 1	Light-Duty Vehicle	$0.13	$0.08	$0.17
Residential Level 2	Light-Duty Vehicle	$0.14	$0.16	$0.19
Publicly Accessible Level 2	Light-Duty Vehicle	$0.86	$2.10	$1.21
Publicly Accessible DCFC: 50-100 kW	All Vehicles	$0.99	$1.67	$1.12
Publicly Accessible DCFC: 100-300 kW	All Vehicles	$1.27	$2.15	$1.35
Publicly Accessible DCFC: 300+ kW	All Vehicles	$1.94	$3.83	$2.02
Fleet DCFC: 50-100 kW	School Bus	$0.46	$0.61	$0.53
Fleet DCFC: 50-100 kW	Transit Bus	$0.21	$0.22	$0.23
Fleet DCFC: 50-100 kW	Refuse Truck	$0.29	$0.35	$0.33
Fleet DCFC: 50-100 kW	Single Unit Short-Haul Truck	$0.75	$1.04	$0.85
Fleet DCFC: 50-100 kW	Single Unit Long-Haul Truck	$0.43	$0.56	$0.49
Fleet DCFC: 50-100 kW	Combination Short-Haul Truck	$0.18	$0.18	$0.19
Fleet DCFC: 50-100 kW	Combination Long-Haul Truck	$0.07	$0.07	$0.08

AFLEET TUTORIAL – EV CHARGER TCO CALCULATOR

- **4th step: view outputs on "Charger TCO Output" sheet**

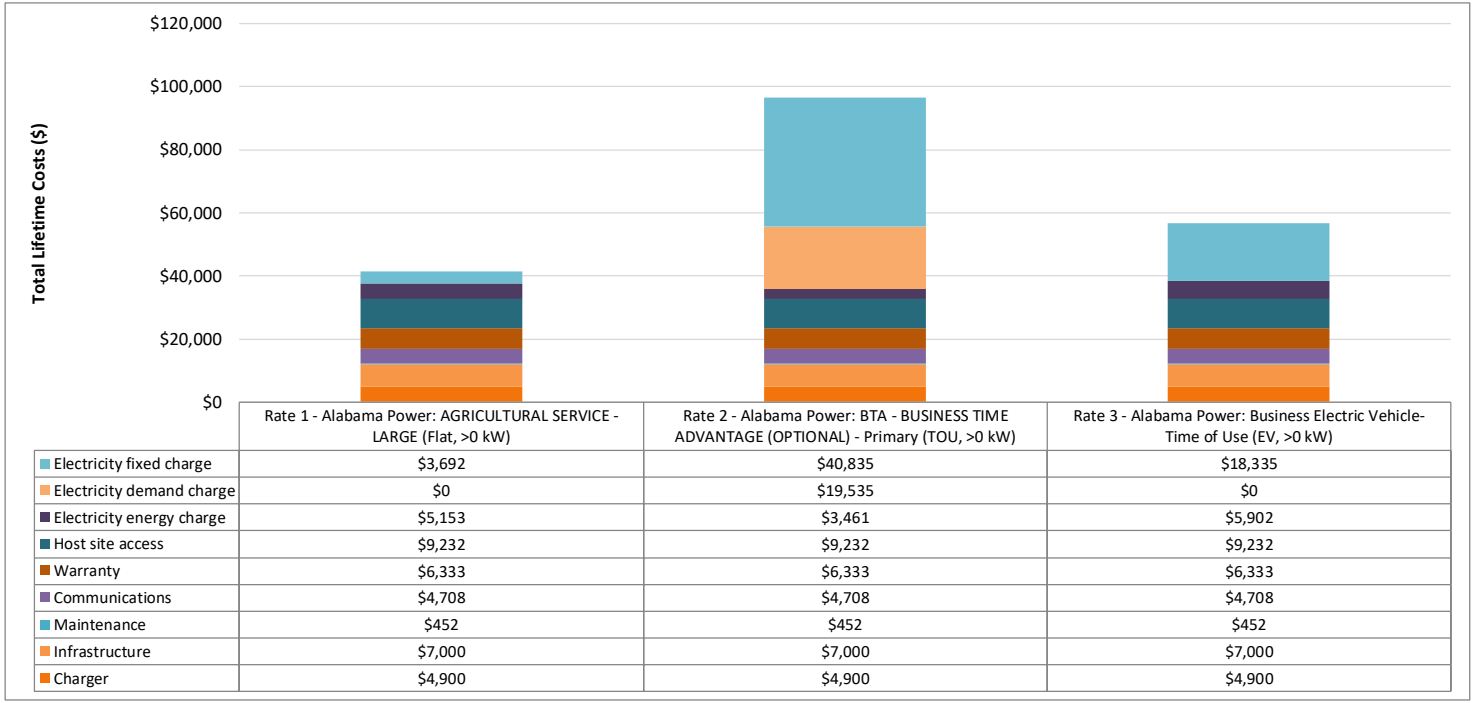
Lifetime EV Charger Cost of Ownership Calculator Output - Costs

	Residential Level 1 - Light-Duty Vehicle	Residential Level 2 - Light-Duty Vehicle	Publicly Accessible Level 2 - Light-Duty Vehicle	Publicly Accessible DCFC: 50-100 kW - All Vehicles	Publicly Accessible DCFC: 100-300 kW - All Vehicles	Publicly Accessible DCFC: 300+ kW - All Vehicles	Fleet DCFC: 50-100 kW - School Bus	Fleet DCFC: 50-100 kW - Transit Bus	Fleet DCFC: 50-100 kW - Refuse Truck	Fleet DCFC: 50-100 kW - Single Unit Short-Haul Truck	Fleet DCFC: 50-100 kW - Single Unit Long-Haul Truck	Fleet DCFC: 50-100 kW - Combination Short-Haul Truck	Fleet DCFC: 50-100 kW - Combination Long-Haul Truck
Rate 1													
Charger	$380	$689	$4,900	$27,900	$87,800	$139,000	$27,900	$27,900	$27,900	$27,900	$27,900	$27,900	$27,900
Infrastructure	$0	$480	$7,000	$62,700	$75,500	$138,200	$62,700	$62,700	$62,700	$62,700	$62,700	$62,700	$62,700
Maintenance	$0	$0	$452	$2,576	$8,105	$12,832	$2,576	$2,576	$2,576	$2,576	$2,576	$2,576	$2,576
Communications	$0	$0	$4,708	$4,708	$4,708	$4,708	$4,708	$4,708	$4,708	$4,708	$4,708	$4,708	$4,708
Warranty	$0	$0	$6,333	$36,059	$113,475	$179,647	$36,059	$36,059	$36,059	$36,059	$36,059	$36,059	$36,059
Host site access	$0	$0	$9,232	$9,232	$9,232	$9,232	$0	$0	$0	$0	$0	$0	$0
Electricity energy charge	$4,000	$4,000	$5,153	$15,459	$26,796	$26,796	$35,715	$130,136	$70,750	$19,736	$39,128	$182,173	$184,292
Electricity demand charge	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Electricity fixed charge	$2,745	$2,745	$3,692	$3,692	$3,692	$3,692	$3,692	$3,692	$3,692	$3,692	$3,692	$3,692	$3,692
Total Cost of Ownership	$7,125	$7,914	$41,470	$162,325	$329,307	$514,106	$173,349	$267,770	$208,384	$157,370	$176,762	$319,807	$321,926
Rate 2													
Charger	$380	$689	$4,900	$27,900	$87,800	$139,000	$27,900	$27,900	$27,900	$27,900	$27,900	$27,900	$27,900
Infrastructure	$0	$480	$7,000	$62,700	$75,500	$138,200	$62,700	$62,700	$62,700	$62,700	$62,700	$62,700	$62,700
Maintenance	$0	$0	$452	$2,576	$8,105	$12,832	$2,576	$2,576	$2,576	$2,576	$2,576	$2,576	$2,576
Communications	$0	$0	$4,708	$4,708	$4,708	$4,708	$4,708	$4,708	$4,708	$4,708	$4,708	$4,708	$4,708
Warranty	$0	$0	$6,333	$36,059	$113,475	$179,647	$36,059	$36,059	$36,059	$36,059	$36,059	$36,059	$36,059
Host site access	$0	$0	$9,232	$9,232	$9,232	$9,232	$0	$0	$0	$0	$0	$0	$0
Electricity energy charge	$3,784	$7,370	$3,461	$10,383	$17,997	$17,997	$23,988	$87,406	$47,520	$13,256	$26,281	$122,357	$123,780
Electricity demand charge	$0	$0	$19,535	$58,140	$174,420	$406,980	$19,535	$19,535	$19,535	$19,535	$19,535	$19,535	$19,535
Electricity fixed charge	$270	$270	$40,835	$40,835	$40,835	$40,835	$40,835	$40,835	$40,835	$40,835	$40,835	$40,835	$40,835
Total Cost of Ownership	$4,434	$8,809	$96,456	$252,532	$532,072	$949,430	$218,300	$281,718	$241,832	$207,568	$220,593	$316,669	$318,092
Rate 3													
Charger	$380	$689	$4,900	$27,900	$87,800	$139,000	$27,900	$27,900	$27,900	$27,900	$27,900	$27,900	$27,900
Infrastructure	$0	$480	$7,000	$62,700	$75,500	$138,200	$62,700	$62,700	$62,700	$62,700	$62,700	$62,700	$62,700
Maintenance	$0	$0	$452	$2,576	$8,105	$12,832	$2,576	$2,576	$2,576	$2,576	$2,576	$2,576	$2,576
Communications	$0	$0	$4,708	$4,708	$4,708	$4,708	$4,708	$4,708	$4,708	$4,708	$4,708	$4,708	$4,708
Warranty	$0	$0	$6,333	$36,059	$113,475	$179,647	$36,059	$36,059	$36,059	$36,059	$36,059	$36,059	$36,059
Host site access	$0	$0	$9,232	$9,232	$9,232	$9,232	$0	$0	$0	$0	$0	$0	$0
Electricity energy charge	$5,851	$6,178	$5,902	$17,706	$30,691	$30,691	$40,907	$132,580	$78,801	$22,605	$44,816	$179,705	$178,945
Electricity demand charge	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Electricity fixed charge	$2,745	$2,745	$18,335	$18,335	$18,335	$18,335	$18,335	$18,335	$18,335	$18,335	$18,335	$18,335	$18,335
Total Cost of Ownership	$8,976	$10,092	$56,862	$179,215	$347,845	$532,644	$193,184	$284,857	$231,078	$174,882	$197,093	$331,982	$331,223

AFLEET TUTORIAL – EV CHARGER TCO CALCULATOR

- 4th step: view outputs on “Charger TCO Output” sheet

Publicly Accessible Level 2 - Detailed

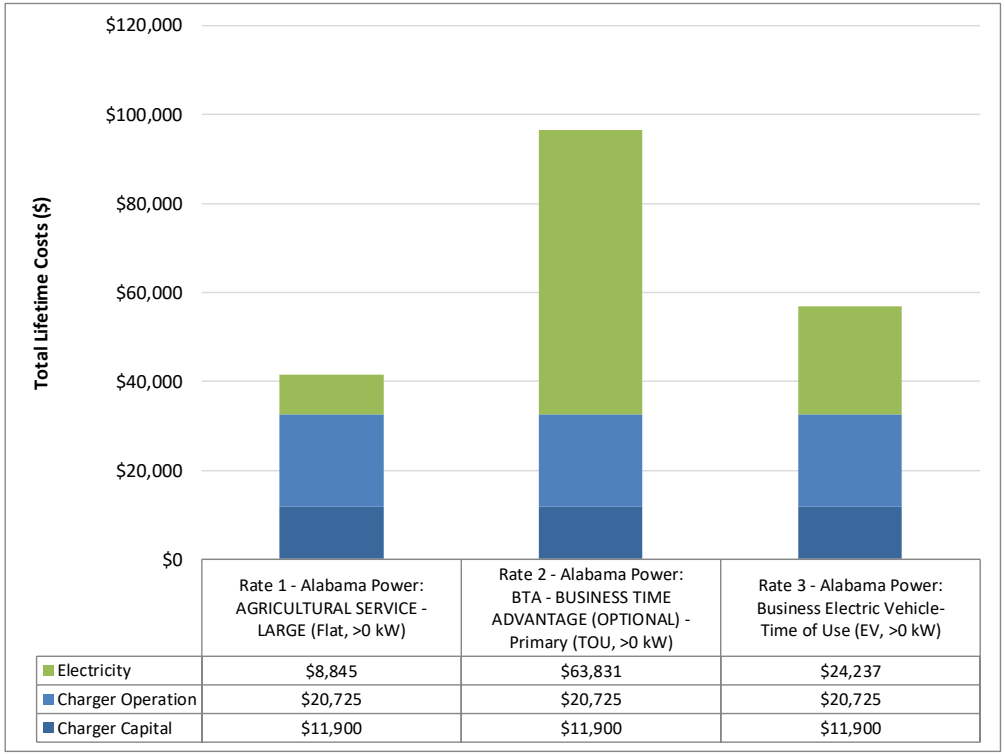


	Rate 1 - Alabama Power: AGRICULTURAL SERVICE - LARGE (Flat, >0 kW)	Rate 2 - Alabama Power: BTA - BUSINESS TIME ADVANTAGE (OPTIONAL) - Primary (TOU, >0 kW)	Rate 3 - Alabama Power: Business Electric Vehicle-Time of Use (EV, >0 kW)
Electricity fixed charge	$3,692	$40,835	$18,335
Electricity demand charge	$0	$19,535	$0
Electricity energy charge	$5,153	$3,461	$5,902
Host site access	$9,232	$9,232	$9,232
Warranty	$6,333	$6,333	$6,333
Communications	$4,708	$4,708	$4,708
Maintenance	$452	$452	$452
Infrastructure	$7,000	$7,000	$7,000
Charger	$4,900	$4,900	$4,900

AFLEET TUTORIAL – EV CHARGER TCO CALCULATOR

- **4th step: view outputs on "Charger TCO Output" sheet**

Publicly Accessible Level 2 - Simplified



	Rate 1 - Alabama Power: AGRICULTURAL SERVICE - LARGE (Flat, >0 kW)	Rate 2 - Alabama Power: BTA - BUSINESS TIME ADVANTAGE (OPTIONAL) - Primary (TOU, >0 kW)	Rate 3 - Alabama Power: Business Electric Vehicle-Time of Use (EV, >0 kW)
Electricity	$8,845	$63,831	$24,237
Charger Operation	$20,725	$20,725	$20,725
Charger Capital	$11,900	$11,900	$11,900

Using AFLEET Online: Payback On-Road, Payback Off-Road, and TCO Calculators to Compare Potential Acquisitions

FUTURE TOOL DEVELOPMENT

AFLEET 2024

- MOVES4
- GREET 2023
- EV Utility Rate Calculator Online
- EV Charger TCO Calculator Online

THANK YOU!!!

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AFLEET EV RATE GLOSSARY

- **Average session power**: average power dispensed by charger over a session. Units are kW.
- **Bundled rate**: rate that includes charges for energy usage and demand.
- **Commercial rate**: rate that applies to businesses
- **Delivery with Standard Offer rate**: includes charges for energy usage and demand based on the default supply of electricity guaranteed available to the user (i.e., standard offer)
- **Demand**: immediate rate of consumption (i.e., power). Units are kW.
- **Demand charge**: charge for the highest kW usage in any 15-minute interval within a billing month. Units are $.
- **Demand limit:** minimum and maximum kW for which the rate is applicable (e.g. if your max demand is 60 kW and the rate is for 50 kW or less, you would not be eligible to use that rate)
- **Energy charge**: charge for the kWh consumed within the selected charging period. Units are $.
- **Energy dispensed**: total amount of energy used by the fleet. Units are kWh.
- **EV rate: rate structure designed by utility specifically for EV charging**
- **Fast charge demand adjustment**: throttling % for depot managed/unmanaged charging strategies. %.
- **Flat rate**: rate structure where the energy and demand charges do not change over time of day

AFLEET EV RATE GLOSSARY

- **Managed charging strategy**: to reduce demand charges, users selecting “managed charging” will have the charger power throttled down to the minimum power required to charge the vehicle during the charging period
- **Managed power ratio**: % by which charging power is throttled (i.e., reduced) during managed charing. 100% = charging at full power. %.
- **Maximum session power**: maximum power dispensed by a charger over a session. Units are kW.
- **Mid-peak**: period when electricity demand is neither at its lowest or highest point during the day; an intermediary amount is paid per kWh/kW
- **Off-peak**: period when electricity demand is lowest during the day; lowest cost per kWh/kW
- **On-peak**: period when electricity demand is highest during the day; lowest cost per kWh/kW
- **Residential rate:** rate that applies to residential customers
- **TOU (time-of-use) rate**: rate structure where the energy and demand charges change over time of day. AFLEET uses three TOU periods (off-, mid- and on-peak), as this is the typical structure for utilities. In some cases, all three are used in a rate, while in others only off-peak and on-peak are used.
- **Unmanaged charging strategy**: charger will operate at full power