



Electric Vehicle Feasibility Study

November 8, 2024

SUSTAINABILITY AND TECHNOLOGY SUBCOMMITTEE



1



Strategic Goal

Taking calculated risks to explore new technologies and innovative pilot programs that promote efficiency, productivity, sustainability and connectivity while demonstrating return on investment.

ELT Action Plan Item

Continue the replacement of aging City vehicles with electric and hybrid alternatives that generate return on investment.

*Currently, there is not any language in a vehicle replacement policy that addresses alternative fuel vehicles and/or sustainability although Administrative Regulation updates are in process. However, staff always considers hybrid/EV options when looking at replacements on a case by case basis

2

Current Fleet Stats

4%

of City Fleet a Hybrid or
Electric Vehicle

8

Electric Vehicles

28

* 11 more will replace
10 ICE vehicles in
2025

Hybrid Vehicles

18

Public Car Charging Ports

11

Fleet Designated Car
Charging Ports

3

Vehicle Type Analysis

Ford Maverick Hybrid

Mile Driven Per Year	5,000
Miles Per Gallon	42
Gallons Per Year	119.05
Cost Per Gallon	\$3.36
Cost Per Year	\$400.00
Cents Per Mile	\$0.08
Annual Savings Vs. EV	\$215.79

Chevrolet Bolt (EV)

Mile Driven Per Year	5,000
Miles Per kWh	3.8
kW Per Year	1315.79
Cost Per kWh	\$0.14
Cost Per Year	\$184.21
Cents Per Mile	\$0.04

Ford Maverick

Mile Driven Per Year	5,000
Miles Per Gallon	25
Gallons Per Year	200.00
Cost Per Gallon	\$3.36
Cost Per Year	\$672.00
Cents Per Mile	\$0.13
Annual Savings Vs. EV	\$487.79

* Average installation cost per charging station ranges from \$15,000 to \$90,000+

4

Vehicle Type Analysis

Police Comparison

Ford PIU Hybrid

Mile Driven Per Year	14,500
Miles Per Gallon	24
Gallons Per Year	604.17
Cost Per Gallon	\$3.36
Cost Per Year	\$2,030.00
Cents Per Mile	\$0.14
Annual Savings	\$835.88

Ford PIU ICE

Mile Driven Per Year	14,500
Miles Per Gallon	17
Gallons Per Year	852.94
Cost Per Gallon	\$3.36
Cost Per Year	\$2,865.88
Cents Per Mile	\$0.20

* Average cost per charging station ranges from \$15,000 to \$90,000+

5

Vehicle Type Analysis

Police Comparison

Ford F-150 PPV

Mile Driven Per Yr	14,500
Miles Per Gallon	19
Gallons Per Year	763.16
Cost Per Gallon	\$3.36
Cost Per Year	\$2,564.21
Cents Per Mile	\$0.18

Ford Lightning PPV * If available

Mile Driven Per Year	14,500
Miles Per Gallon	1.5
kW Per Year	9666.67
Cost Per kWh	\$0.14
Cost Per Year	\$1,353.33
Cents Per Mile	\$0.09
Annual Fuel Savings	\$1210.88

* Average cost per charging station ranges from \$15,000 to \$90,000+

6

Vehicle Type Residual Value

2024 Toyota Camry Hybrid

MSRP

\$28,855

Residual Value After 10 Years

\$10,175

2024 Toyota Camry

MSRP

\$26,420

Residual Value After 10 Years

\$7,750

2023 Chevy Bolt (EV)

MSRP

\$26,500

Residual Value After 10 Years

\$3,775

7

Vehicle Type Resale Value

2024 Ford F-150 Lightning (XLT SuperCrew 4WD)

MSRP

\$57,290

Resale Value After Six Years

\$17,925

2024 Ford F-150 (XLT SuperCrew 4WD)

MSRP

\$56,540

Resale Value After Six Years

\$19,900

8



Key Takeaways

- There is no one size fits all solution for fleet electrification based on type of vehicle and usage.
- Fleet electric vehicle availability to government agencies is limited.
- Current application of electric vehicle replacements is based on right sizing and vehicle replacement cycles. Current inventory replacement cycle is approximately 9 years. Converting to electric may take several years based on age of fleet and the propensity to keep vehicles longer.
- Facilities sometimes lack sufficient infrastructure and electric utility capacity to support EV charging stations resulting in higher capital infrastructure investment to upgrade utilities therefore diminishing the ROI.
- Residual value of hybrid vehicles is historically greater than both ICE vehicles and EV.
- Based on fuel and electricity costs, hybrid represents an economic and sustainable alternative to both EV and ICE vehicles. (All things being equal)
- Auto manufacture's EV strategy is changing due to evolving technology (Battery, Hybrid, and Hydrogen), shifting regulatory landscapes, and changing consumer preferences.

9

Electric Vehicle Availability

What Ford's surprise canceling of EV production in favor of 'profitable' ICE vehicles means for industry: 'Thought that growth was going to continue'
Other companies and states are trying to find ways to promote buying electric vehicles to keep them cheaper and to avoid the issues associated with public charging stations.

Auto Industry Pulls Back On EVs As Consumers Hesitate Over High Price, Inconvenience

Ford is cutting back F-150 Lightning electric truck production
Ford Slows Its Push Into Electric Vehicles
The automaker said it would delay new battery-powered models and shift its focus to hybrid cars, sales of which are rising fast.

Path to Zero Emissions: Honda Latest Automaker Focusing on Hydrogen Technology

Mercedes-Benz delays electrification goal, beefs up combustion engine line-up

Honda and General Motors Halt \$5B Plans To Develop Affordable Electric Vehicles to Rival Tesla — What Now?

BMW says Goodbye to Electric Cars; it has now Solved the Problem of Hydrogen Engines — MES

Why Volvo has pulled the plug on its electric car brand

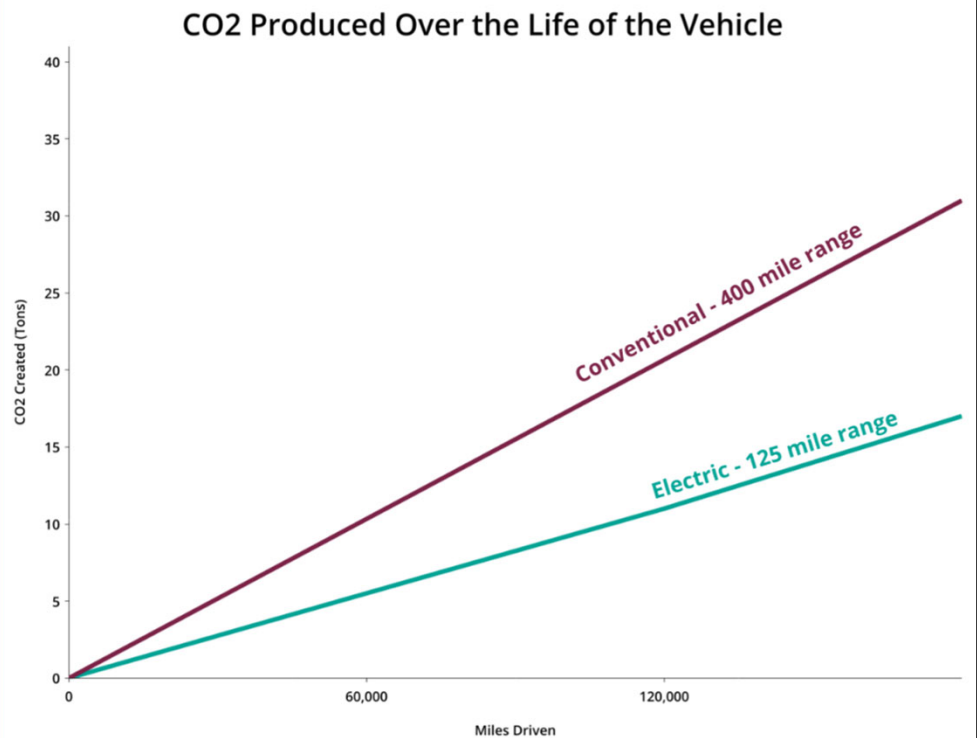
Why major car manufacturers are slowing production of electric vehicles

Automakers Alter EV Plans
Ford and General Motors scale back electric vehicle production while the hybrid market remains hot

10

CO2 Impact

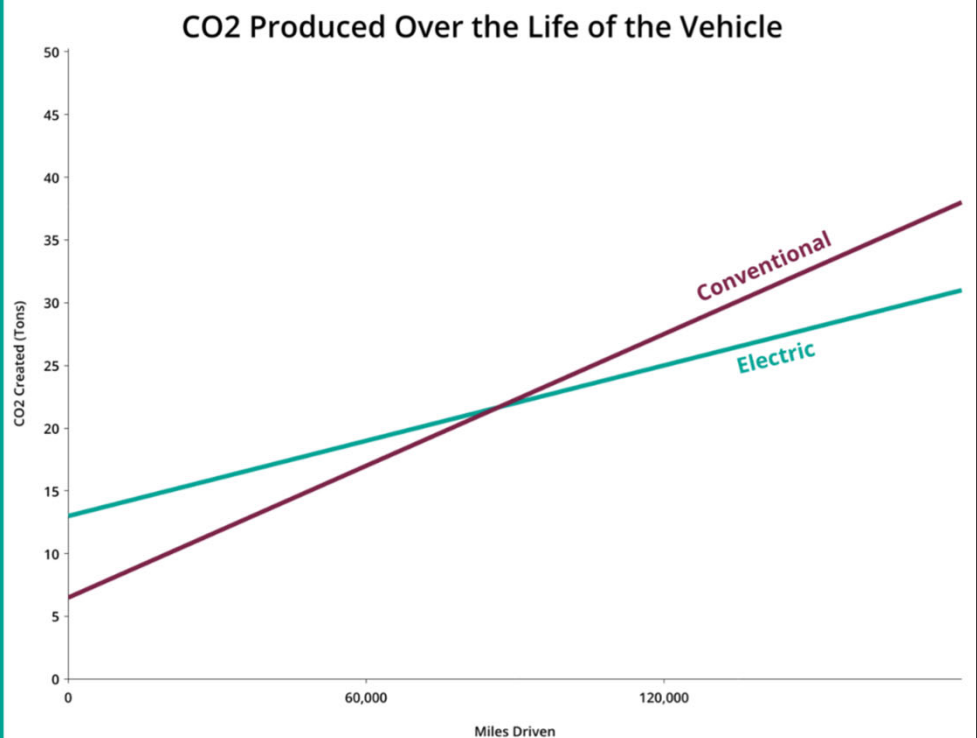
- Average age of vehicle before it's scrapped is 180,000 miles
- Average conventional vehicle produces roughly 30 CO2 tons during its use
- Roughly 30% of energy used to charge electric vehicles is from renewable energy sources
- Problem with graph is it says at zero miles driven, zero CO2 has been produced
- Have to take into account CO2 generated during production of vehicle



11

CO2 Impact

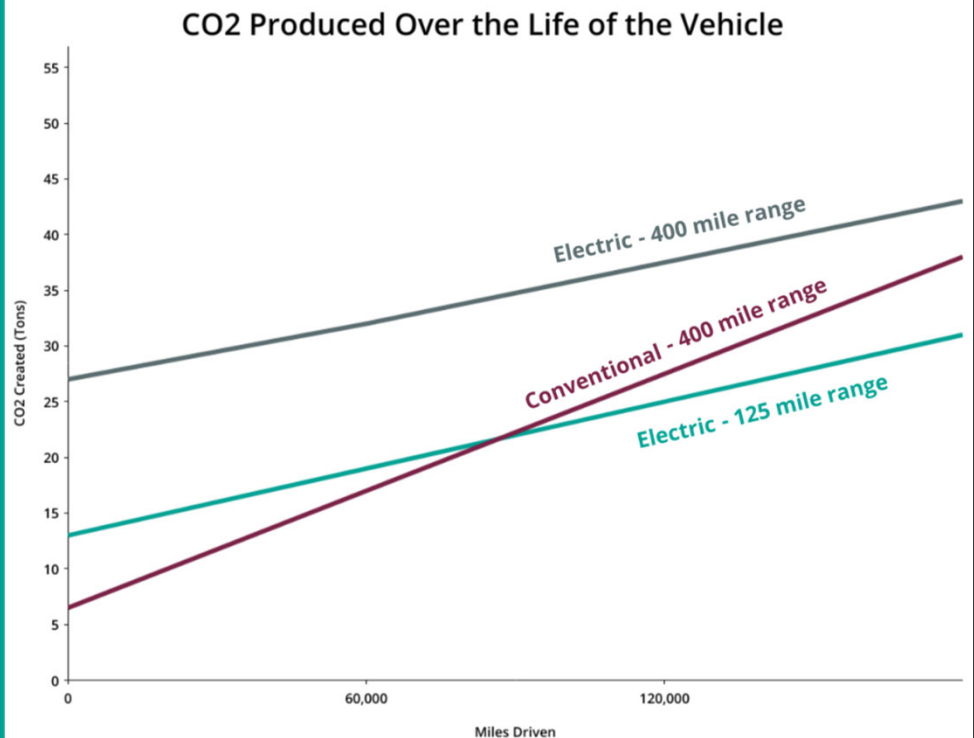
- Production of a lithium car battery requires a massive amount of energy
- Conventional vehicle comes to showroom having produced roughly six tons of CO2
- Electric vehicle comes to the showroom having produced about 12 tons of CO2
- Would have to drive electric vehicle close to 90,000 miles to offset the CO2 penalty of a conventional vehicle
- To make an accurate comparison we need to make the ranges the same



12

CO2 Impact

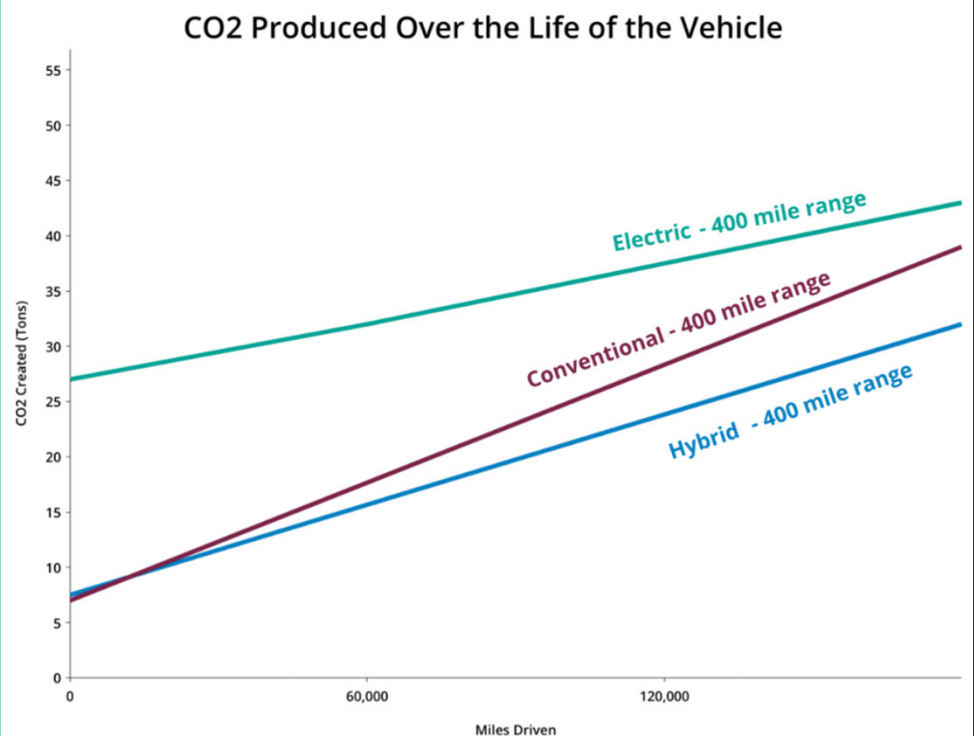
- A larger battery produces a much larger CO2 penalty
 - For every ton of mined lithium, 15 tons of CO2 are emitted into the air
- In its projected life it produces more CO2 than a conventional vehicle
- It produces more CO2 but currently we measure it as producing none from the tail pipe
- Calling these vehicles "Zero Emissions" is unproductive
- Hybrids bring flexibility and a lower CO2 impact on the environment



13

CO2 Impact

- Hybrids are far more efficient than conventional vehicles
- Hybrid vehicles have a much smaller battery so the CO2 impact is very similar to conventional vehicles while the end-of-life emissions are far lower
- To offset the CO2 produced from the electric vehicle you would have to drive a hybrid vehicle nearly 450,000 miles



14



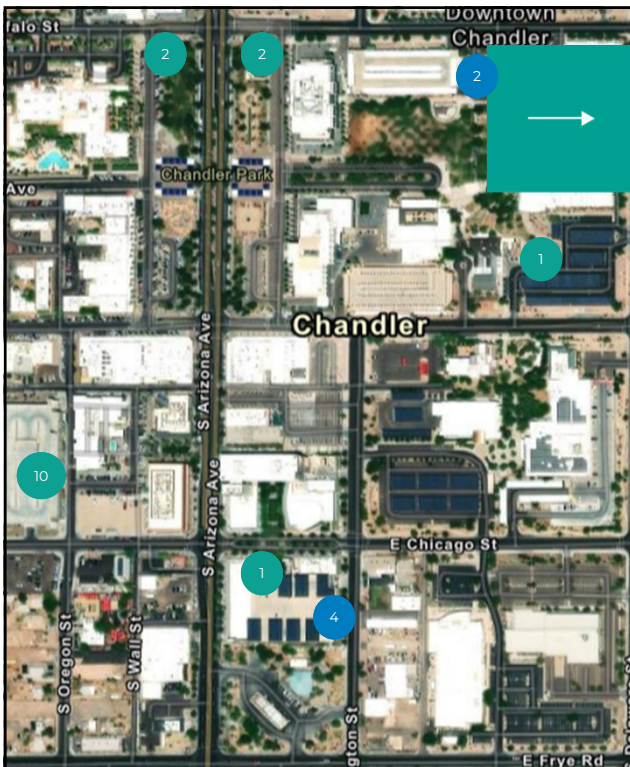
Strategic Goal

Taking calculated risks to explore new technologies and innovative pilot programs that promote efficiency, productivity, sustainability and connectivity while demonstrating return on investment.

ELT Action Plan Item

Complete the city's fleet electric vehicle charging study and define the municipal role for placement of charging stations in the community

15



Public Car Charging

- Staff received a grant from Salt River Project (SRP) to conduct a fleet electrification plan
 - Only considered fully electric vehicles even for heavy duty
 - Cost prohibitive
 - No hybrid or plug-in-hybrid vehicles included in the study
- Maricopa Association of Governments (MAG) Electrification Readiness Strategic Plan completed May 22, 2023
 - U.S. Department of Energy shows a surplus of 253 charging stations based on the current demand
- Grants for new car charging stations are not to meet the current demand, rather to encourage the purchase of electric vehicles and remove any potential barriers for electric vehicle ownership
- 16 public car charging stations are located downtown
 - Eight ports considered light use
 - One port considered moderate use
 - Seven ports considered heavy use
 - Heaviest use is 8:00 AM to 5:00 PM

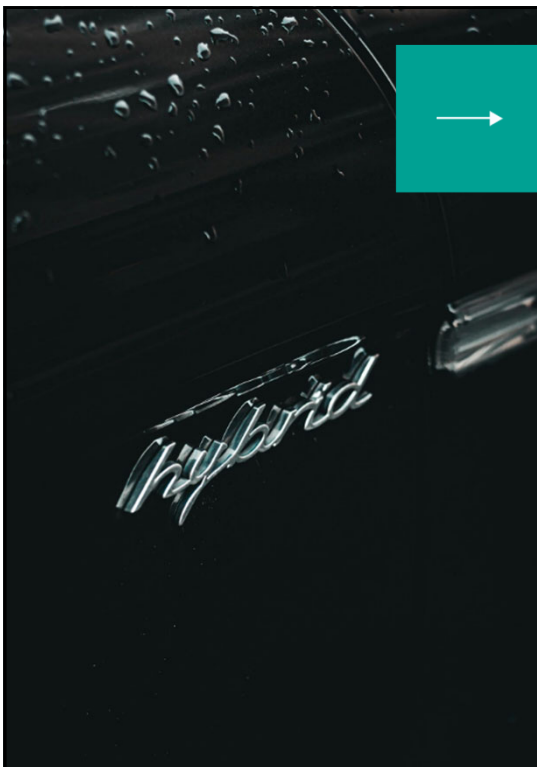
16



Public Car Charging

- Charging stations are strongly encouraged in new developments through zoning stipulations
 - Previous Council direction not to codify this
 - 167 new stations added at commercial developments
 - 124 new homes pre-wired for level two charging stations
- U.S. Department of Energy states that more than 80% of electric vehicle charging happens at home. The next highest used location for charging is at work
- Capacity has not been reached at current publicly available car charging stations downtown
 - When repairs are needed, providers are non-responsive, and parts are often on back order
- Cost of infrastructure if power is not readily available is extremely prohibitive
- Electric vehicle market will soon be changing with introduction of Hydrogen fueled vehicles and solid-state battery electric vehicles

17



Recommended Policy

- Fleet vehicle purchases will be evaluated using a Total Cost of Ownership (TCO) analysis, taking into consideration vehicle availability, intended purpose, infrastructure costs for charging stations, resale value, mileage, and cradle-to-grave CO2 emissions. The organization will prioritize the purchase of electric vehicles (EVs) when TCO analysis demonstrates cost-effectiveness and environmental benefits compared to ICE vehicles and HEVs.
- This policy will be reviewed annually to reflect technological advancements, market conditions, and infrastructure development. Adjustments will be made as necessary to maintain alignment with organizational goals and industry best practices.
- The organization is committed to reducing its environmental impact and operational costs through strategic fleet management. By utilizing TCO analysis and prioritizing EV and HEV acquisitions when feasible, we will enhance our sustainability efforts and ensure efficient and cost-effective fleet operations.
- City will require adequate charging stations at all new developments/redevelopments through developments agreements or zoning stipulations. Staff will include charging stations at new city facilities and parking lot rehabilitations where demand exists.

18



Questions?

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