



WHEN TRUST MATTERS

Fleet Electrification Assessment City of Flagstaff

City Council – Presentation of Results

APS Funded Study

Lara Krecic
Susan Regan
Walter Schaefer
Andrey Gribovich

09 April 2024

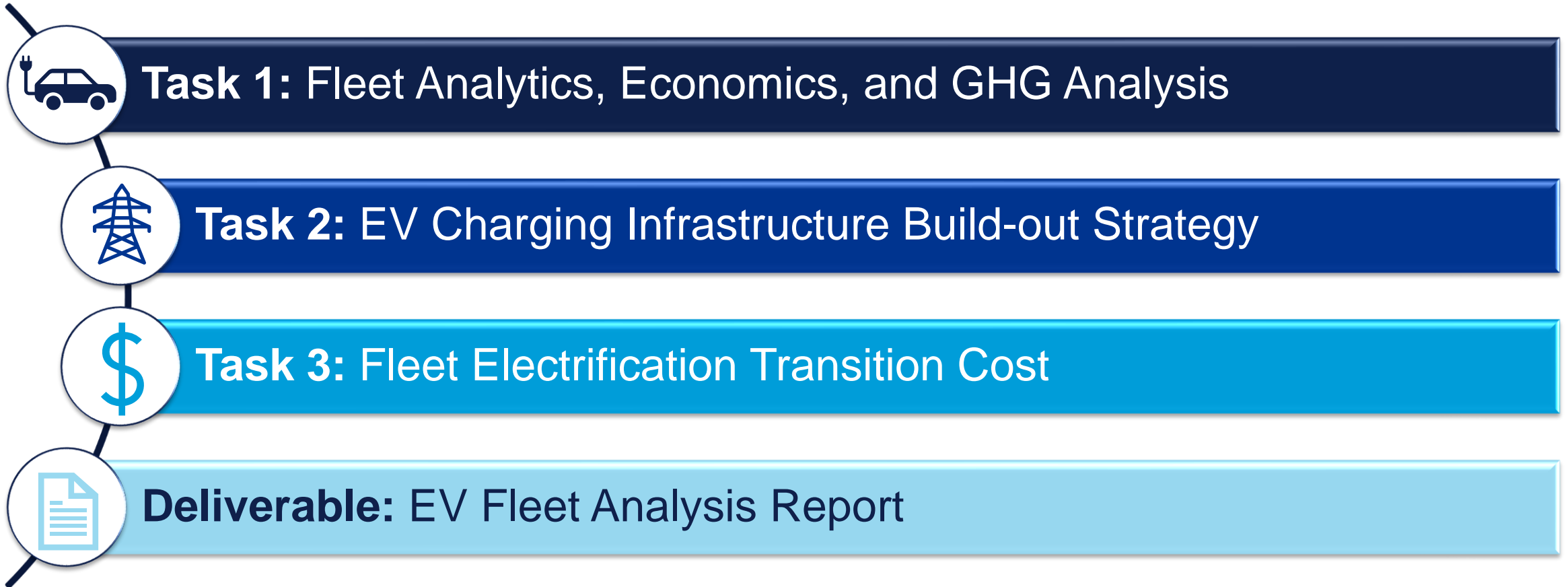
Agenda

- Study overview
- Flagstaff fleet electrification opportunities
- Potential cost savings from electrification
- Charging infrastructure considerations
- Recommendations, considerations, and challenges to fleet electrification

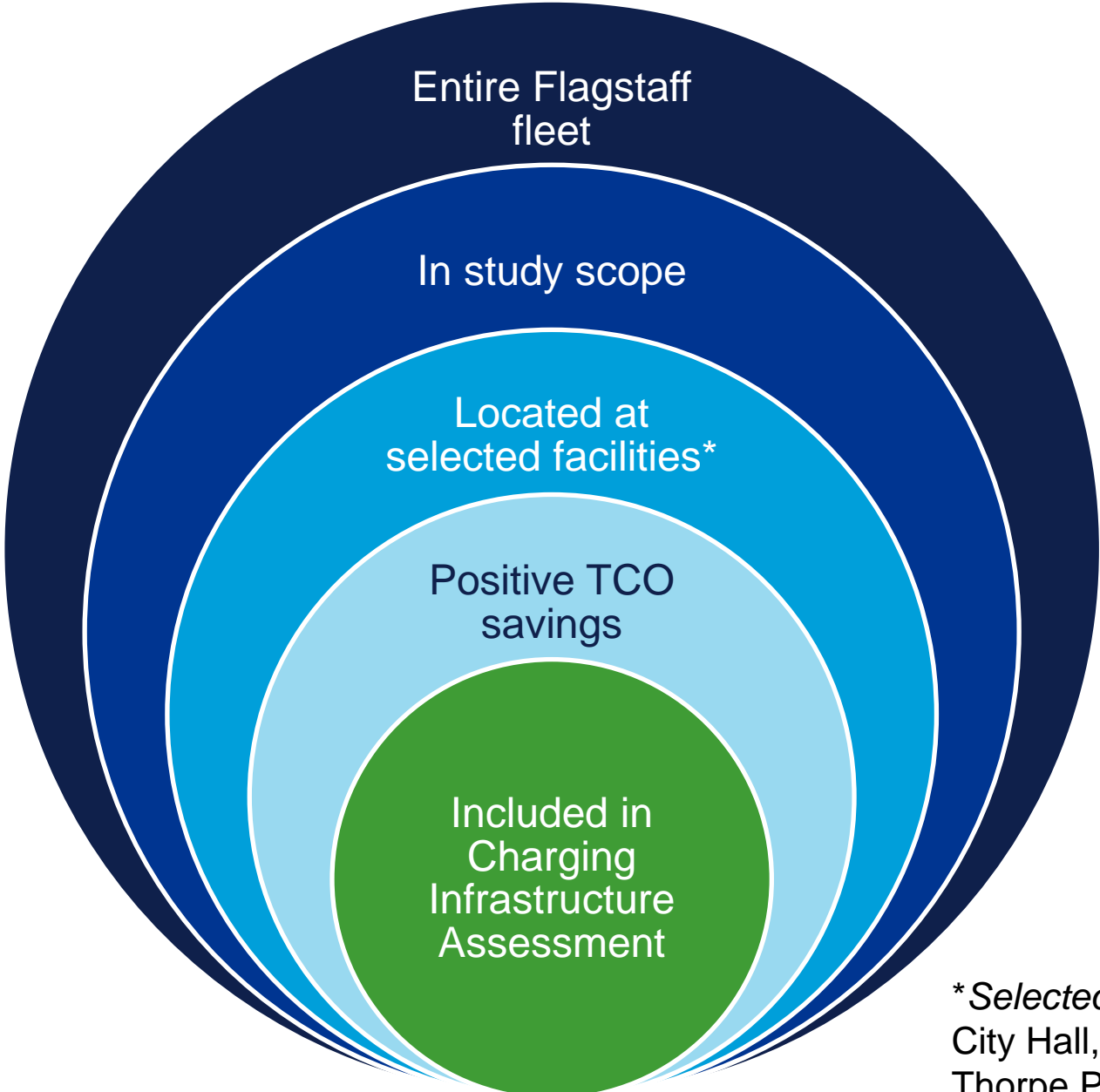
Glossary

- **LDV** – light-duty vehicle (up to 10,000 lbs gross vehicle weight)
- **MDV** – medium-duty vehicle (between 10,000 and 26,000 lbs gross vehicle weight)
- **HDV** – heavy-duty vehicle (above 26,000 lbs gross vehicle weight)
- **MHDV** – medium- and heavy-duty vehicles
- **TCO** – Total cost of ownership; the estimated total cost to own and operate a vehicle over the “effective useful life” of the vehicle
- **GHG** – greenhouse gas

Fleet Electrification Assessment Scope



Fleet Electrification Analysis Approach



**Selected facilities include:*
City Hall, Police Dept.,
Thorpe Park, Public Works

Flagstaff's Selected Facilities

- City Hall
- Police Department
- Public Works
- Thorpe Park



High-level Fleet Summary

Vehicle class	Vehicle type	Total vehicles	Percent of vehicles in class
Light-duty (LDV)	SUV/Hatchback	100	54%
	Pickup truck	68	37%
	Sedan	9	5%
	Van	7	4%
Light-duty Subtotal		184	100%
Medium-duty (MDV)	Incomplete vehicle	38	50%
	Pickup truck	33	43%
	Truck	5	7%
Medium-duty Subtotal		76	100%
Heavy-duty (HDV)	Truck	85	84%
	Fire vehicle	13	13%
	Incomplete vehicle	2	2%
	Bus	1	1%
Heavy-duty Subtotal		101	100%
Total		361	

Fleet at a glance:

By class:

- 51% LDV, 21% MDV, 28% HDV

By vehicle type:

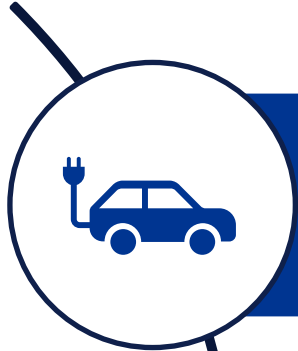
- 28% pickup truck
- 28% SUV/hatchback
- 25% truck

By department:

- Police (18%)
- Administrative (17%)
- Streets (16%)

Total Cost of Ownership (TCO) Analysis Overview

What is included in the analysis?



Vehicle acquisition costs

- Upfront purchase cost (MSRP)
- Applicable incentives, tax credits, etc.
- Depreciation and residual value



Fuel costs

- Average daily miles driven
- Fuel economy (mpg, kWh per mile)
- Fuel costs (gasoline, diesel, electricity)



Maintenance costs

- Average daily miles driven
- Per-mile maintenance costs for EVs and internal combustion engine vehicles

Fleetwide Total Cost of Ownership Savings Summary

	Light-duty (non-patrol)	Light-duty (police patrol)	Medium- and heavy-duty	Total
Vehicles assessed	143	41	177	361
Vehicles achieving positive TCO savings	120	41	151	312
Percent of vehicles with positive savings	84%	100%	85%	86%
Average annual TCO savings (per-vehicle)	\$1,946	\$2,435	\$3,490	\$2,758
Total annual TCO savings	\$233,533	\$99,847	\$527,005	\$860,385
Total lifetime TCO savings ^a	\$3,269,457	\$698,928	\$7,378,070	\$11,346,455
Total energy required (annual kWh)	709,383	160,704	1,460,484	2,330,571
Lifetime GHG emissions reduction (metric tons)	8,360	1,324	31,080	40,764

^a Note that the vehicle life for non-patrol vehicles (all classes) was modeled at 14 years vs. 7 years for patrol vehicles. This impacts the lifetime TCO savings calculation.

Fleetwide electrification can result in over \$860,000 per year in total cost of ownership savings

This equates to over \$11.3M over the life of the vehicles

Summary: Recommended Infrastructure



City Hall

5x dual-port Level 2 chargers



Police Department

6x dual-port Level 2 chargers

2x 150 kW fast chargers



Thorpe Park

1x dual-port Level 2 charger

1x 100 kW fast charger



Public Works

10x 100 kW fast chargers

Vehicles included in infrastructure scenarios	99
Recommended EV chargers	Level 2: 12 (24 ports) Fast charger: 13 (13 ports)
Annual vehicle TCO savings	\$241,131
Lifetime vehicle TCO savings	\$3,307,646
Lifetime charging infrastructure cost	\$2,192,818
All-in TCO savings	\$1,114,828

Fleet Electrification: Recommendations, Considerations, and Challenges

Recommendations

- **Continue** with electrification efforts, including EV First policy and strategic infrastructure deployment
- **Engage** with key stakeholders, including APS and partners/manufacturers
- **Track and evaluate** EV and charger usage to inform a data-driven fleet transition
- Where possible, **charge off-peak** (9 a.m.–3 p.m.) to reduce costs and maximize emissions benefits

Considerations

- **Proceed intentionally** with pilot deployments and performance evaluation plans (esp. for large/specialized EVs)
- **Explore** charging infrastructure leasing options, which may open access to additional incentives
- **Study options** for charging take-home vehicles
- **Engage** with internal and external stakeholders around electrifying police vehicles, including collecting user feedback

Challenges

- **Acquisition of medium- and heavy-duty vehicles** – this market is nascent and evolving rapidly, requiring solid vendor relationships to understand specifications, pricing, and availability
- **Infrastructure deployment** – this process takes time and involves several stakeholders, including APS and solution providers
- **Studying vehicle performance and maintaining strong internal communication**



Strategic Fleet Electrification





Market Availability & Suitability

Delivery Time

- **Availability** has **varied** in FY24, with **lead time 6-12 months** once ordered
- Have been **successful** in **procuring EVs “on the lot”**
- Timeline has been **similar for gas and diesel vehicles**

EV Costs

- **Pricing fluctuated** greatly in FY24
- **Special funding** approved in FY23 has **helped cover price differences** between EV and gas/diesel
- City is **pursuing federal tax credits** for EVs purchased

EV Suitability

- **Fleet works directly with divisions** to identify if there are EV options that meet operational needs
- **Medium/Heavy-duty EVs are not currently compatible** with operations and infrastructure & **cost ~2x as much upfront**



Overarching Fleet Status & Policies

Integrating EVs into the City Fleet

- 11 EVs currently in the City Fleet
- 5 additional EV pickups are on order for FY24

Streamlining Policies

- Updating and streamlining existing fleet policies and forms
- Establishing guidelines for integrating EV technologies into existing system

Advancing Sustainability

- EV-First Policy ensures fleet maximizes fuel efficiency and emission reductions
- Aim to align operations with sustainable practices while maintaining a high level of service to the community



Transitioning to EVs: A Phased Approach

The City's Approach:

Phased replacement of conventional gas and diesel vehicles with EVs when available to ensure operations and maintain same level of service.

Advantages of this approach:

1. **Market Evolution:** Allows for smoother transition rather than abrupt disruption
2. **Infrastructure Development:** Enables gradual expansion and optimization of EV charging infrastructure
3. **Consumer Adoption:** Minimizes resistance from consumers, promotes acceptance of EVs
4. **Fiscal Responsibility:** Spreads the costs out over time and reduces risks



Streamlining EV Procurement

Staff is preparing a solicitation specifically for EVs that will:

- Streamline the procurement process for EVs
- Plan ahead in coordination with Fleet Advisory Committee's replacement decisions
- Enable the City to order multiple EVs at once



Level 2 Existing Charging Stations

Location	Users	# of Charging Ports
City Hall	Fleet, Public, Staff	4
Visitor's Center	Fleet, Public, Staff	4
Aquaplex	Fleet, Public, Staff	4
Airport	Fleet, Public, Staff	6
Fleet Services	Fleet	2
Police Department	Fleet	4
East Side Utility Shop	Fleet	2
Rio de Flag	Fleet	1
Downtown Library	Fleet	1

TOTAL: 28 existing ports



Level 2 Planned Charging Stations

Location	Users	# of Charging Ports
Core Services – <i>coming May 2024</i>	Fleet, Visitors	12
East Side Utility Shop – <i>coming summer 2024</i>	Fleet	2
Thorpe Park (Shop) – <i>coming summer 2024</i>	Fleet	2

TOTAL: 16 planned ports

28 existing charging ports
+16 planned charging ports

44 total charging ports

Fleet Electrification Assessment & Efforts

City Staff:

Jennifer Brown

Nathan Naliborski

Patrick Brown

Danae Presler

Consultants:

Walter Schaefer

Andrey Gribovich

Lara Krecic

Susan Regan



Thank You!

Questions?

Appendix Slides

Detail: Recommended Infrastructure Cost Breakdown (one-time and recurring/annual)

	Level 2	DCFC	Total
Charger quantity	12 (24 ports)	13 (13 ports)	25 (37 ports)
Equipment costs (one-time)	\$60,000	\$987,269	\$1,047,269
Installation costs (one-time)	\$72,000	\$819,113	\$891,113
Maintenance costs (lifetime)	\$66,836	\$145,600	\$212,436
Networking fees (lifetime)	\$20,160	\$21,840	\$42,000
Maintenance costs (annual)	\$4,774	\$10,400	\$15,174
Networking fees (annual)	\$1,440	\$1,560	\$3,000
Year 1 cost	\$138,214	\$1,818,342	\$1,956,556
Recurring annual cost	\$6,214	\$11,960	\$18,174
Total lifetime cost	\$218,996	\$1,973,822	\$2,192,818

Detailed Recommendations (originally presented December 2023)

Given the strong potential for TCO savings, continue Flagstaff's "EV First" vehicle procurement policy

Pursue strategic deployment and integrated planning of EV charging infrastructure across the selected properties, including EV Ready installation to lower overall installation costs

Engage with APS to map out existing electric capacity, identify potential future constraints, and identify efficiencies arising through coordinated long-term infrastructure planning

Build strong, long-term partnerships across the value chain to collect critical data, ensure diverse perspectives are taken into account, and streamline electrification efforts

Track and evaluate EV and charger usage to assess EV fleet vehicle performance and optimize future electrification efforts; this will be aided by the deployment of a robust vehicle telematics platform

Leverage managed charging functionality to minimize on-peak charging (3-8 p.m., M-F) and charge off-peak when possible, using a combination of charging schedules, user access controls, and staff training

Considerations (originally presented December 2023)

Consider the development of a policy around charging for take-home vehicles; we anticipate that this will be more of an administrative than a technical challenge

- In the near-term we expect that admin/detective take-home vehicles will charge at the Police Department

Initiate a stakeholder process to develop next steps regarding patrol fleet electrification and address current concerns by collecting necessary data and user feedback

- While patrol vehicles do show positive TCO savings, this fleet's mission critical status and well-documented concerns from department staff suggest that additional planning and data collection are necessary to guide electrification efforts

Consider pilot EV deployments, particularly for MHDVs; this approach will allow the City to collect critical performance data before committing to larger investments

Consider the costs and benefits of non-ownership (leasing) arrangements for EV charging infrastructure; note that the cost-benefit equation may change over time as the fleet scales and gains experience

Where possible, consider the potential to charge from 9 a.m. – 3 p.m. to align with APS's lowest rates; this is likely achievable at PD for take-home vehicles, potentially also City Hall