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Town of Windsor
Zero-Emission Fleet Transition Plan

July 19, 2024

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Glossary

CARB: California Air Resource Board

ACF: Advanced Clean Fleet, regulations on fleets to achieve the transition towards zero emission vehicles.

- **Option 1:** Local government fleets purchase requirement
  - 2024 – 2026: 50% of vehicle purchases are zero-emission
  - 2027 and on: 100% of vehicle purchases are zero-emission
- **Option 2:** ZEV Milestone Requirement – Sets ZEV vehicle transition into 3 groups of vehicles and four transition percentage milestones that phase the vehicle transition through 2042.

ZEV: Zero Emission Vehicles

ICE: Internal Combustion Engine

VMT: Vehicle Miles Travelled

GVWR: Gross Vehicle Weight Rating

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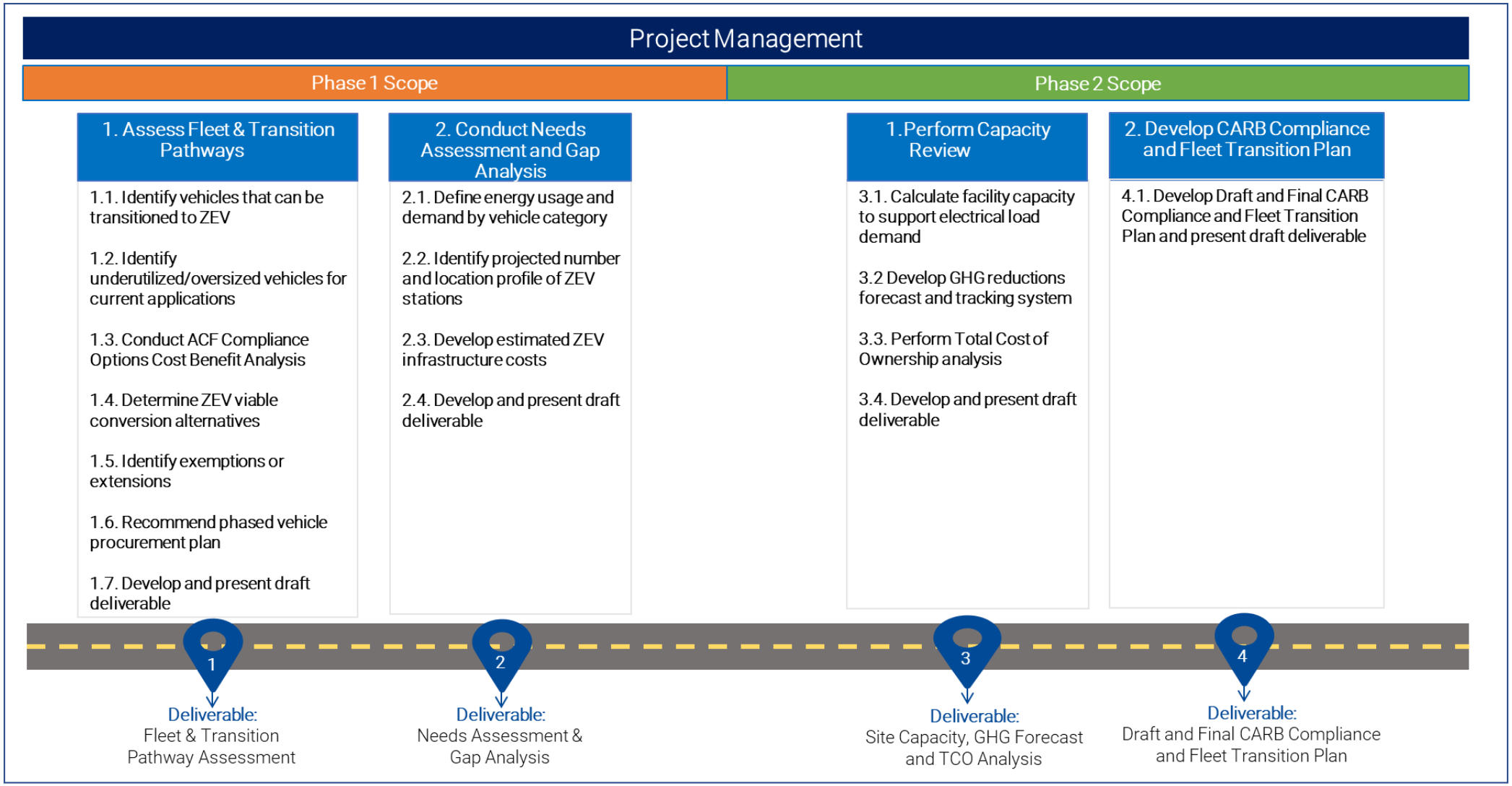
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Executive Summary

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Project Approach

Fleet Transition Plan Scope



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Executive Summary

Project enables Windsor to plan the transition of its fleet toward ZEVs while ensuring ACF compliance and continued fleet operations

Objectives

1. **Fleet Transition –** Decarbonize the fleet to help achieve Windsor's sustainability goals
2. **CARB Compliance -** Assess the compliance pathways of the CARB Advanced Clean Fleets regulation to ensure the Town of Windsor is complying via the best possible path

Approaches

1. **ZEV Alternatives -** Create a vehicle profile of the Town's fleet vehicles and evaluate their suitability for transition towards ZEVs
2. **Infrastructure Planning -** Prepare a high-level infrastructure plan with cost estimates for the scaling up of the ZEV adoption in the fleet

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Executive Summary

Through this engagement – the Town has developed a foundational strategy to guide its fleet electrification transition and begin the next phases required for implementation



VEHICLE REPLACEMENT & COMPLIANCE PLAN

Plan to replace 63 vehicles across the fleet in compliance with CARB-ACF and the sustainability goals through 2040



CHARGING & FACILITY INFRASTRUCTURE NEEDS

Identification of vehicle charging infrastructure requirements and facility electrical upgrades to support load demand growth and fleet operations



TOTAL FLEET COST OF OWNERSHIP & EMISSION REDUCTIONS

Estimated costs for EV vehicle and infrastructure through 2040, as well as scope 2 emission reductions obtained from the fleet transition



FLEET ELECTRIFICATION DEPLOYMENT TIMELINE

Roadmap to guide three-phase implementation of the fleet transition that times the deployment budgeting for new infrastructure with acquisition of vehicles

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Executive Summary

Key Recommendations – Town of Windsor should…

- **Comply through Purchase Option 1 -** Comply with ACF through the default purchase option which offers optimal flexibility and allows the Town's fleet to transition at its pace
- **Take advantage of the 1:1 provision –** Between 2024-26, CARB allows a 50% purchase ratio between ICE and ZEV, focus on retiring the older vehicles with suitable ZEV alternative and buy ICE for those without
- **New electrical service -** Invest its charging infrastructure with a new electrical service to take advantage of the utility's EV rates and make-ready benefits
- **Complete engineering & pre-construction -** Optimize the charging design via solution engineering to lower the costs and increase the operational efficiency of the electric fleet

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CONTINUED EVOLUTION OF THE CITY'S VEHICLE ELECTRIFICATION ROADMAP

2024	2025	2026	2027

GRANTS & TAX CREDITS

2024	2025	2026	2027
1. GRANT AND TAX CREDITS APPLICATIONS	2. GRANT AND TAX CREDIT RE-FRESH 3. GRANT AND TAX CREDITS APPLICATIONS		

PROCUREMENT & SITE DEVELOPMENT

2024	2025	2026	2027
1. ELECTRIC VEHICLES 2. CHARGING INFRASTRUCTURE	3. SITE DEVELOPMENT (Engineering Design & Pre-construction)	4. CONSTRUCTION	

WORKFORCE REQUIREMENTS

2024	2025	2026	2027
	1. STRATEGY DEVELOPMENT	2. STRATEGY IMPLEMENTATION	

MANAGED CHARGING STRATEGY

2024	2025	2026	2027
	1. STRATEGY DEVELOPMENT	2. STRATEGY IMPLEMENTATION	

RELIABILITY AND RESILIENCY STRATEGY

2024	2025	2026	2027
	1. STRATEGY DEVELOPMENT	2. STRATEGY IMPLEMENTATION	

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The Town of Windsor should begin applying for relevant grant funding opportunities and prepare for vehicle & infrastructure RFPs for the Corp Yard

Focus Areas	Key Next Steps
1 **GRANTS & TAX CREDITS**	1. Develop grant applications and leverage available tax credits 2. Periodically refresh grant and tax funding opportunity list 3. Continue to develop grant applications and leverage available tax credits
2 **PROCUREMENT FACILITATION**	1. Electric vehicle requirements / outfitting, etc. 2. Determine the replacement vehicle candidates while complying with ACF 3. Conduct assessment of existing and planned functionality of charging equipment OEM's 4. Evaluate and identify preferred business model and partners (e.g., O&M services) 5. Determine charging equipment requirements 6. Develop RFP scope of work and documents

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Windsor should focus on developing and implementation strategies to workforce preparedness, managed charging optimization, and site reliability / resiliency

Focus Areas	Key Next Steps
3 **WORKFORCE REQUIREMENTS**	1. Identify key skills, training, and credentials required for future operation and maintenance of vehicles and maintenance. Perform gap analysis to develop training/transition plan. 2. Identify key training partner and institutions to implement the necessary training 3. Determine costs and budget to fund the transition plan for workforce
4 **MANAGED CHARGING**	1. Perform charging infrastructure solution engineering and develop infrastructure requirements to enable managed charging 2. Evaluate and develop managed charging strategies for fleet operation and electric load optimization for improved cost-effectiveness 3. Implement, monitor, and update managed charging strategy as new technologies arise
5 **RELIABILITY AND RESILIENCY**	1. Perform on-site energy resource evaluation for solar and storage to improve infrastructure reliability and resiliency during power outages 2. Perform charging infrastructure solution engineering to incorporate fast chargers on circuits with backup generation for emergency use 3. Develop emergency operation guidelines around vehicle charging and rotation to ensure operational resiliency during emergencies

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Executive Summary – Fleet Analysis

Phase.1 Task 1 Overview and Key Insights

Fleet Assessment

Analyze current fleet to identify potential ZEV alternatives based on vehicle types and operational characteristics.

Utilization Analysis

Assess vehicle utilization to identify underutilized vehicles and provide recommendations.

Least Viable Conversions

Profile key ZEV operational attributes to determine suitability to meet current fleet requirements.

Compliance Pathways

Evaluate CARB ACF compliance pathway options and provide recommendation for selection and fleet transition.

Key Insights

- 63 total fleet vehicles
- 66.67% are ACF regulated
- 33.33% vehicles have no regulatory requirements to transition to ZEV
- ZEV alternatives are available for 7 of the 8 vehicle types in the City fleet
- ZEV alternatives are all Battery Electric

- 10 vehicles had no annual mileage data reported
- 8 vehicles were under 50% of the average vehicle type utilization in 2023
- Vehicles <1,000 annual miles may apply for ACF Backup Vehicle exemption

- 1 vehicle type – Vacuum Truck does not currently have available or suitable alternatives and if necessary, should apply for ACF Unavailability Exemption
- 4 vehicle types have low to medium suitability
- 4 vehicle types have high suitability and do not present concerns

- ACF Option 1 is recommended pathway given the flexibility it provides for timing of fleet procurement
- Option 2 appears more appealing due to majority of ACF regulated vehicles are in Group 2 with a less aggressive schedule.
- Option 2 is driven by ACF Milestone schedule therefore requires replacement before end-of-life vehicles

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Executive Summary

4 of the 8 vehicle types of the fleet have readily available ZEV alternatives today

Vehicle Type #		1	2	3	4	5	6	7	8
Vehicle Description		**Light-Duty Pickup Truck**	**Medium-Duty Utility Work Truck**	**Medium-Duty Work Truck**	**Van**	**Vacuum Truck**	**Medium-Duty Dump Work Truck**	**Medium-Duty Bucket Work Truck**	**Light-Duty Passenger Vehicle**
ICE Representative Vehicle		*F-150 and F-250*	*F-250 Utility Body/Bed*	*F-350 to F-650*	*Ford Transit (15pssngr)*	*Vactor*	*F-550 flat bed/hoist*	*F-550 bucket truck*	*Ford Escape Hybrid*
Vehicle Count		27	12	4	3	1	2	1	13
Vehicle Class		1 - 3	2b	5 - 6	2 - 3	7	3 - 4	5	1
Weight		6,001 - 11,000	8,501 - 10,000	16,001 - 26,000	8,501 - 14,000	> 26,001	10,001 - 16,000	16,001 - 19,500	< 6,000
Duty Cycle	**Daily Miles Traveled**	28	26	8	14	2	12	41	14
	Daily engine hours					2.8			
	Operating Times	7:00am - 6:00pm M-Th	7:00am - 6:00pm M-Th	7:00am - 6:00pm M-Th	7:00am - 6:00pm M-Th	7:00am - 6:00pm M-Th	7:00am - 6:00pm M-Th	7:00am - 6:00pm M-Th	7:00am - 6:00pm M-Th
	Dwell Times	6:00pm - 7:00am M-Th	6:00pm - 7:00am M-Th	6:00pm - 7:00am M-Th	6:00pm - 7:00am M-Th	6:00pm - 7:00am M-Th	6:00pm - 7:00am M-Th	6:00pm - 7:00am M-Th	6:00pm - 7:00am M-Th
Alternative Fuel		Battery Electric	Battery Electric	Battery Electric	Battery Electric	Battery Electric	Battery Electric	Battery Electric	Battery Electric
Representative ZEV Alternative		Ford F-150 Lightning (If applicable for F-250 pickups requirements)	**Chevy Silverado EV WT**	Rizon e18M (available EV chassis)	Ford E-Transit	NA	Cenntro Logistar 400	Terex EV Aeriel	Chevy Bolt EUV
Battery Size (kWh)		98	200	82	68	162	80.6	210	65
ZEV Efficiency (kWh/Mile)		0.50	0.44	0.74	0.79	0	0.65	1.40	0.29

Notes:
1. Vehicle count reflects existing inventory as of 03/21/2024
2. Vehicle count and fuel / electric types do not include vehicles from the police and fire departments

Color	Definition - ZEV Readiness
	High
	Medium
	Low

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Executive Summary

City operates 42 vehicles that are regulated by ACF compliance requirements

63 vehicles

ACF Regulated

43 vehicles

Vehicle Type	Vehicle Count
Light-Duty Pickup Truck	19
Medium-Duty Utility Truck	12
Medium-Duty Work Truck	4
Van – Passenger	3
Vacuum Truck	1
Medium-Duty Dump Truck	2
Medium-Duty Bucket Truck	1
TOTAL	**42**

Purchase Exemption

Vehicle Type	Vehicle Count
Vacuum Truck	1
TOTAL	**1**

ACF Exempted

20 vehicles

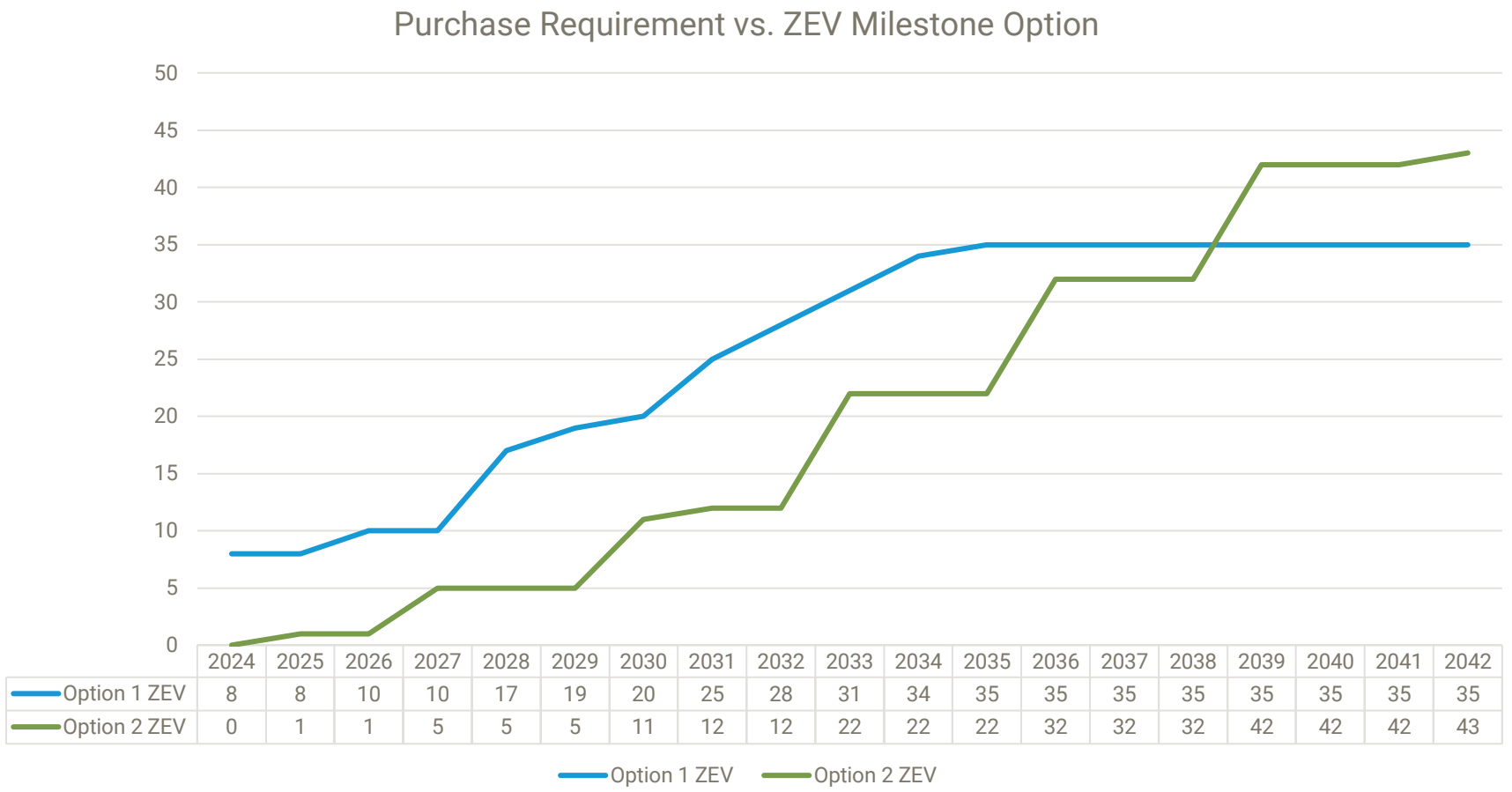
Vehicle Type	Vehicle Count	Exemption
Light-duty Passenger Vehicles	13	Vehicles under 8,500 GVWR are exempt from ACF
Light-duty Pickup Trucks	7	Advanced Clean Cars; only ZEV options will be available for purchase starting 2035
TOTAL	**20**	

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Executive Summary – Fleet Replacement Pathways

Recommend Option 1 Purchase Requirement for ACF compliance due to its flexibility



	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042
Option 1 ZEV	8	8	10	10	17	19	20	25	28	31	34	35	35	35	35	35	35	35	35
Option 2 ZEV	0	1	1	5	5	5	11	12	12	22	22	22	32	32	32	42	42	42	43

Key Takeaways:

- Option 2 appears to be more appealing thanks to majority of ACF regulated vehicles are in Group 2 with a less aggressive schedule.
- But Option 2 could require fleet vehicles to retire before they would “typically’ be replaced with ZEV in Option 1.
- Option 1 offers the flexibility for the City fleet to decide when to replace a fleet vehicle.

Notes:
1. Estimation based on 12-yr or 80k miles replacement schedules.

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Executive Summary – Near-term replacement (2024-2026)

Recommend taking advantage of the 50% ICE/EV procurement ratio to procure ICE vehicles that don't have suitable ZEV alternatives between 2024-2026

Proposed Replacement Plan

Year	ICE Replacement	EV Replacement
2025	39 - 2003 Silverado Pickup 303 - 1999 Ecoline Wagon Van	200 - 2003 F-250 Utility Truck 202 - 2003 F-250 4x2 Utility Truck
2026	204 - F-350 Hoist/Flat Bed Truck 207 - F-450 Dump Truck 211 - F-250 4x2 Utility Truck 212 - F-350 Utility Truck	(2) EVs 90 - 2012 F-250 Regular Cab 208 - 2006 F-150 4x2 (4) TBD: (two more EV required for ICE match) 93 - 2014 F-250 4x2 Pickup 94 - 2014 F-250 4x2 Pickup 99 - 2016 F-250 SuperCab 210 – F250w/ Utility Body (2027 replacement?)

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Executive Summary – Charging Need Assessment

Phase.1 Task.2 Overview and Key Insights

Fleet EV Suitability Update

Updated ZEV alternatives with refined information

Full EV Fleet Need Assessment

The charging configuration takes into consideration the daily operations and resiliency situations

Conceptual Design of Infrastructure

A new dedicated service for EV charging is recommended for scalability and utility advantages

Infrastructure Cost Estimate

Close to 50% of the initial estimated cost could be phased in at the pace of EV procurement

Key Insights

- Class 2b Medium-duty work truck category has a recent ZEV alternative of Chevy Silverado EV
- Class 3-5 ZEV alternatives exist in the form of chassis with possible configuration from the upfitter in the after-market

- Daily average miles of all the vehicle types range from 8-40 miles (excluding vacuum truck)
- Given the energy demand of the corresponding EV alternatives, the charging configuration allows the vehicles to be recharged within the available dwell time and provides substantial redundancy for emergency situations

- Dedicated service for EV charging allows Windsor to take advantage of the EV fleet charging rates
- Conceptual charger and electrical design could be updated in Phase 2 of this project to connect fast chargers to on-site back-up generation.
- New electrical service will be sufficient to accommodate the EV fleet operation including electrification of vehicle types not currently available

- 42% of the cost estimates for charging equipment could be postponed until delivery of ZEVs
- 30% of the electrical work is for wiring, which could be timed with installation of charging equipment

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Executive Summary – Charging Need Assessment

The charging configuration will provide sufficient energy given the available dwell time of the fleet

										*Time to Charge 0-100% (hrs)					Charger Count			
Vehicle Type	Vehicle Type Description	EV Make	EV Model	Final EV Count	Battery Size (kWh)	Daily Miles	Annual VMT	Daily kWh Demand	Dwell Duration (hrs)	AC Level 2 7.2kw	AC Level 2 19.2kw	DC charger 60kw	DC charger 120kw	DC charger 40kw	Level 2 chargers (7.2kw)	Level 2 chargers (19.2kw)	DC chargers (60kw)	DC dual port Chargers (40kw)
1	**Light-Duty Pickup Truck**	Ford	Ford F-150 Lightning	27	98	28.09	5,842	14	13	15.1	5.7	2.3	1.8	2.7	0	27	0	14
2	**Medium-Duty Utility Work Truck**	Chevrolet	Silverado EV 4WT	12	113	25.5f2	5,308	25	13	17.4	6.5	2.6	2.1	3.1	0	12	0	6
3	**Medium-Duty Work Truck**	Rizon	Rizon e18M	4	82	8.29	1,725	6	13	12.7	4.7	1.9	1.5	2.3	0	4	0	2
4	**Van**	Ford	Ford E-Transit 2023	3	68	14.10	2,933	11	13	10.5	3.9	1.6	1.3	1.9	0	3	0	2
5	Vacuum Truck **	Geely China	N/A	1	162	2.40	500	-	13	25.0	9.4	3.8	3.0	4.5	0	0	1	0
6	**Medium-Duty Dump Work Truck**	Cenntro Automotive	Cenntro Logistar 400	2	80.6	12.02	2,500	8	13	12.4	4.7	1.9	1.5	2.2	0	2	0	1
7	**Medium-Duty Bucket Work Truck**	Terex	Terex EV Aeriel	1	210	40.87	8,500	57	13	32.4	12.2	4.9	3.9	5.8	0	0	1	0
8	**Light-Duty Passenger Vehicle**	Chevrolet	Chevy Bolt EUV	13	65	13.94	2,900	4	13	10.0	6.3	1.5	1.5	1.8	13	0	0	0
													Option.1	**Count of 19.2kW**	**13**	**48**	**2**	0
													Option.2	**Count of 40kW**	**13**	0	**2**	**24**

Notes:

1. Charging time from 0-100% considers of the vehicle onboard charger limitations and the DC charging profiles of similar EVs.
2. Vacuum trucks doesn't exist as a ZEV in the class 7 category yet, but it's safe to assume a higher power DC charger will be required;

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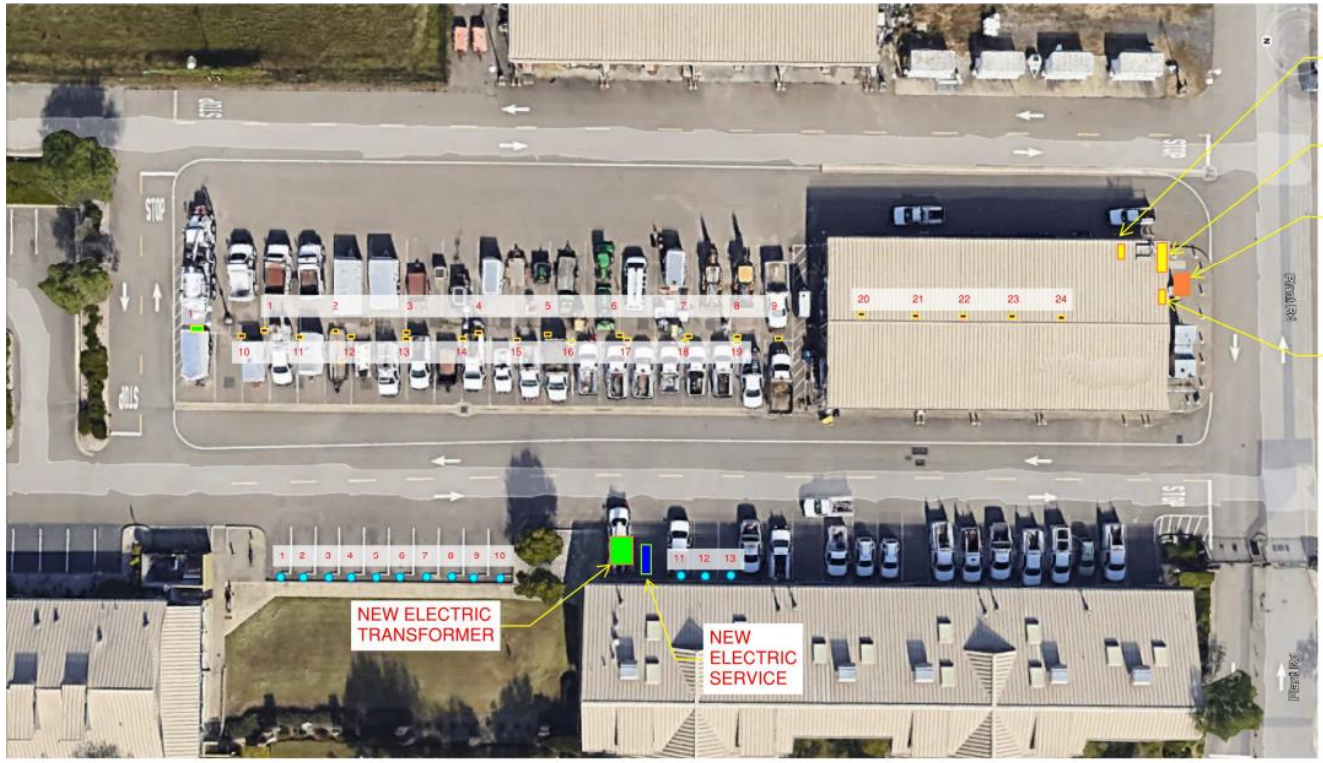
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Executive Summary – Charging Need Assessment

Option 2 provides operational flexibility and electrical simplicity

Task 2. 2 needs assessment										
Site Address:	8400 Windsor Rd Bldg. 100, Windsor, CA 95492			**Site:**	A	**Existing Utility Transformer**	**kVA TBD?**			
Site Name:	Corporate Yard			**Amps**		**Existing Main:**	**480V 3Θ, 1600 A, 65kAIC**			
Quantity 7.2kW Charger	**Quantity 40kW Charger**	**Quantity 120 kw Charger**	**kw total**	**@208V**	**@480V**	**panel name with capacity:**	HA	**Amps**	**Volts**	**KAic**
13	24	1	1174	4075	1765	**panel location with capacity:**	main elec room	225	480V, 3Θ	65

New Service	2000A, 480V, 3Θ	**L2 C&W / Breaker**	13 X (40A/2P, 3- #8 ,#10G in 1" PVC)	**LV Transformer**	1- 112.5 kVA- 480V/ 208, 3Θ
New Utility Transformer	1000 - 1500kVA	**L3 C&W / Breaker**	24 X (60A/3P, 3#4, #10G in 1.25" PVC)	**LV Transformer**	
New Panel Board	1-400A, 208V, 3Θ	**L3 C&W / Breaker**	1 X (200A/3P, 4/0, #4G in 2.5" PVC)	**LV TF C&W / Breaker**	1 X (175A/3P, 4- 2/0, #6G in 2" PCV)
Panel BD Feeder C&W	2 X (4-3/0,#2G in 2" PVC)			**LV TF C&W / Breaker**	



Option 2 with 40kW dual-port charger

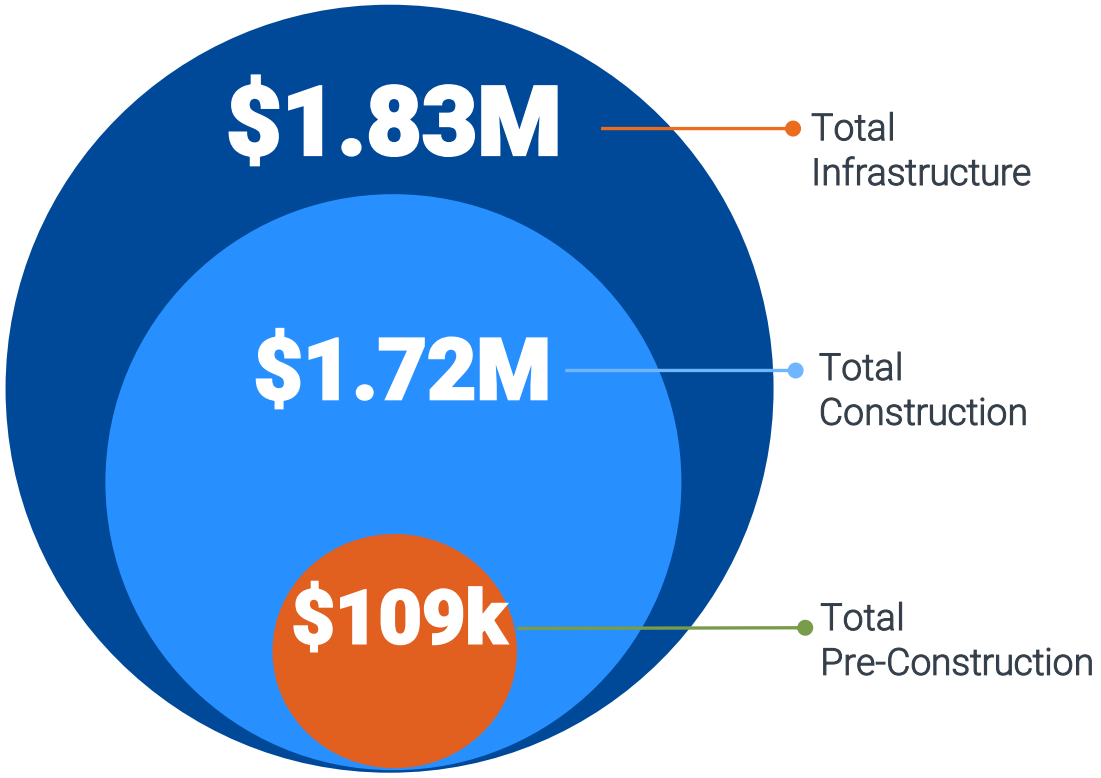
- Removes 3 - 300kVA transformers and 3 - 800A panels
- Reduces wire size for less amperage at 480V
- Less installation labor and O&M costs from reduced equipment

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Executive Summary – Charging Need Assessment

An estimated investment of ~$1.83M will support installation of charging infrastructure and upgrade site electrical capacity to support the Town's fleet transition

TOTAL INFRASTRUCTURE COSTS



KEY TAKEAWAYS

- 42% of the cost estimate for charging equipment could be postponed until delivery of the ZEVs
- 30% of the electrical work is for wiring, which could be postponed with charging equipment
- Utility infrastructure costs are not included in this estimate
- Cost estimate can be refined to include connection of fast chargers to back-up generation

Notes:
1. Infrastructure costs are at a Class 5 Level estimate: -30%/+50%
2. Detailed infrastructure cost estimate assumptions can be found in the Appendix of this deliverable

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Executive Summary – Charging Need Assessment

Charging equipment will represent the highest share (42%) of total infrastructure costs in the execution of the fleet transition plan

COST CATEGORY (FROM HIGHEST TO LOWEST COST)

CHARGING EQUIPMENT 1

13 – 7.2kW AC L2 Charger Single Port
24 – 40kW DC Charger Dual Port
1 – 120kW DC Charger Single Port

ELECTRICAL WORK 2

Conduit ~ 70%
Wiring ~ 30%

ELECTRICAL EQUIPMENT 3

2000A Switchboard
112.5 kVA Transformer
400A Distribution Panel
1500kVA Transformer (Utility provides)

SITE IMPROVEMENT 4

Striping & Ground Symbols
Concrete Wheel stops
Protection Bollards
Pipe Bollards Sleeves
Landscaping

DESIGN AND ENGINEERING 5

Site Walk
Electrical Engineering
Civil Engineering
Structural Engineering
Engineering techs/Graphics

ALL OTHER COSTS

Switchboard Coordination, Utility Coordination Permitting Land Survey

ALL OTHER COSTS

Demolition, Trenching and Backfill, Asphalt Paving, Concrete Work, Commissioning Support Additional Site & Electrical Work

TOTAL COST & SHARE BY COST CATEGORY

CHARGING EQUIPMENT	ELECTRICAL EQUIPMENT
$769k	42%	$225k	12%

ELECTRICAL WORK	SITE IMPROVEMENT
$264k	14%	$186k	10%

DESIGN AND ENGINEERING	ALL OTHER COSTS
$55k	3%	$327k	18%

PRE-CONSTRUCTION CONSTRUCTION

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Executive Summary – Capacity Review, Modeling, and CARB Compliance

Phase.2 Overview and Key Insights

Existing Infrastructure Capacity Evaluation

Available existing electrical capacity to accommodate for additional EV charging loads

TCO Results of ACF Compliance Pathways

Option.1 appears to be more expensive due to a more aggressive replacement schedule in the model

GHG Reduction Projection

Both options of ACF yield significant annual GHG savings compared to the baseline

CARB Compliance and Transition Plan

Close to 50% of the initial estimated cost could be phased in at the pace of EV procurement

Key Insights

- The existing electrical capacity won't support the full-scale deployment
- Depending on existing physical space, existing capacity could support "bridge" phase for some infrastructure deployment
- Existing circuit with back-up generator is ideal to pair with high-power DC fast chargers for emergency and resiliency

- Option.1 is more expensive due to the early transition of vehicles towards EV in the model, whose price is expected to fall in the future as the technology matures
- Both options more expensive than the business-as-usual baseline scenario where the fleet procures the same kinds of ICE vehicle, but that's due to the initial charging infrastructure investment, which is about $1.8M in total

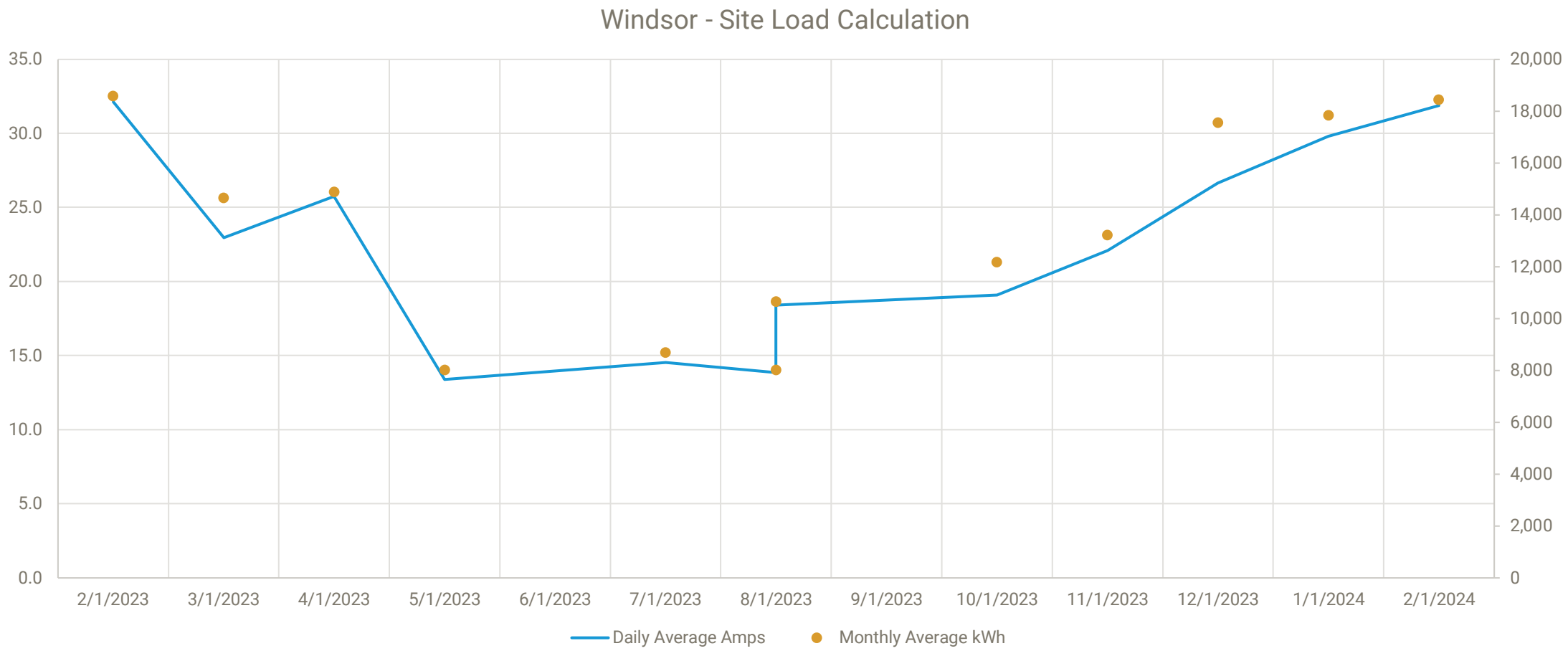
- The electrification of the Windsor fleets can provide an annual saving of 145~166 MT CO2e of GHG emission
- The GHG savings are mostly attributed to the fuel consumption savings and the low embodied emission of the electric vehicles

- Option.1 is the recommended pathway of compliance thanks to its flexibility
- CARB has clarified the fleet can operate its existing ICE vehicles for as long as it desires
- Windsor can leverage the near-term 50% replacement provision to replace hard to replace vocational vehicles as ICE while replace the more mature EV models under ACF's regulation

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Executive Summary – Available Electrical Capacity Review

About 1,200 Amps of existing electrical capacity available for EV charging



There is about 1,200 Amps of available electrical capacity, but it will depend on the onsite panel space to accommodate electrical load for EV charging.

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Executive Summary –TCO Modeling of ACF Pathways

Total Cost of Ownership model provides a comprehensive view into vehicle lifecycle costs

TCO MODEL

KEY UNCERTAINTIES & SENSITIVITIES

- Technology Advancements
- Energy Price Fluctuations
- Policy Changes

ECONOMIC INPUTS

- Net Present Value – Discount Rate
- Capital escalation rate
- Labor escalation rate

FINANCIAL MODEL

- Annual Costs
- Costs through Useful Life

TCO OUTPUT

- NPV over useful life
- Net savings or costs for conversion
- NPV of scenario cost differences

INVESTMENT COSTS

ELECTRIC

- Vehicle purchase
- Maintenance
- Electricity
- Charging equipment
- EVSE O&M
- Electrical upgrades

INTERNAL COMBUSTION

- Vehicle purchase
- Maintenance
- Fuel

Notes:

1. The TCO model is modeling the incremental costs associated with the ACF compliance options.

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Executive Summary – Projected TCO of ACF Compliance Pathways

When comparing annual Costs between scenarios, ACF Option 2 is more cost-effective compared to Option 1 and No ZEV Procurement

Scenario: ACF Option 1

- ACF Purchase Requirement
- Passenger vehicle transition plan
- EVSE deployed with EV procurement

Total Transition Costs = $7.1 Millions

Scenario: ACF Option 2

- ACF Milestone Schedule
- Passenger vehicle transition plan
- EVSE deployed with EV procurement

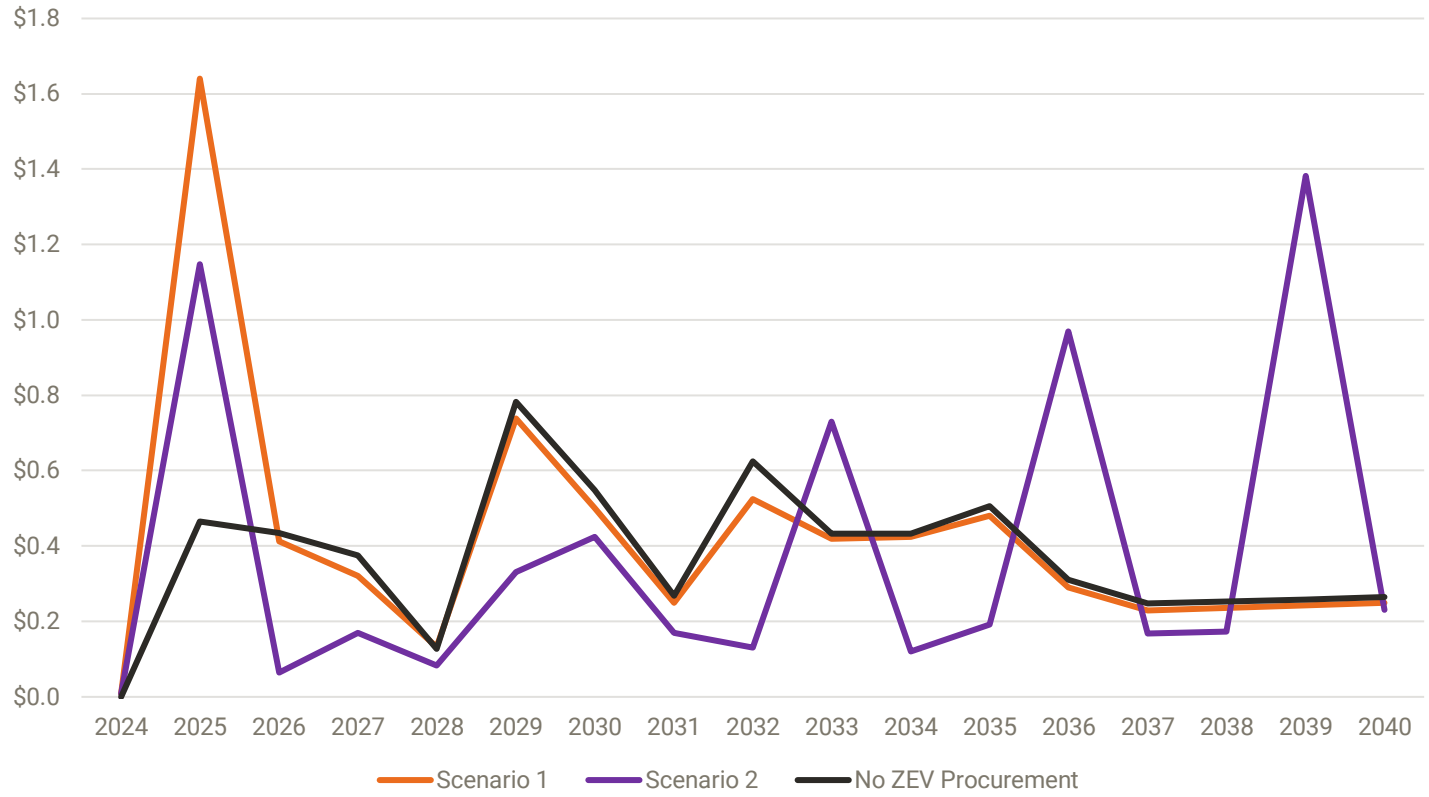
Total Transition Costs = $ 6.5 Millions

Scenario: No ZEV Procurement

- Based on benchmark vehicle replacements derived for Option 1
- No ZEV purchases, only ICE replacements

Total Transition Costs = $6.3 Millions

Cost Comparison: Scenario 1 vs Scenario 2 vs No ZEV Procurement
(millions)



Notes:
1. Costs excludes EV charging infrastructure and installation which is about $1.8 million
2. Costs include EV incentives and rebates (*Option 1 - Total Rebates*: $477,250, *Option 2 - Total Rebates*: $368,250)

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Executive Summary – GHG Reduction Projection

Town of Windsor has signed up for EverGreen schedule of Sonoma Clean Power which has a 100% eligible renewable portfolio

Scenario: ACF Option 1

- ACF Purchase Requirement
- Passenger vehicle transition plan
- EVSE deployed with EV procurement

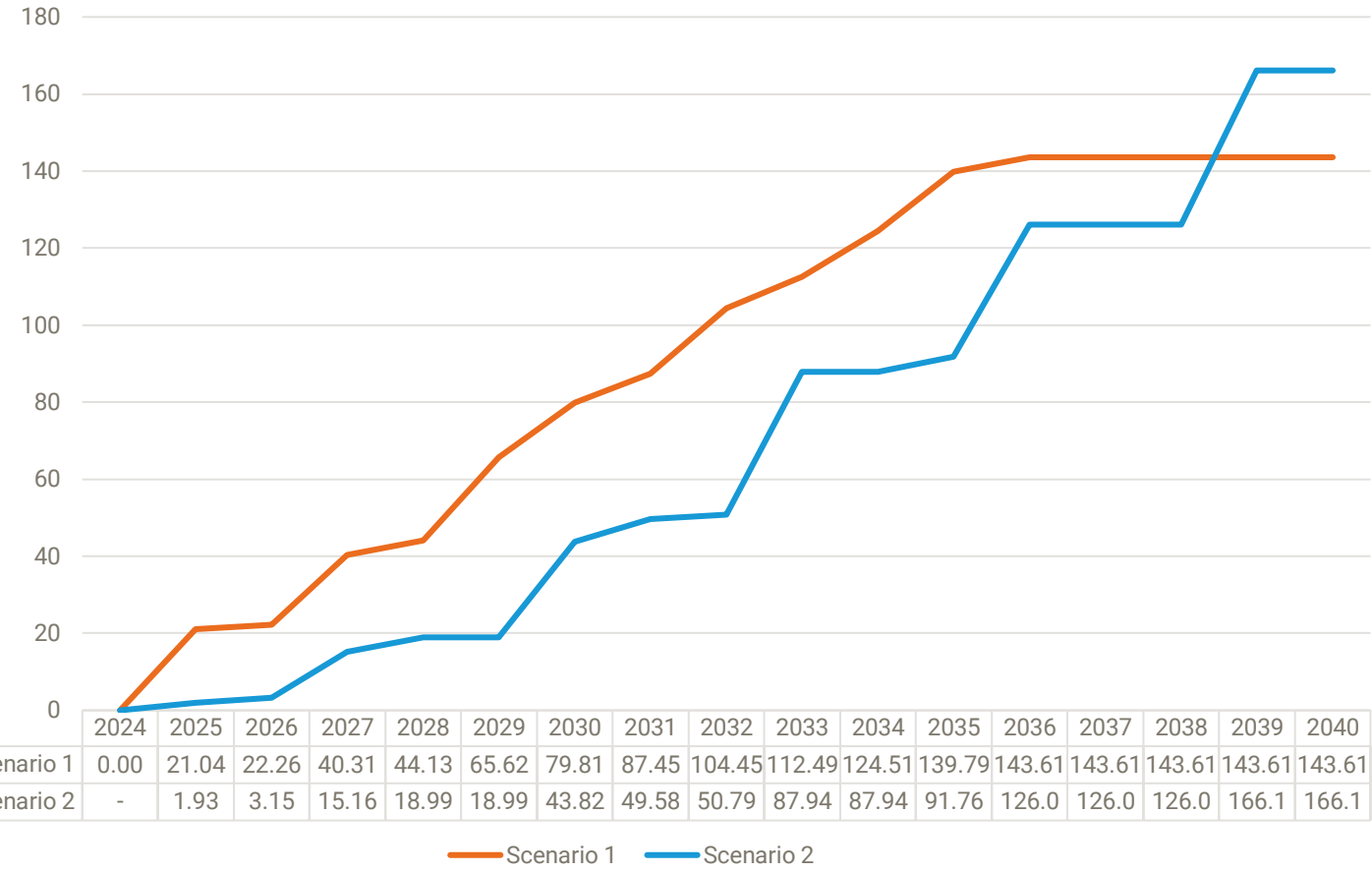
Annual Emission Savings = 143.61 MT CO2e starting 2036

Scenario: ACF Option 2

- ACF Milestone Schedule
- Passenger vehicle transition plan
- EVSE deployed with EV procurement

Total Emission Savings = 166.1 MT CO2e starting 2039

Emissions Savings: Scenario 1 vs Scenario 2 (MTCO2e)



	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Scenario 1	0.00	21.04	22.26	40.31	44.13	65.62	79.81	87.45	104.45	112.49	124.51	139.79	143.61	143.61	143.61	143.61	143.61
Scenario 2	-	1.93	3.15	15.16	18.99	18.99	43.82	49.58	50.79	87.94	87.94	91.76	126.0	126.0	126.0	166.1	166.1

Notes:

1. GHG savings is derived from comparing to the fossil fuel operation of the non-ZEV current fleet composition scenario.
2. The non-ZEV vehicles' emission is based on the fuel direct emission, where the ZEV vehicles' emission is based on the emission associated with electricity.

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Executive Summary – CARB ACF Compliance Plan

Exemptions and clarifications on ACF regulations

Applicable Exemptions

- Purchase Exemption – ZEV Unavailability
  - ACF regulated vehicles without a ZEV alternative may apply, but won't include any pickup, box trucks, or vans
- Daily Usage Exemption:
  - Fleet my purchase an ICE vehicle if the daily usage needs of a vehicle configuration can't be met by ZEVs
- Non-Repairable Vehicle Exemption:
  - Fleet may temporarily replace an existing non-repairable vehicle with another used ICE vehicle
- Backup Vehicle Exemption:
  - Fleet may purchase ICE vehicle and exclude it from ACF if its annual mileage is no more than 1,000 miles

CARB Clarifications

- ACF Regulated Vehicles
  - Vehicles with GVWR over 8,500 lbs or "package delivery vehicle" with 100 cubic feet of cargo-carrying volume for package delivery or mail, vehicles under the 8,500 lbs (i.e. F150 Lightning standard range) is excluded
- Renting or Leasing Vehicles
  - For vehicles rented or leased, the owner shall be presumed to be the rental or leasing entity for purposes of compliance unless the rental agreement is for more than one year and the agreement identifies the renting operator as the party responsible for compliance
- Vehicle Retirement
  - There is no requirement to remove or retire vehicles in ACF for local government fleet, they may continue to operate existing vehicles as long as they want

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Fleet Assessment

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Fleet Utilization Analysis

Utilization – Key Findings

- **Utilization Defined:**
  - Calculated on the last 12-month VMT compared to the average daily VMT of its vehicle type accounting for the days of operation of the specific vehicle.
- **Under-utilization:**
  - There are 8 vehicles with annual VMTs at less than 50% compared to the annual average of similar vehicle type and 1 of them is going into “Surplus”.
  - 3 of the 8 under-utilized vehicles were added in 2022/23.
- **Over-utilization:**
  - There are 10 vehicles with annual VMTs at over 150% compared to the annual average of similar vehicle type.
- **Finding:**
  - The utilization situation could be optimized with proper load management amongst the similar vehicle types.

Vehicle #	Model	Vehicle Type	Utilization
148	F-650 regular Cab/Chassis Diesel	Medium-Duty Work Truck	12%
130	Ford F-550	Medium-Duty Work Truck	58%
149	F-450 S-DTY	Medium-Duty Work Truck	70%
69	S-Duty F-450	Medium-Duty Work Truck	261%

*Taking MD Work Truck as an example group for workload balancing.

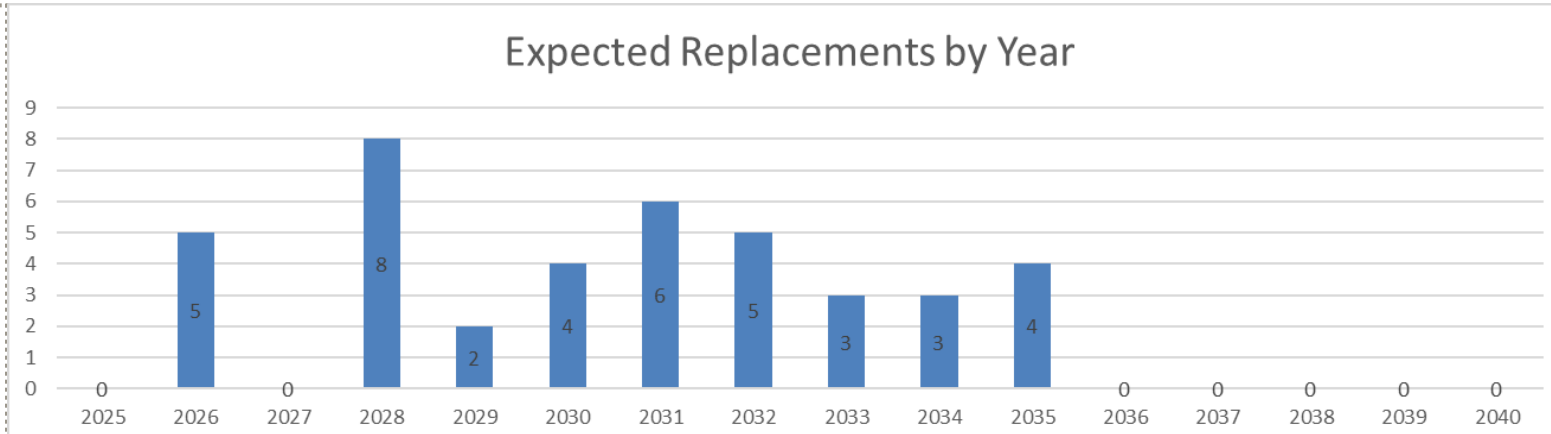
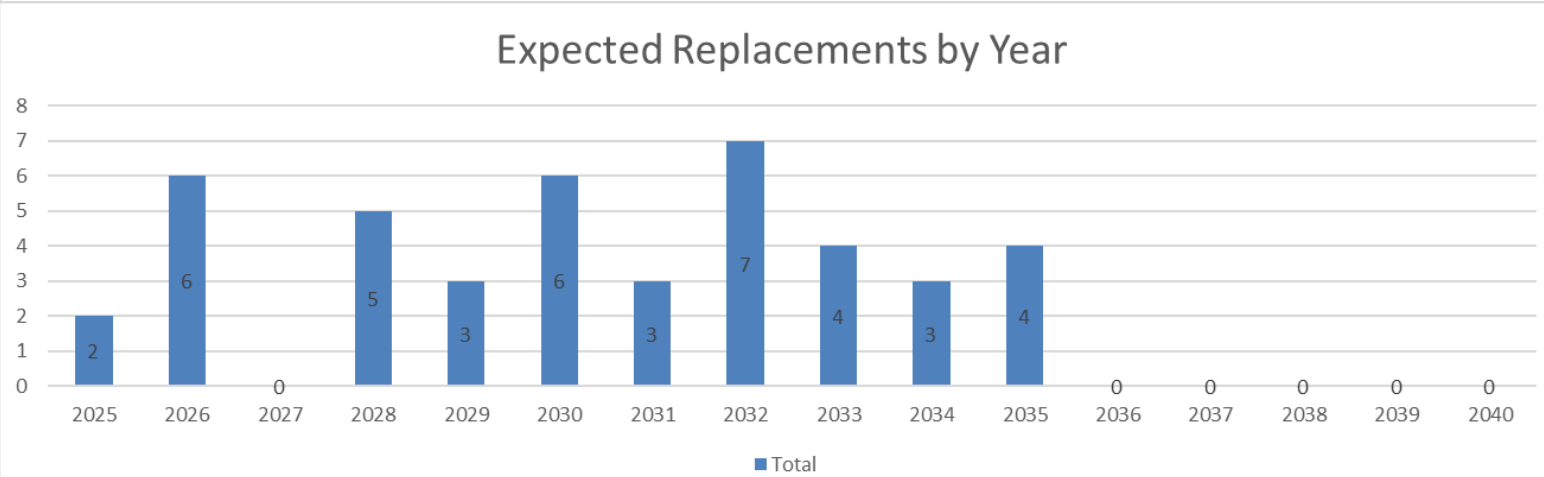
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Fleet Replacement Analysis

12-yr Replacement Schedule

*Excludes replacement schedule before 2024

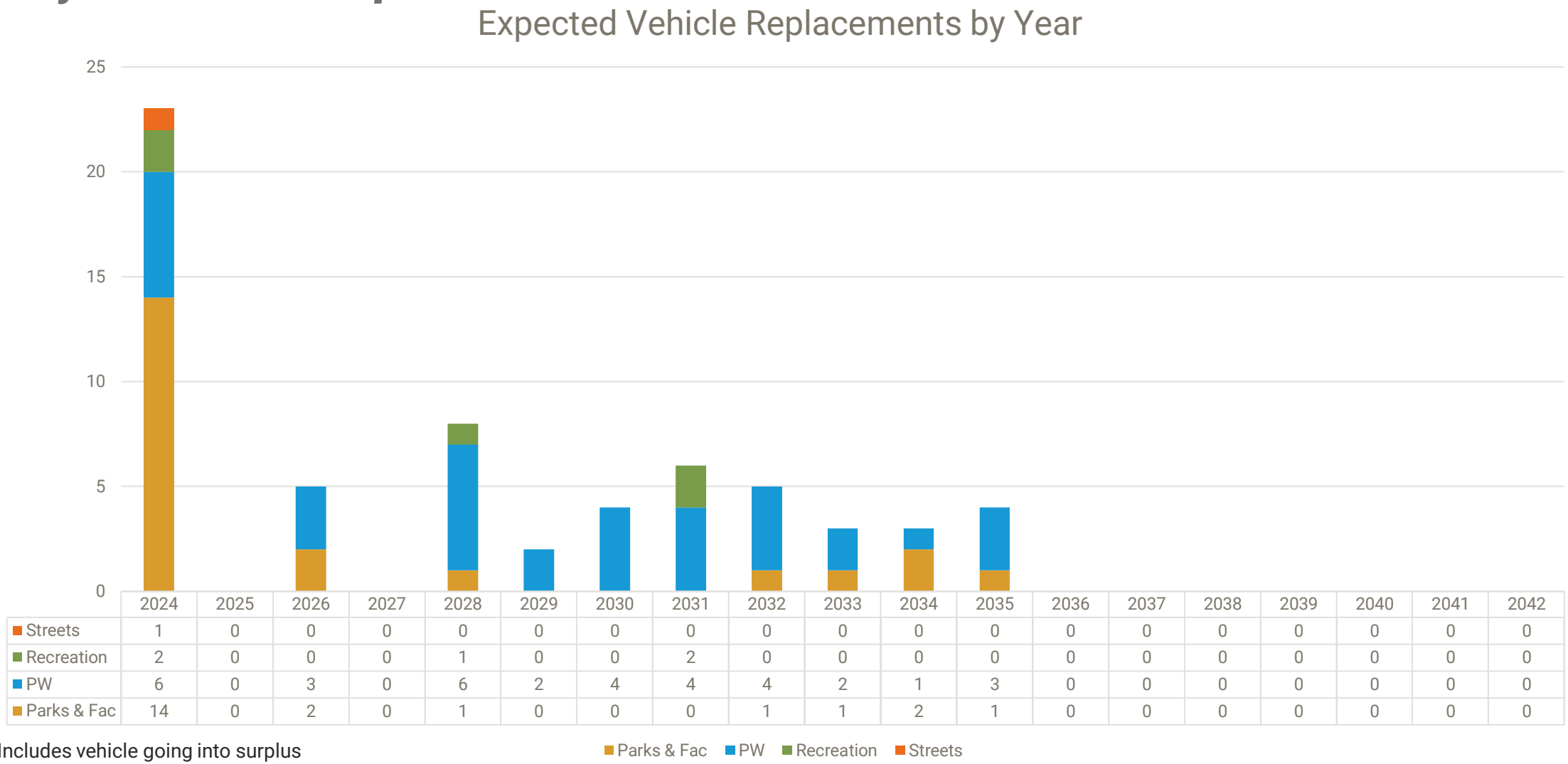
Criteria	Replacement Schedule	Notes
12 years or *80k miles*		**52/63** replacements due to vehicle age **11/63** replacements due to vehicle mileage **23/63** replacements before/in 2024
12 years or *90k miles*		**57/63** replacements due to vehicle age **6/63** replacements due to vehicle mileage **20/63** replacements before/in 2024

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Fleet Replacement Analysis

12-yr/80k miles Replacement Schedule



	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042
Streets	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Recreation	2	0	0	0	1	0	0	2	0	0	0	0	0	0	0	0	0	0	0
PW	6	0	3	0	6	2	4	4	4	2	1	3	0	0	0	0	0	0	0
Parks & Fac	14	0	2	0	1	0	0	0	1	1	2	1	0	0	0	0	0	0	0

*Includes vehicle going into surplus

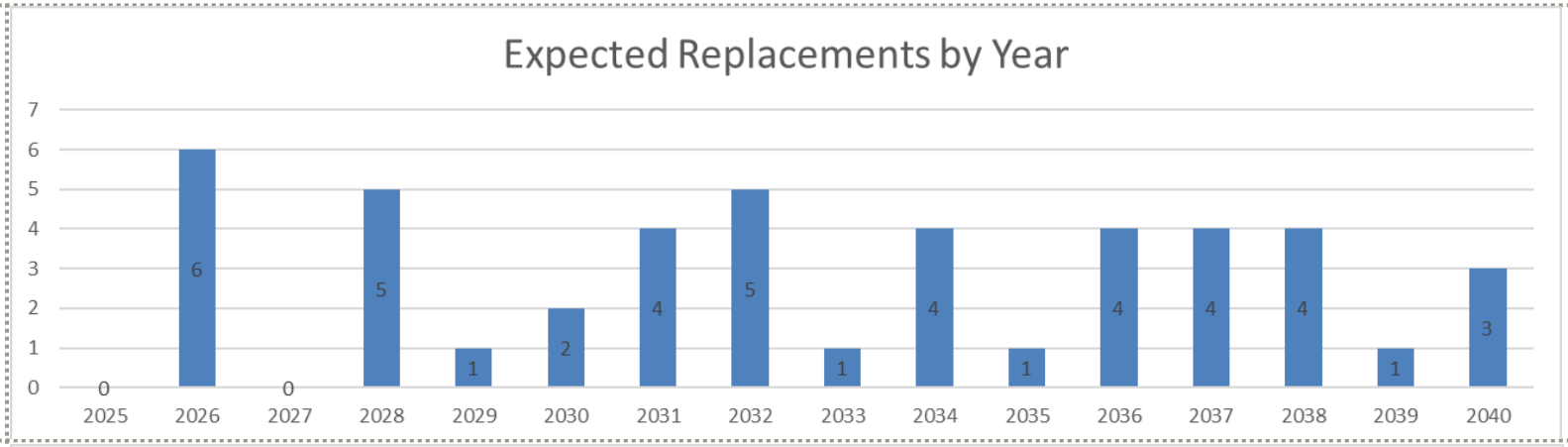
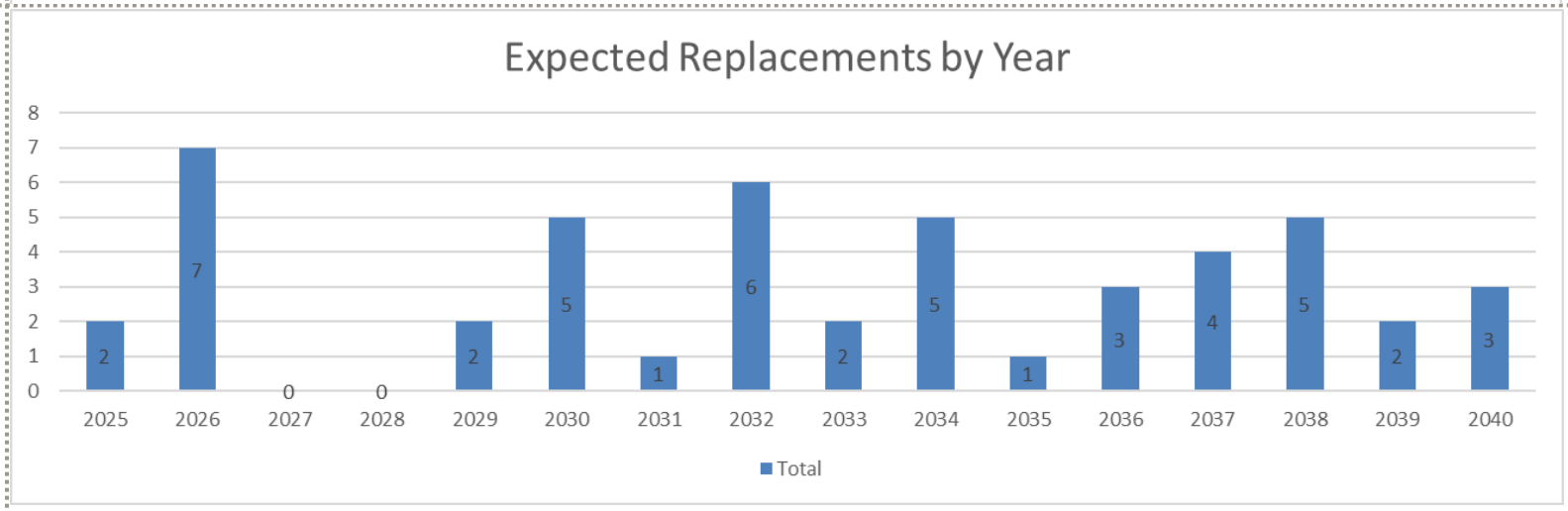
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Fleet Replacement Analysis

18-yr Replacement Schedule

*Excludes replacement schedule before 2024

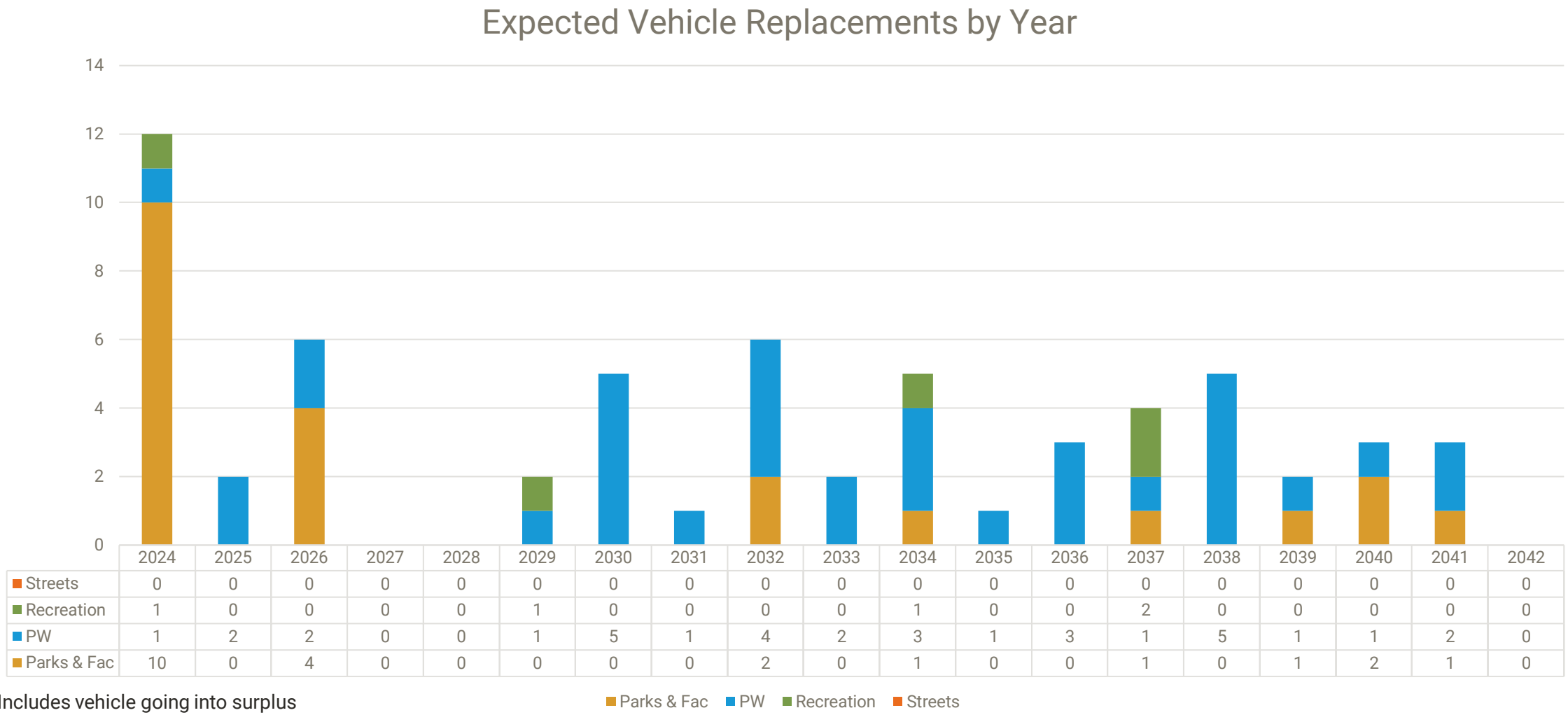
Criteria	Replacement Schedule	Notes
18 years or *80k miles*		**38/63** replacements due to vehicle age **25/63** replacements due to vehicle mileage **12/63** replacements before/in 2024
18 years or *90k miles*		**40/63** replacements due to vehicle age **23/63** replacements due to vehicle mileage **12/63** replacements before/in 2024

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Fleet Replacement Analysis

18-yr/90k miles Replacement Schedule



	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042
Streets	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Recreation	1	0	0	0	0	1	0	0	0	0	1	0	0	2	0	0	0	0	0
PW	1	2	2	0	0	1	5	1	4	2	3	1	3	1	5	1	1	2	0
Parks & Fac	10	0	4	0	0	0	0	0	2	0	1	0	0	1	0	1	2	1	0

*Includes vehicle going into surplus

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Fleet Replacement Analysis

Replacement Schedule

Pre-2024 Replacement Vehicles Breakdown

12-yr Schedule

- **18/23** replacement were for vehicles with model year prior to 2010
- **3/23** replacements was delayed to 2025/2026 when extending the standard mileage from 80k -> 90k:

Vehicle ID	Vehicle Model	Vehicle Type	Model Year	Odometer	Annual VMT
93	F-250 Reg Cab	Pickup Truck	2014	89,406	10,000
94	F-250 4x2	Pickup Truck	2014	80,135	8,000
99	F-250 4x2 Supercab	Pickup Truck	2016	85,645	12,000

18-yr Schedule

- **6/12** replacement were for vehicles with over 100k miles

Vehicle ID	Vehicle Model	Vehicle Type	Model Year	Department	Odometer
39	Silverado	Pickup Truck	2003	PW	132,412
212	F-350 Crew Cab w/ utility body	Utility Work Truck	2008	Parks & Fac	125,789
162	Escape 2X	Passenger Vehicle	2008	Parks & Fac	112,311
203	F-250 4 x 2 w/Utility body (Going to Surplus)	Utility Work Truck	2003	Parks & Fac	109,419
202	F-250 4 x 2 w/Utility body	Utility Work Truck	2003	Parks & Fac	105,570
304	Sierra PU (Going to Surplus)	Pickup Truck	2005	Facilities	102,589
303	Econoline Wagon	Van	1999	Recreation	93,964
200	F-250 w/ Utility body	Utility Work Truck	2003	Parks & Fac	84,167

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Fleet Transition Analysis

Replacement Schedule – Key Takeaways

Criteria	Takeaways

Vehicle Age	• Most of vehicles are replaced due to vehicle age in both 12/18-year schedules
	  • 12-yr: 57 timed-out replacements
	  • 18-yr: 40 timed-out replacements
	• 18 vehicles with model year from 2008 and older (1-1999, 5-2003, and 4 from 2005/2006) could be good candidates for replacement and take advantage of the purchase requirement from 2024-2026.

Vehicle Mileage	• At least 6 vehicles at over 100k in mileage and 5 more over 80k miles; • Mileage could be a factor to be considered for replacement schedule, but it's not the critical factor contributing to vehicle replacement; • Higher mileage vehicles could post stronger economics due to fuel savings from more miles traveled;

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Town of Windsor Fleet Inventory & ACF Regulatory Overview

63 vehicles

ACF Regulated

43 vehicles

Vehicle Type	Vehicle Count
Light-Duty Pickup Truck	20
Medium-Duty Utility Truck	12
Medium-Duty Work Truck	4
Van – Passenger	3
Vacuum Truck	1
Medium-Duty Dump Truck	2
Medium-Duty Bucket Truck	1
TOTAL	**43**

Purchase Exemption

Vehicle Type	Vehicle Count
Vacuum Truck	1
TOTAL	**1**

ACF Exempted

21 vehicles

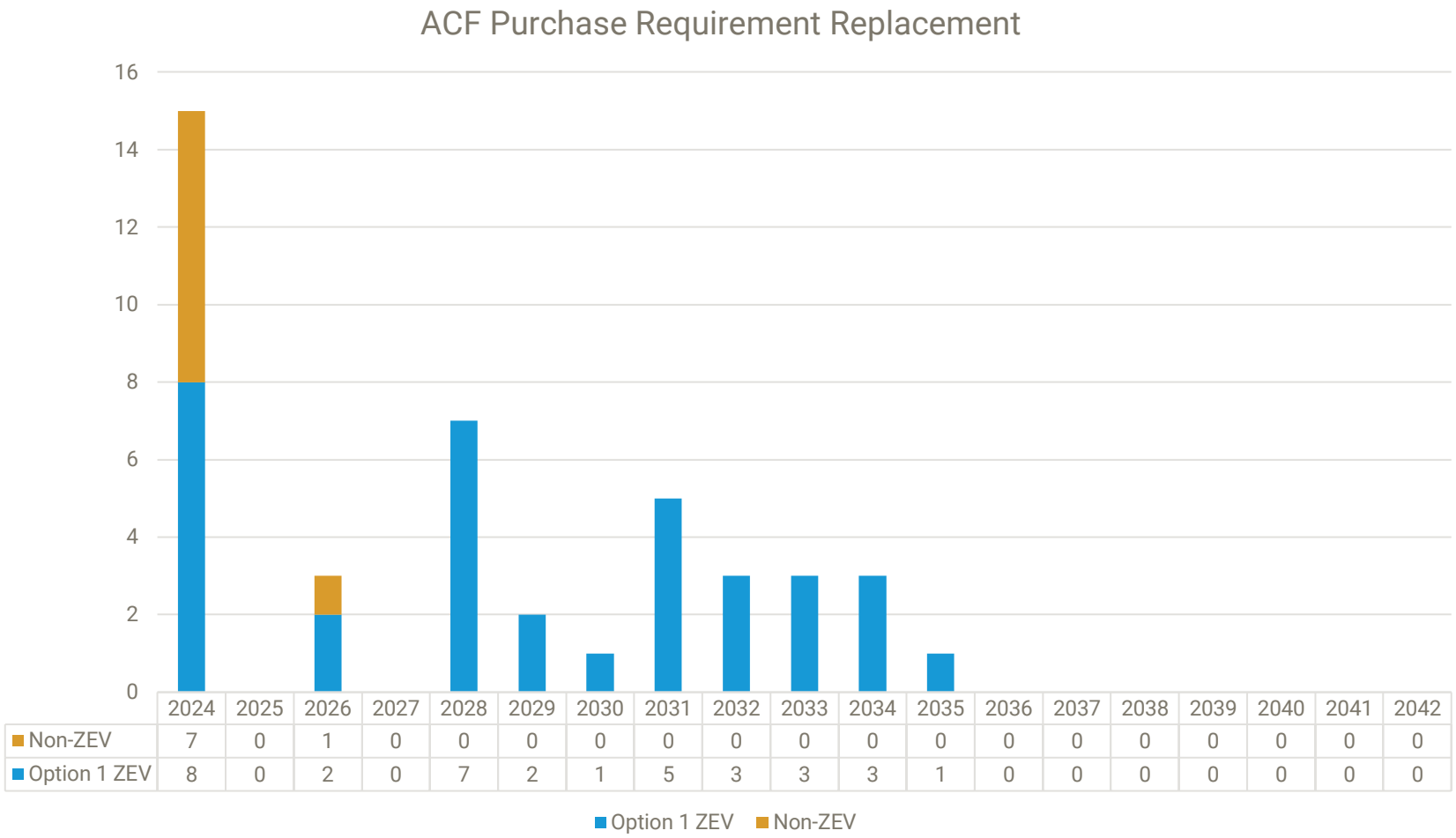
Vehicle Type	Vehicle Count	Exemption
Light-duty Passenger Vehicles	13	Vehicles under 8,500 GVWR are exempt from ACF
Light-duty Pickup Trucks	8	Advanced Clean Cars; only ZEV options will be available for purchase starting 2035
TOTAL	**21**	

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ACF Compliance Analysis

Default Purchase Requirement Replacement Schedule



	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042
Non-ZEV	7	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Option 1 ZEV	8	0	2	0	7	2	1	5	3	3	3	1	0	0	0	0	0	0	0

Vehicle Type	Vehicle Description	Replacement Age	Replacement Miles
1	Pickup Truck	12	80,000
2	Utility Work Truck	12	80,000
3	Work Truck	12	80,000
4	Van	12	80,000
5	Vacuum Truck	12	80,000
6	Dump Work Truck	12	80,000
7	Bucket Work Truck	12	80,000

- 15 vehicles to be replaced prior or in 2024:

Vehicle ID	Vehicle Model	Model Year	Odometer
303	Econoline Wagon (8 pssngr)	1999	93,964
39	Silverado	2003	132,412
203	F-250 4 x 2 w/Utility body (Going to Surplus)	2003	109,419
202	F-250 4 x 2 w/Utility body	2003	105,570
200	F-250 w/ Utility body	2003	84,167
204	F-350 Flat Bed/hoist	2003	66,794
207	F-450 Dump Truck	2006	39,539
212	F-350 Crew Cab w/ utility body	2008	125,789
211	F-250 4x2 w/utility body	2008	70,340
210	F-250 w/ Utility body	2008	51,489
309	E-350 Econoline Van (15 pssngr)	2011	38,831
93	F-250 Reg Cab	2014	89,406
94	F-250 4x2	2014	80,135
99	F-250 4x2 Supercab	2016	85,645
90	F-250 Reg Cab	2012	44,314

*Estimation didn't exclude Vacuum Truck or vehicle going into surplus for its purchase exemption.

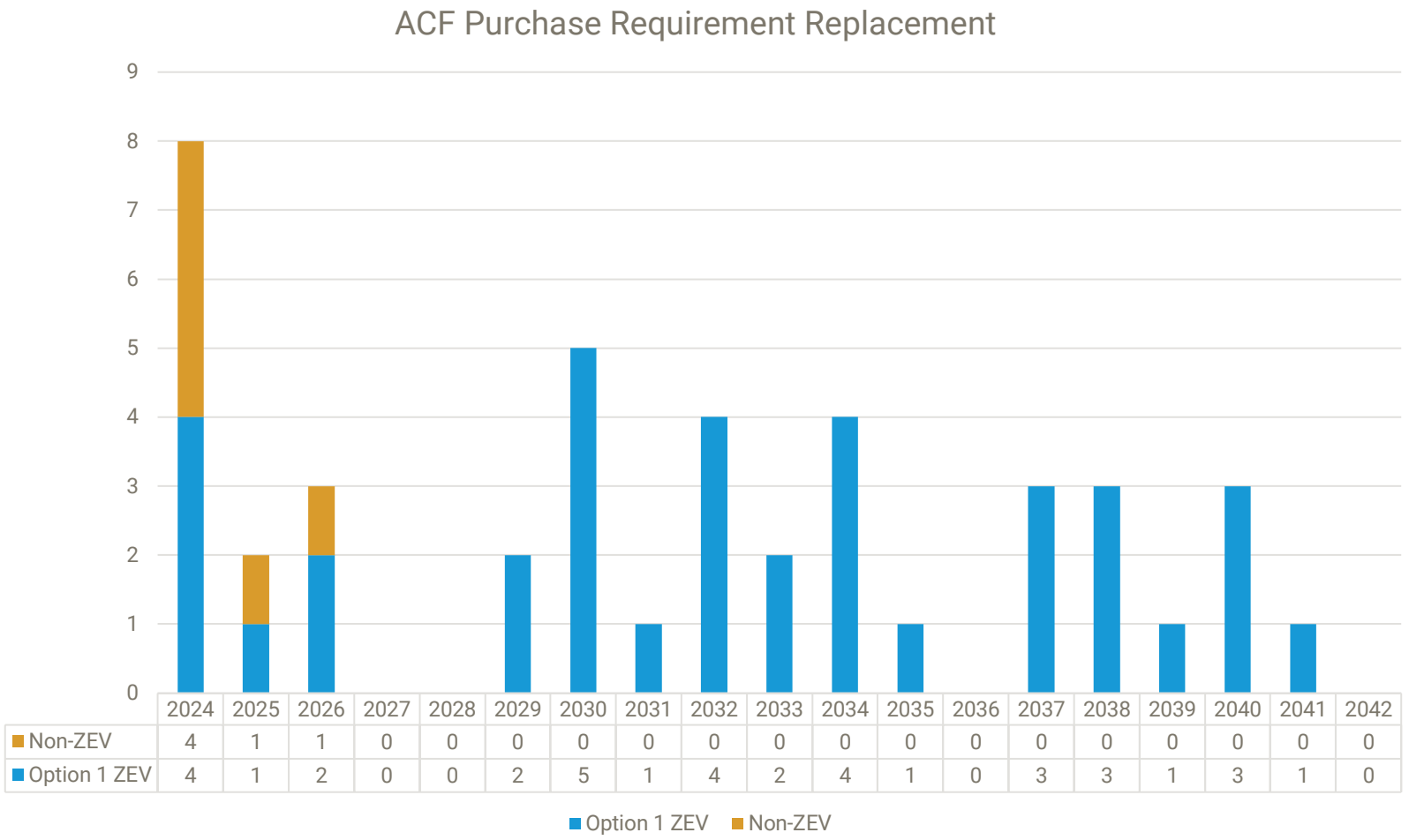
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ACF Compliance Analysis

Default Purchase Requirement Replacement Schedule

18 years or *90k miles*



	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042
Non-ZEV	4	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Option 1 ZEV	4	1	2	0	0	2	5	1	4	2	4	1	0	3	3	1	3	1	0

Vehicle Type	Vehicle Description	Replacement Age	Replacement Miles
1	Pickup Truck	18	90,000
2	Utility Work Truck	18	90,000
3	Work Truck	18	90,000
4	Van	18	90,000
5	Vacuum Truck	18	90,000
6	Dump Work Truck	18	90,000
7	Bucket Work Truck	18	90,000

- 8 vehicles to be replaced prior or in 2024:

Vehicle ID	Vehicle Model	Model Year	Odometer
303	Econoline Wagon (8 pssngr)	1999	93,964
39	Silverado	2003	132,412
203	F-250 4 x 2 w/Utility body (Going to Surplus)	2003	109,419
202	F-250 4 x 2 w/Utility body	2003	105,570
200	F-250 w/ Utility body	2003	84,167
204	F-350 Flat Bed/hoist	2003	66,794
207	F-450 Dump Truck	2006	39,539
212	F-350 Crew Cab w/ utility body	2008	125,789

*Estimation didn't exclude Vacuum Truck or vehicle going into surplus for its purchase exemption.

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Fleet Transition Analysis

ZEV Transition – Option 2: ZEV Milestone

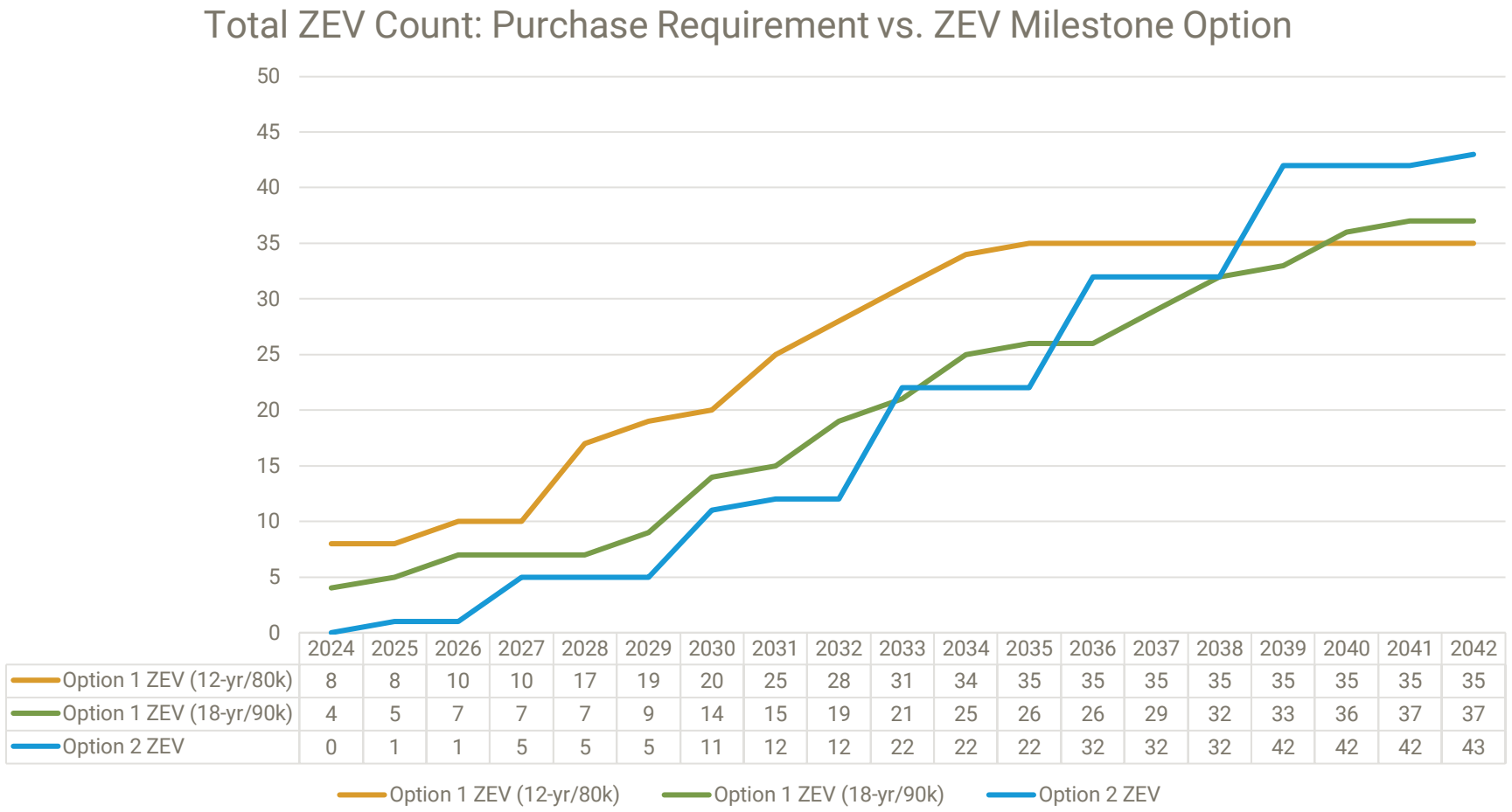
Vehicle Type #	1	2	3	4	5	6	7	8
Vehicle Description	**Light-Duty Pickup Truck**	**Medium-Duty Utility Work Truck**	**Medium-Duty Work Truck**	**Van**	**Vacuum Truck**	**Medium-Duty Dump Work Truck**	**Medium-Duty Bucket Work Truck**	**Light-Duty Passenger Vehicle**
ICE Representative Vehicle	*F-150 and F-250*	*F-250 Utility Body/Bed*	*F-350 to F-650*	*Ford Transit (15pssngr)*	*Vactor*	*F-550 flat bed/hoist*	*F-550 bucket truck*	*Ford Escape Hybrid*
Vehicle Class	1 - 3	2	5 - 6	2 - 3	7	3 - 4	5	1
Vehicle Count	27	12	4	3	1	2	1	13
Weight	6,001 - 11,000	8,501 - 10,000	16,001 - 26,000	8,501 - 14,000	> 26,001	10,001 - 16,000	16,001 - 19,500	< 6,000
Alternative Fuel	Battery Electric	Battery Electric	Battery Electric	Battery Electric	N/A	Battery Electric	Battery Electric	Battery Electric
Representative ZEV Alternative	Ford F-150 Lightning	Phoenix E450/Optimal E1	Rizon e18M	Ford E-Transit	N/A	Cenntro Logistar 400	Terex HR55 All Electric Bucket Truck	Chevy Bolt EUV
ACF ZEV Milestone Group	2	2	2	1	3	3	3	N/A
ACF Vehicle Count	20	12	4	3	1	2	1	N/A

ZEV Milestone Group	Vehicle Count
Group 1: Box trucks, vans, buses with two axles, yard tractors, light-duty package delivery vehicles	3
Group 2: Work trucks, day cab tractors, pickup trucks, buses with three axles	36
Group 3: Sleeper cab tractors and specialty vehicles	4

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ACF Compliance Analysis

Purchase Requirement vs. ZEV Milestone Option



	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042
Option 1 ZEV (12-yr/80k)	8	8	10	10	17	19	20	25	28	31	34	35	35	35	35	35	35	35	35
Option 1 ZEV (18-yr/90k)	4	5	7	7	7	9	14	15	19	21	25	26	26	29	32	33	36	37	37
Option 2 ZEV	0	1	1	5	5	5	11	12	12	22	22	22	32	32	32	42	42	42	43

Key Takeaways:

- Option 2 appears to be more appealing thanks to majority of ACF regulated vehicles are in Group 2 with a less aggressive schedule.
- But Option 2 could require fleet vehicles to retire before they would “typically’ be replaced with ZEV in Option 1.
- Option 1 offers the flexibility for the City fleet to decide when to replace a fleet vehicle.

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Charging Need Assessment

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Needs Assessment and Gap Analysis

2.1. Define Energy Usage and Demand by Vehicle Category (Updated Recommendation)

Vehicle Type #		1	2	3	4	5	6	7	8
Vehicle Description		**Light-Duty Pickup Truck**	**Medium-Duty Utility Work Truck**	**Medium-Duty Work Truck**	**Van**	**Vacuum Truck**	**Medium-Duty Dump Work Truck**	**Medium-Duty Bucket Work Truck**	**Light-Duty Passenger Vehicle**
ICE Representative Vehicle		*F-150 and F-250*	*F-250 Utility Body/Bed*	*F-350 to F-650*	*Ford Transit (15pssngr)*	*Vactor*	*F-550 flat bed/hoist*	*F-550 bucket truck*	*Ford Escape Hybrid*
Vehicle Count		27	12	4	3	1	2	1	13
Vehicle Class		1 - 3	2	5 - 6	2 - 3	7	3 - 4	5	1
Weight		6,001 - 11,000	8,501 - 10,000	16,001 - 26,000	8,501 - 14,000	> 26,001	10,001 - 16,000	16,001 - 19,500	< 6,000
Duty Cycle	**Daily Miles Traveled**	28	26	8	14	2	12	41	14
	Daily engine hours					2.8			
	Operating Times	7:00am - 6:00pm M-Th	7:00am - 6:00pm M-Th	7:00am - 6:00pm M-Th	7:00am - 6:00pm M-Th	7:00am - 6:00pm M-Th	7:00am - 6:00pm M-Th	7:00am - 6:00pm M-Th	7:00am - 6:00pm M-Th
	Dwell Times	6:00pm - 7:00am M-Th	6:00pm - 7:00am M-Th	6:00pm - 7:00am M-Th	6:00pm - 7:00am M-Th	6:00pm - 7:00am M-Th	6:00pm - 7:00am M-Th	6:00pm - 7:00am M-Th	6:00pm - 7:00am M-Th
Alternative Fuel		Battery Electric	Battery Electric	Battery Electric	Battery Electric	Battery Electric	Battery Electric	Battery Electric	Battery Electric
Representative ZEV Alternative		Ford F-150 Lightning (If applicable for F-250 pickups requirements)	**Chevy Silverado EV WT**	Rizon e18M (available EV chassis)	Ford E-Transit	NA	Cenntro Logistar 400	Terex EV Aeriel	Chevy Bolt EUV
Battery Size (kWh)		98	200	82	68	162	80.6	210	65
ZEV Efficiency (kWh/Mile)		0.50	0.44	0.74	0.79	0	0.65	1.40	0.29

Color	Definition - ZEV Readiness
	High
	Medium
	Low

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Conduct Needs Assessment and Gap Analysis

2.1. Define Energy Usage and Demand by Vehicle Category - Updated

													*Time to charge from 0-100%					Count of chargers			
Vehicle Type	**Vehicle Type Description**	**EV Make**	**EV Model**	**Final EV Count**	**Battery Size (kWh)**	**Daily Miles**	**Days in Operation**	**Annual VMT**	**ZEV kWh/Mile**	**Annual kWh Demand**	**Daily kWh Demand**	**Dwell Duration (hrs)**	**AC Level 2 7.2kw (hrs)**	**AC Level 2 19.2kw (hrs)**	**DC charger 60kw (hrs)**	**DC charger 120kw (hrs)**	**DC charger 40kw (hrs)**	**Level 2 chargers (7.2kw)**	**Level 2 chargers (19.2kw)**	**DC chargers (60kw)**	**DC dual port Chargers - (40kw)**
1	**Light-Duty Pickup Truck**	Ford	Ford F-150 Lightning	27	98	28.09	208	5,842	0.50	2,895	14	13	15.1	5.7	2.3	1.8	2.7	0	27	0	14
2	**Medium-Duty Utility Work Truck**	Chevrolet	Silverado EV 4WT	12	113	25.52	208	5,308	0.98	5,176	25	13	17.4	6.5	2.6	2.1	3.1	0	12	0	6
3	**Medium-Duty Work Truck**	Rizon	Rizon e18M	4	82	8.29	208	1,725	0.74	1,273	6	13	12.7	4.7	1.9	1.5	2.3	0	4	0	2
4	**Van**	Ford	Ford E-Transit 2023	3	68	14.10	208	2,933	0.79	2,317	11	13	10.5	3.9	1.6	1.3	1.9	0	3	0	2
5	Vacuum Truck **	Geely China	N/A	1	162	2.40	208	500	0.00	-	-	13	25.0	9.4	3.8	3.0	4.5	0	0	1	0
6	**Medium-Duty Dump Work Truck**	Cenntro Automotive	Cenntro Logistar 400	2	80.6	12.02	208	2,500	0.65	1,625	8	13	12.4	4.7	1.9	1.5	2.2	0	2	0	1
7	**Medium-Duty Bucket Work Truck**	Terex	Terex EV Aeriel	1	210	40.87	208	8,500	1.40	11,900	57	13	32.4	12.2	4.9	3.9	5.8	0	0	1	0
8	**Light-Duty Passenger Vehicle**	Chevrolet	Chevy Bolt EUV	13	65	13.94	208	2,900	0.29	850	4	13	10.0	6.3	1.5	1.5	1.8	13	0	0	0
																Option.1	**Total 19.2kW**	13.0	48	2	0
																Option.2	**total 40kW**	13.0	0	2	**24**

*Charging time from 0-100% considers of the vehicle onboard charger limitations and the DC charging profiles of similar EVs.
**Vacuum trucks doesn't exist as a ZEV in the class 7 category yet, but it's safe to assume a higher power DC charger will be required;

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Conduct Needs Assessment and Gap Analysis

2.2. Identify Projected Number and Location Profile of ZEV Stations – Charging Infrastructure Options and the Electrical Equipment Requirements

Option 1

Site Name	Site Address	Site #	# 7.2kW Charger	# 19.2kW Charger	# 60kW Charger	kw total	A@208V	A@480V
Corp Yard WWTP	8400 Windsor Rd Bldg. 100, Windsor, CA 95492	A	13	48	2	1135	3942	1708
Civic Center	9291 Old Redwood Hwy, Windsor, CA 95492	B	2	TBD	TBD	-	-	-

Option 2

Site Name	Site Address	Site #	**# 7.2kW Charger**	# 40kW Charger	# 60kW Charger	kw total	A@208V	A@480V
Corp Yard WWTP	8400 Windsor Rd Bldg. 100, Windsor, CA 95492	A	13	24	2	1174	4075	1765
Civic Center	9291 Old Redwood Hwy, Windsor, CA 95492	B	2	TBD	TBD	-	-	-

Option 3

Site Name	Site Address	Site #	**# 7.2kW Charger**	# 40kW Charger	# 60kW Charger	kw total	A@208V	A@480V
Corp Yard WWTP	8400 Windsor Rd Bldg. 100, Windsor, CA 95492	A	61	-	2	559	1942	841
Civic Center	9291 Old Redwood Hwy, Windsor, CA 95492	B	2	TBD	TBD	-	-	-

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Conduct Needs Assessment and Gap Analysis

2.2. Identify Projected Number and Location Profile of ZEV Stations – Charging Infrastructure Options and the Electrical Equipment Requirements

Option .1

Task 2. 2 needs assessment										
Site Address:	8400 Windsor Rd Bldg. 100, Windsor, CA 95492			**Site:**	A	**Existing Utility Transformer kVA TBD?**				
Site Name:	Corporate Yard			**Amps**		**Existing Main: 480V 3Θ, 1600 A, 65kAIC**				
Quantity 7.2kW Charger	**Quantity 19.2 kW Charger**	**Quantity 60 kw Charger**	**kw total**	**@208V**	**@480V**	**panel name with capacity:**	HA	**Amps**	**Volts**	**KAic**
13	48	2	1135	3942	1708	**panel location with capacity:**	main elec room	225	480V, 3Θ	65

New Service	2000A, 480V, 3Θ	**L2 C&W / Breaker**	13 X (40A/2P, 3- #8 ,#10G in 1" PVC)	**LV Transformer**	1- 112.5 kVA- 480V/ 208, 3Θ
New Utility Transformer	1000 - 1500kVA	**L3 C&W / Breaker**	24 X (60A/3P, 3#4, #10G in 1.25" PVC)	**LV Transformer**	3- 300kVA 480V/ 208, 3Θ
New Panel Board	1-400A, 208V, 3Θ 3- 800A 208V, 3Θ	**L3 C&W / Breaker**	2 X (100A/3P, 4-#1, #8G in 1.5" PVC)	**LV TF C&W / Breaker**	1 X (175A/3P, 4- 2/0, #6G in 2" PCV)
Panel BD Feeder C&W	2 X (4-3/0,#2G in 2" PVC)	**Panel BD Feeder C&W**	3 x (3 x(4-300, 1/0G in 3" PCV))	**LV TF C&W / Breaker**	3 X (1 - 450A/3P, 2 X (3-4/0,2G in 2" PCV))

Option.2

Task 2. 2 needs assessment										
Site Address:	8400 Windsor Rd Bldg. 100, Windsor, CA 95492			**Site:**	A	**Existing Utility Transformer kVA TBD?**				
Site Name:	Corporate Yard			**Amps**		**Existing Main: 480V 3Θ, 1600 A, 65kAIC**				
Quantity 7.2kW Charger	**Quantity 40kW Charger**	**Quantity 60 kw Charger**	**kw total**	**@208V**	**@480V**	**panel name with capacity:**	HA	**Amps**	**Volts**	**KAic**
13	24	2	1174	4075	1765	**panel location with capacity:**	main elec room	225	480V, 3Θ	65

New Service	2000A, 480V, 3Θ	**L2 C&W / Breaker**	13 X (40A/2P, 3- #8 ,#10G in 1" PVC)	**LV Transformer**	1- 112.5 kVA- 480V/ 208, 3Θ
New Utility Transformer	1000 - 1500kVA	**L3 C&W / Breaker**	24 X (60A/3P, 3#4, #10G in 1.25" PVC)	**LV Transformer**	
New Panel Board	1-400A, 208V, 3Θ	**L3 C&W / Breaker**	2 X (100A/3P, 4-#1, #8G in 1.5" PVC)	**LV TF C&W / Breaker**	1 X (175A/3P, 4- 2/0, #6G in 2" PCV)
Panel BD Feeder C&W	2 X (4-3/0,#2G in 2" PVC)			**LV TF C&W / Breaker**	

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Conduct Needs Assessment and Gap Analysis

2.2. Identify Projected Number and Location Profile of ZEV Stations – Charging Infrastructure Options and Trade-offs

Option 1 vs. Option 2 (19.2kW AC L2 vs. 40kW dual-port DC charger)

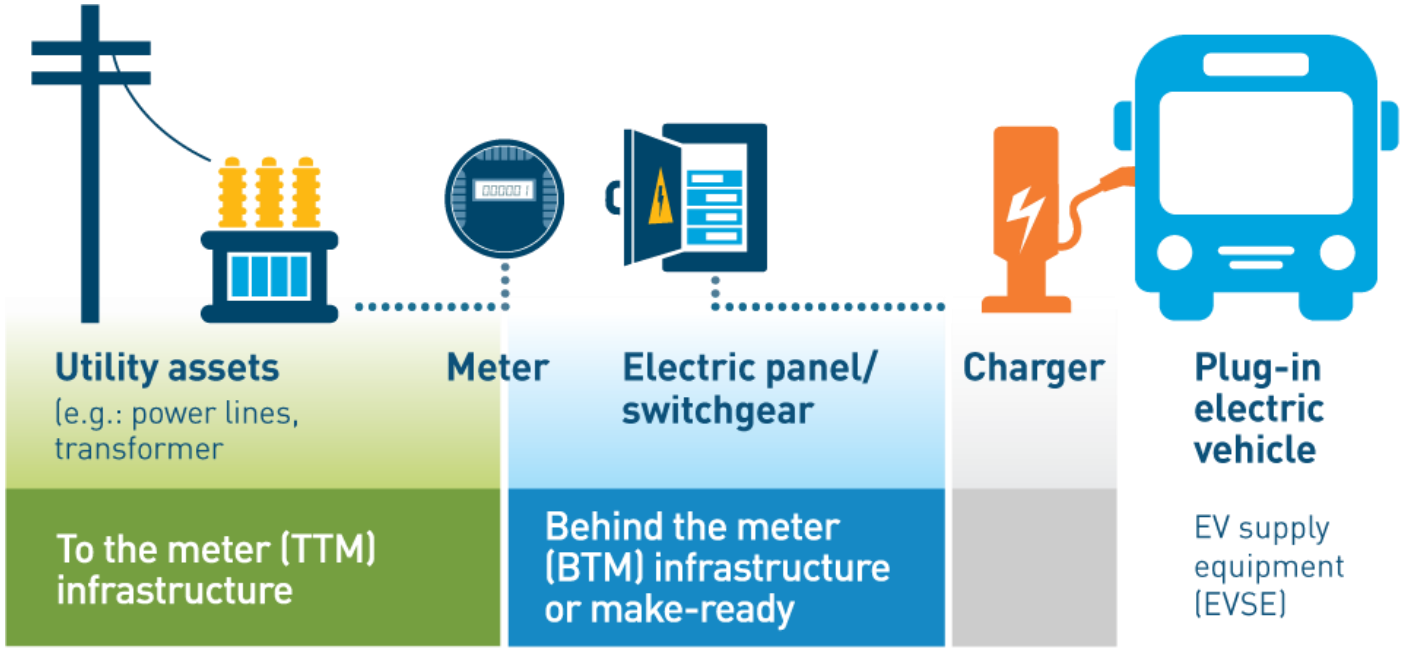
- Pros Option 2 40kW dual-port charger option:
  - Removes 3 - 300kVA transformers and 3 - 800A panels
  - Reduces wire size for less amperage at 480V
  - Less installation labor and O&M costs from reduced equipment
  - Higher power for 40kW DC charger when only one single port is plugged in, providing flexibility
- Cons:
  - EVSE equipment will be of higher cost

Both options 1 & 2 will require new electrical service, which could be subsidized by PG&E EV Fleet Program

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Conduct Needs Assessment and Gap Analysis

PG&E EV Fleet Program may be able to support Windsor project



The EV Fleet program supports all off-road, medium-duty and heavy-duty vehicle applications, such as:

- Agriculture and food processing
- Distribution and delivery
- Municipal fleets
- School buses
- Transit, coach and shuttle buses
- Work trucks and utility vehicles

EV Fleet Program requires providing EV usage data for 5 years and operation of charging equipment for 10 years.

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Conduct Needs Assessment and Gap Analysis

2.2. Identify Projected Number and Location Profile of ZEV Stations – Charging Infrastructure Options and the Electrical Equipment Requirements

Option .3

Task 2. 2 needs assessment										
Site Address:	8400 Windsor Rd Bldg. 100, Windsor, CA 95492			**Site:**	A	.				
Site Name:	Corporate Yard			**Amps**		**Existing Main: 480V 3Θ, 1600 A, 65kAIC**				
Quantity 7.2kW Charger	**Quantity 19.2 kW Charger**	**Quantity 60 kw Charger**	**kw total**	**@208V**	**@480V**	**panel name with capacity:**	HA	**Amps**	**Volts**	**KAic**
61	0	2	559	1942	841	**panel location with capacity:**	main elec room	225	480V, 3Θ	65

New Service	-	**L2 C&W / Breaker**	61 X (40A/2P, 3- #8 ,#10G in 1" PVC)	**LV Transformer**	1- 112.5 kVA- 480V/ 208, 3Θ
New Utility Transformer	-	**L3 C&W / Breaker**		**LV Transformer**	1- 300kVA 480V/ 208, 3Θ
New Panel Board	1-400A, 208V, 3Θ 3- 800A 208V, 3Θ	**L3 C&W / Breaker**	2 X (100A/3P, 4-#1, #8G in 1.5" PVC)	**LV TF C&W / Breaker**	1 X (175A/3P, 4- 2/0, #6G in 2" PCV)
Panel BD Feeder C&W	2 X (4-3/0,#2G in 2" PVC)		3 x (3 x(4-300, 1/0G in 3" PCV))	**LV TF C&W / Breaker**	1 - 450A/3P, 2 X (3-4/0,2G in 2" PCV)

Option 3 – leveraging existing electrical service with all 7.2kW AC L2

- Pro:
  - Cost-saving from charging equipment
  - No utility cost or coordination needed
- Con:
  - Reduced operational flexibility since some medium-heavy duty EVs can take more than 24 hours to charge fully if the battery is fully depleted
  - Emergency resilience will be challenging

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Conduct Needs Assessment and Gap Analysis

2.2. Identify Projected Number and Location Profile of ZEV Stations – Recommended Charging Configuration

Option 2

Site Name	Site Address	Site #	# 7.2kW Charger	# 40kW Charger (Dual Port)	# 120kW Charger (Dual Port)	kw total	A@208V	A@480V
Corp Yard WWTP	8400 Windsor Rd Bldg. 100, Windsor, CA 95492	A	13	24	1	1174	4075	1765
Civic Center	9291 Old Redwood Hwy, Windsor, CA 95492	B	2	TBD	TBD	-	-	-

Task 2. 2 needs assessment										
Site Address:	8400 Windsor Rd Bldg. 100, Windsor, CA 95492			Site:	A	Existing Utility Transformer	kVA TBD?			
Site Name:	Corporate Yard			Amps		Existing Main:	480V 3Θ, 1600 A, 65kAIC			
Quantity 7.2kW Charger	Quantity 40kW Charger	Quantity 120 kw Charger	kw total	@208V	@480V	panel name with capacity:	HA	Amps	Volts	KAic
13	24	1	1174	4075	1765	panel location with capacity:	main elec room	225	480V, 3Θ	65

New Service	2000A, 480V, 3Θ	L2 C&W / Breaker	13 X (40A/2P, 3- #8 ,#10G in 1" PVC)	LV Transformer	1- 112.5 kVA- 480V/ 208, 3Θ
New Utility Transformer	1000 - 1500kVA	L3 C&W / Breaker	24 X (60A/3P, 3#4, #10G in 1.25" PVC)	LV Transformer	
New Panel Board	1-400A, 208V, 3Θ	L3 C&W / Breaker	1 X (200A/3P, 4/0, #4G in 2.5" PVC)	LV TF C&W / Breaker	1 X (175A/3P, 4- 2/0, #6G in 2" PCV)
Panel BD Feeder C&W	2 X (4-3/0,#2G in 2" PVC)			LV TF C&W / Breaker	

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Conduct Needs Assessment and Gap Analysis

2.2. Identify Projected Number and Location Profile of ZEV Stations – Recommended Charging Configuration

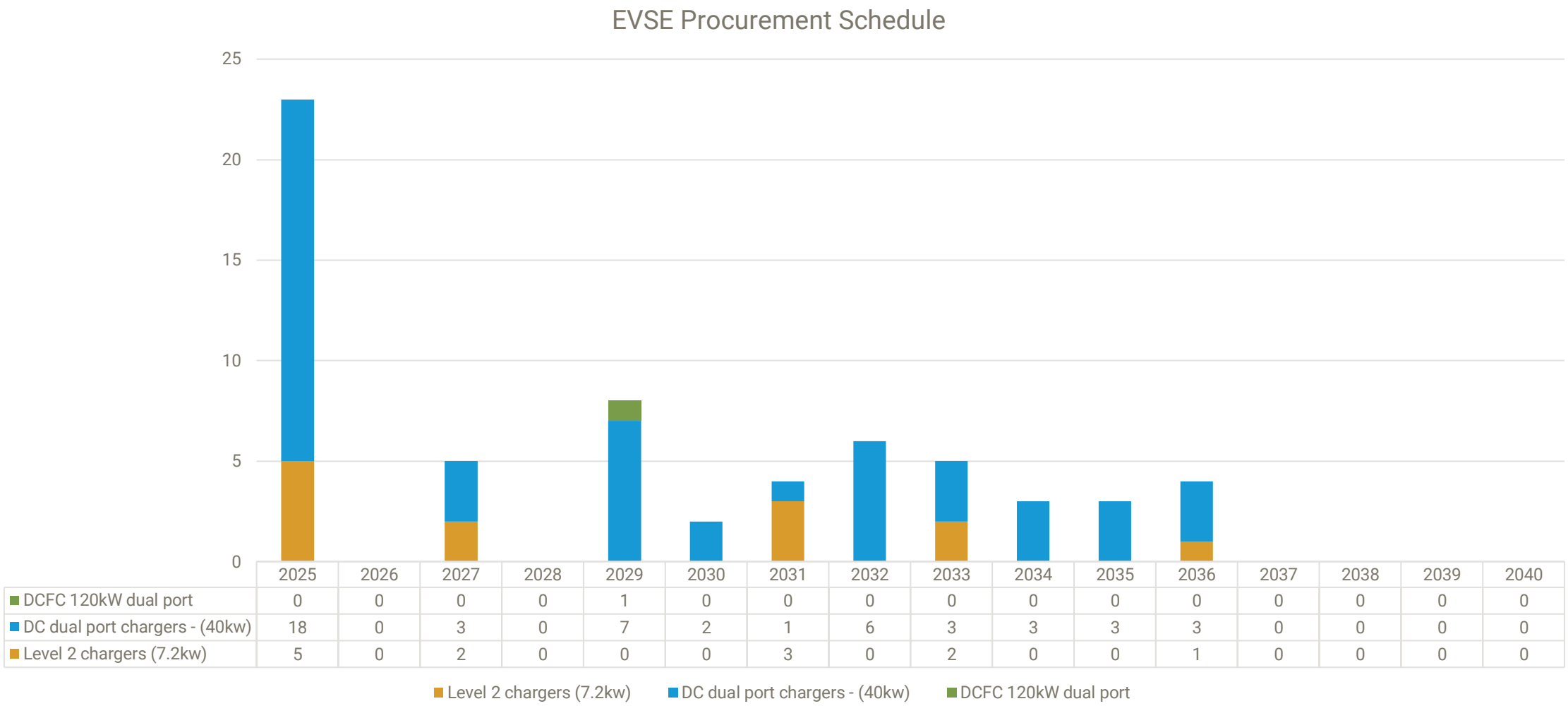


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Conduct Needs Assessment and Gap Analysis

2.2. Identify Projected Number and Location Profile of ZEV Stations – EVSE Procurement Schedule Based on BEV Replacement Schedule (12-yr/80k miles)



	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
DCFC 120kW dual port	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
DC dual port chargers - (40kw)	18	0	3	0	7	2	1	6	3	3	3	3	0	0	0	0
Level 2 chargers (7.2kw)	5	0	2	0	0	0	3	0	2	0	0	1	0	0	0	0

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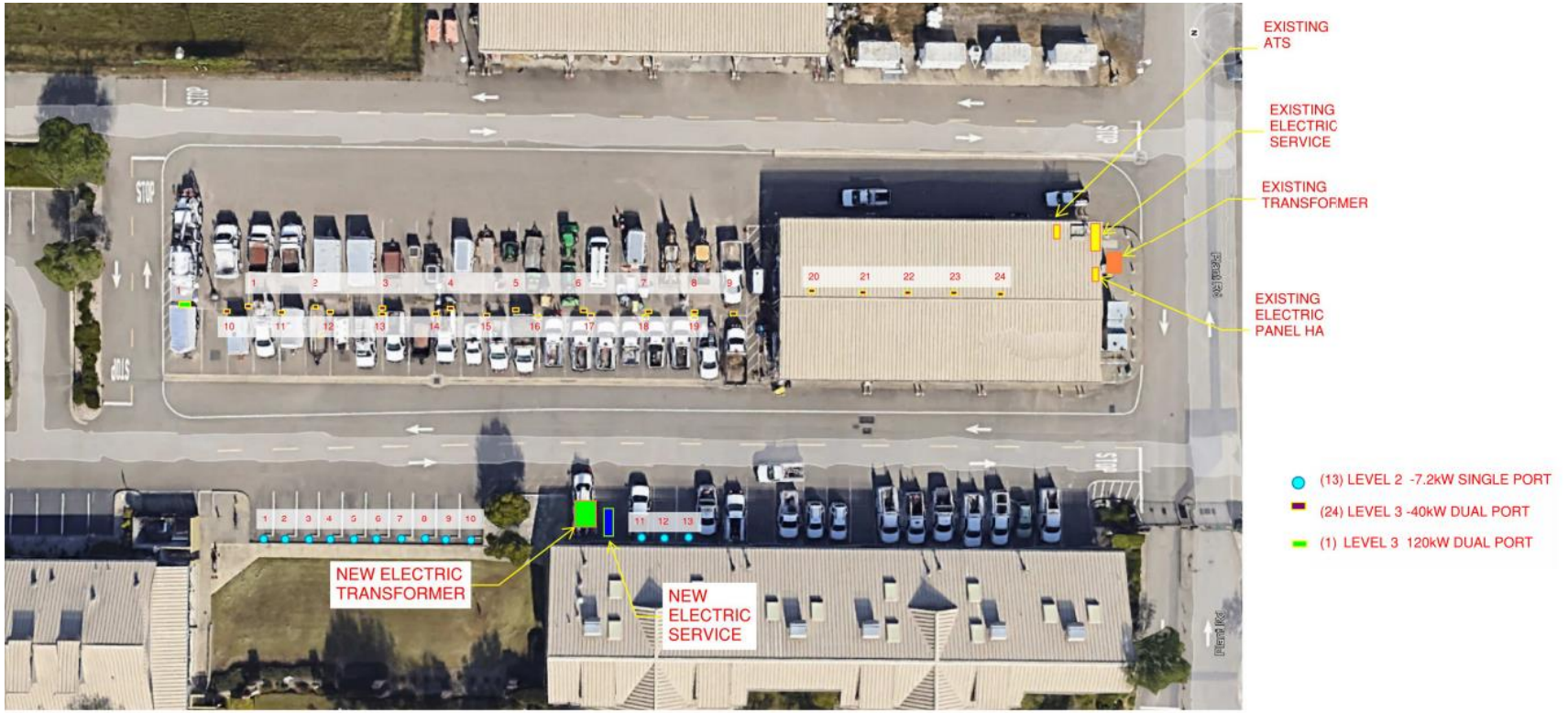
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Conduct Needs Assessment and Gap Analysis

Task 2.3 Infrastructure Costs Charging Configuration and Conceptual Layout

Task 2. 2 needs assessment										
Site Address:	8400 Windsor Rd Bldg. 100, Windsor, CA 95492			**Site:**	A	**Existing Utility Transformer**	**kVA TBD?**			
Site Name:	Corporate Yard			**Amps**		**Existing Main:**	**480V 3Θ, 1600 A, 65kAIC**			
Quantity 7.2kW Charger	**Quantity 40kW Charger**	**Quantity 120 kw Charger**	**kw total**	**@208V**	**@480V**	**panel name with capacity:**	HA	**Amps**	**Volts**	**KAic**
13	24	1	1174	4075	1765	**panel location with capacity:**	main elec room	225	480V, 3Θ	65

New Service	2000A, 480V, 3Θ	**L2 C&W / Breaker**	13 X (40A/2P, 3- #8 ,#10G in 1" PVC)	**LV Transformer**	1- 112.5 kVA- 480V/ 208, 3Θ
New Utility Transformer	1000 - 1500kVA	**L3 C&W / Breaker**	24 X (60A/3P, 3#4, #10G in 1.25" PVC)	**LV Transformer**	
New Panel Board	1-400A, 208V, 3Θ	**L3 C&W / Breaker**	1 X (200A/3P, 4/0, #4G in 2.5" PVC)	**LV TF C&W / Breaker**	1 X (175A/3P, 4- 2/0, #6G in 2" PCV)
Panel BD Feeder C&W	2 X (4-3/0,#2G in 2" PVC)			**LV TF C&W / Breaker**	



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Conduct Needs Assessment and Gap Analysis

2.3. Develop Estimated ZEV Infrastructure Costs – Assumptions and Exclusions

- **Inclusion**:
  - Project management & construction management efforts
  - Insurance, overheads, and contingencies
  - Budgetary local and state tax on electrical equipment & materials
  - Commissioning support
  - AC & DC feeders testing and documentation of results
  - Torquing feeder terminators to specification
- **Exclusion:**
  - Permitting fees, costs for equipment extended warranty, software, or additional cable management
  - Escalation on labor, equipment and material costs
  - On-site security, additional lighting, EV signage, and ADA requirements
  - New stormwater system
- **Assumptions:**
  - Standard, non-rocky soil condition
  - Primary and secondary utility scope are provided by the utility (utility-side infrastructure)

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Executive Summary

Close to 50% of the quoted costs could be delayed to a later date

Key Takeaways:

- Rough Order of Magnitude estimate with variance of +/- 50%
- 42% of the cost estimate for charging equipment could be postponed until delivery of the ZEVs
- 30% of the Electrical work is for wiring, which could be postponed with charging equipment
- Utility infrastructure costs are not included in this estimate
- Cost estimate can be refined to include connection of fast chargers to back-up generation

Town of Winsor EVCS EPC ROM Estimate	
Description	Total Amount
Pre-Construction	
Design and Engineering	$55,761
Switchboard Coordination	$4,060
Utility Coordination	$11,768
Permitting	$16,955
Land Survey	$20,510
Pre-Construction	$109,054
Description	Total Amount
Demolition	$31,355
Trenching and Backfill	$35,246
Asphalt Paving	$38,666
Site Improvements	$186,503
Concrete Work	$92,132
Electrical Work	$264,223
Electrical Equipment - Procurement & Installation	$225,238
Charging Equipment - Procurement & Installation	$769,730
Commissioning Support	$29,030
Additional Site & Electrical Work	$47,791
Construction	$1,719,914
Town of Winsor EVCS EPC ROM Estimate	$1,828,968

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Conduct Needs Assessment and Gap Analysis

2.3. Develop Estimated ZEV Infrastructure Costs

COST CATEGORY (FROM HIGHEST TO LOWEST COST)

CHARGING EQUIPMENT 1

13 – 7.2kW AC L2 Charger Single Port
24 – 40kW DC Charger Dual Port
1 – 120kW DC Charger Single Port

ELECTRICAL WORK 2

Conduit ~ 70%
Wiring ~ 30%

ELECTRICAL EQUIPMENT 3

2000A Switchboard
112.5 kVA Transformer
400A Distribution Panel
1500kVA Transformer (Utility provides)

SITE IMPROVEMENT 4

Striping & Ground Symbols
Concrete Wheel stops
Protection Bollards
Pipe Bollards Sleeves
Landscaping

DESIGN AND ENGINEERING 5

Site Walk
Electrical Engineering
Civil Engineering
Structural Engineering
Engineering techs/Graphics

ALL OTHER COSTS

Switchboard Coordination, Utility Coordination Permitting Land Survey

ALL OTHER COSTS

Demolition, Trenching and Backfill, Asphalt Paving, Concrete Work, Commissioning Support Additional Site & Electrical Work

TOTAL COST & SHARE BY COST CATEGORY

CHARGING EQUIPMENT	ELECTRICAL EQUIPMENT
$769k (42%)	$225k (12%)

ELECTRICAL WORK	SITE IMPROVEMENT
$264k (14%)	$186k (10%)

DESIGN AND ENGINEERING	ALL OTHER COSTS
$55k (3%)	$327k (18%)

PRE-CONSTRUCTION CONSTRUCTION

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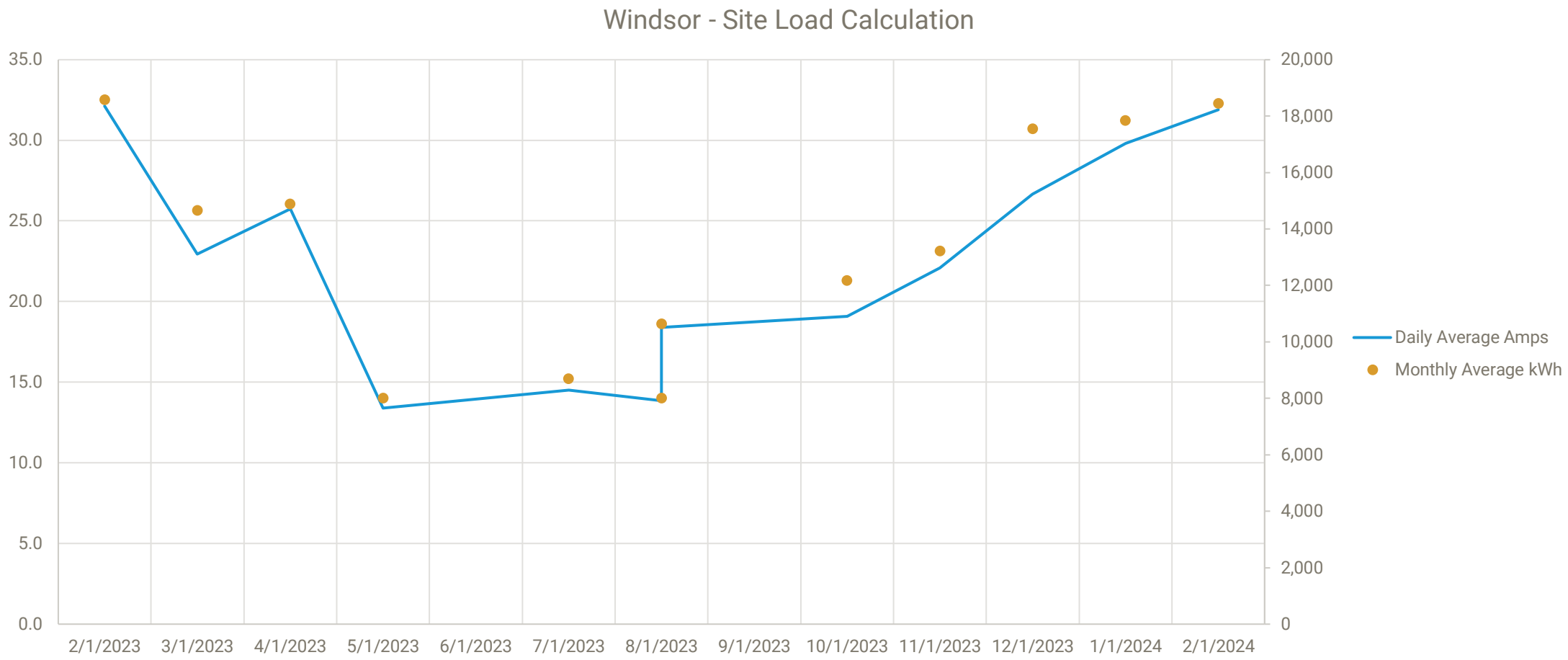
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Capacity Review & Modeling

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Capacity Review

Phase 2 1.1 Calculate Electrical Capacity to Support Electric Load Demand



There is ~ 1,200 Amps of available electrical capacity, but it will depend on the onsite panel space to accommodate electrical load for EV charging.

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Capacity Review

Phase 2 1.1 Calculate Electrical Capacity to Support Electric Load Demand

Take-aways on electrical capacity analysis:

1. There is existing electrical capacity available to accommodate for some additional loads
2. Depending on existing physical space, existing capacity could support “bridge” phase deployment of some infrastructure
3. Existing capacity will not be able to support the full-scale deployment
4. New dedicated electrical service for EV charging brings multiple benefits:
    1. Utility incentives for make-ready infrastructure
    2. Dedicated EV-charging rates for fleets
5. Project Timeline Expectations:
    1. 18-24 months for the entire project
    2. 12-18 months - Utility coordination including transformer lead-time
    3. 12 months – Equipment lead time (switchgear could take up to 52 weeks)
    4. 9 months – Engineering design, RFP, administrative processes

It will take 18-24 months for the entire project to be completed, and the EVSE could be procured and installed at the pace with the BEVs arrival

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GHG Intensity of the Fuels used by ICE Vehicles

Phase 2 1.2 Develop GHG Emission Reduction Projection

Fossil Fuel Emission Factor

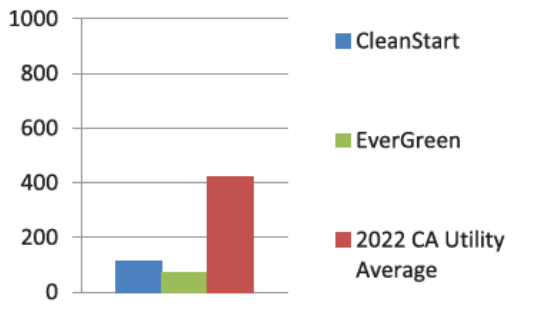
- Motor Gasoline: 8.78 kg CO2e/Gallon
- Renewable Diesel 10.21 kg CO2e/Gallon

Electricity Emission Factor

- Sonoma Clean Power – EverGreen: 8.82 g CO2e/MJ
- 3.6 MJ = 1 kWh
- *Town of Windsor has signed up for EverGreen schedule of Sonoma Clean Power which has a 100% eligible renewable portfolio*

2022 POWER CONTENT LABEL
Sonoma Clean Power Authority
sonomacleanpower.org

Greenhouse Gas Emissions Intensity (lbs CO_2e/MWh)		
CleanStart	EverGreen	2022 CA Utility Average
112	70	422



Energy Resources	CleanStart	EverGreen	2022 CA Power Mix
Eligible Renewable[1]	**50.3%**	**100.0%**	**35.8%**
Biomass & Biowaste	16.4%	0.0%	2.1%
Geothermal	17.0%	86.5%	4.7%
Eligible Hydroelectric	0.4%	0.0%	1.1%
Solar	9.0%	13.5%	17.0%
Wind	7.5%	0.0%	10.8%
Coal	**0.0%**	**0.0%**	**2.1%**
Large Hydroelectric	**40.0%**	**0.0%**	**9.2%**
Natural Gas	**0.0%**	**0.0%**	**36.4%**
Nuclear	**0.9%**	**0.0%**	**9.2%**
Other	**0.1%**	**0.0%**	**0.1%**
Unspecified Power[2]	**8.7%**	**0.0%**	**7.1%**
TOTAL	**100.0%**	**100.0%**	**100.0%**
Percentage of Retail Sales Covered by Retired Unbundled RECs[3]**:**	**0%**	**0%**	

[1]The eligible renewable percentage above does not reflect RPS compliance, which is determined using a different methodology.
[2]Unspecified power is electricity that has been purchased through open market transactions and is not traceable to a specific generation source.
[3]Renewable energy credits (RECs) are tracking instruments issued for renewable generation. Unbundled renewable energy credits (RECs) represent renewable generation that was not delivered to serve retail sales. Unbundled RECs are not reflected in the power mix or GHG emissions intensities above.

For specific information about this electricity portfolio, contact:	**Sonoma Clean Power Authority (855) 202-2139**
For general information about the Power Content Label, visit:	https://www.energy.ca.gov/programs-and-topics/programs/power-source-disclosure-program

Notes:
1. Source of fossil fuel emission: Default Emission Factors, The Climate Registry 2023, https://theclimateregistry.org/wp-content/uploads/2023/06/2023-Default-Emission-Factors-Final-1.pdf
2. Electricity Emission Factor is derived from the Sonoma Clean Power's EverGreen rate schedule

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Annual GHG Emission Savings Comparison

Phase 2 1.2 Develop GHG Emission Reduction Projection

Scenario: ACF Option 1

- ACF Purchase Requirement
- Passenger vehicle transition plan
- EVSE deployed with EV procurement

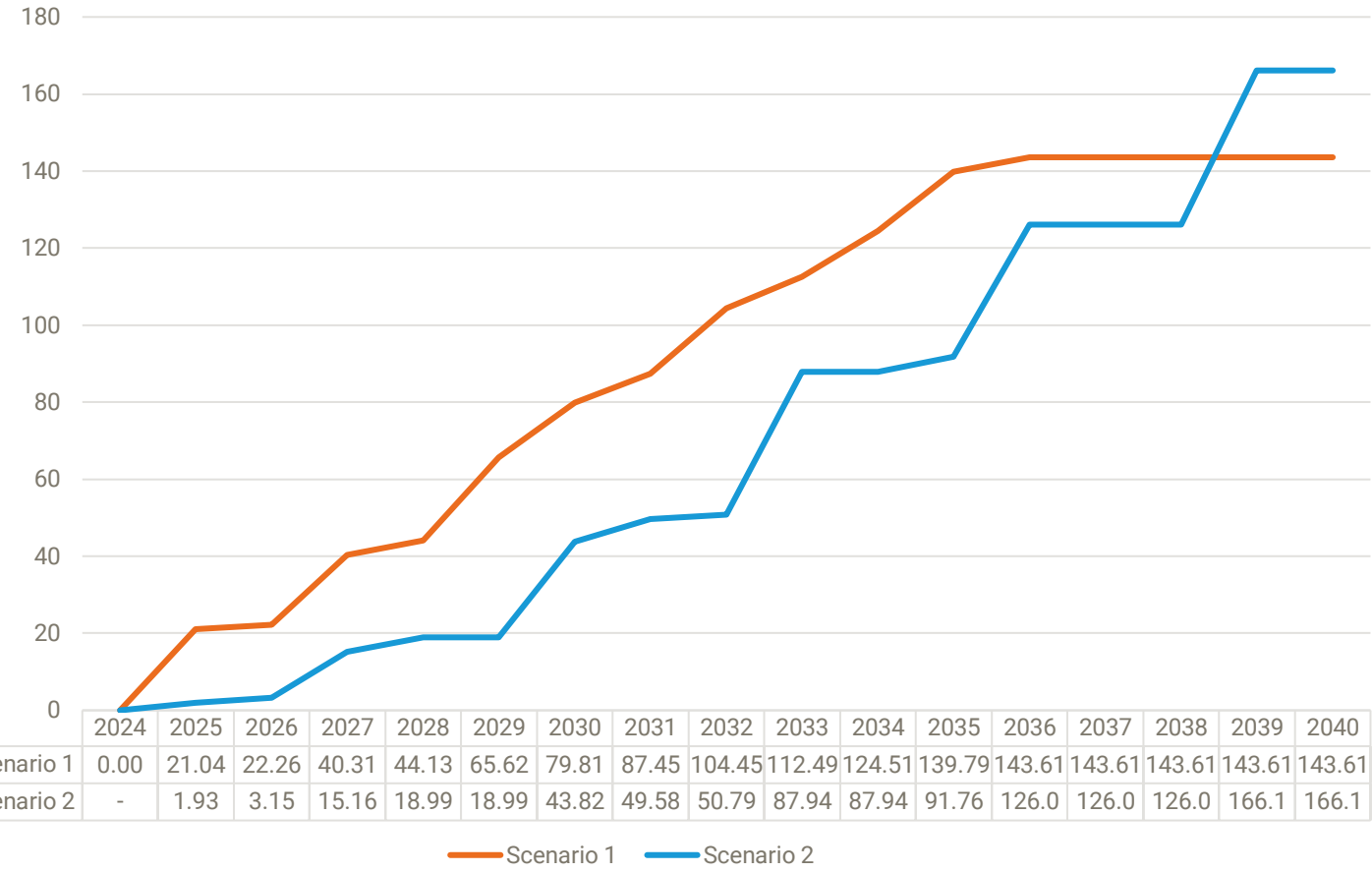
Annual Emission Savings = 143.61 MT CO2e starting 2036

Scenario: ACF Option 2

- ACF Milestone Schedule
- Passenger vehicle transition plan
- EVSE deployed with EV procurement

Total Emission Savings = 166.1 MT CO2e starting 2039

Emissions Savings: Scenario 1 vs Scenario 2 (MTCO2e)



	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Scenario 1	0.00	21.04	22.26	40.31	44.13	65.62	79.81	87.45	104.45	112.49	124.51	139.79	143.61	143.61	143.61	143.61	143.61
Scenario 2	-	1.93	3.15	15.16	18.99	18.99	43.82	49.58	50.79	87.94	87.94	91.76	126.0	126.0	126.0	166.1	166.1

Notes:

1. GHG savings is derived from both scope 1 and scope 2 emission associated with the ICE vehicles and the electric vehicles.
2. The non-ZEV vehicles' emission is based on the fuel direct emission, where the ZEV vehicles' emission is based on the emission associated with electricity.

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Total GHG Emission Savings Comparison of ACF Pathways

Phase 2 1.2 Develop GHG Emission Reduction Projection

Scenario: ACF Option 1

- Early adoption of ZEV leads to greater emission reduction thanks to more miles operated with electricity

2024-2040 Total Emission Savings = 1,559.9 MT CO2e

Scenario: ACF Option 2

- ACF Milestone Schedule led to a late start of the emission savings

2024-2040 Total Emission Savings = 1180.5 MT CO2e



Notes:

1. GHG savings is derived from comparing to the fossil fuel operation of the non-ZEV current fleet composition scenario.
2. The non-ZEV vehicles' emission is based on the fuel direct emission, where the ZEV vehicles' emission is based on the emission associated with electricity.

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Phase 2 1.3 Total Cost of Ownership

Total Cost of Ownership model provides a comprehensive view into vehicle lifecycle costs

TCO MODEL

KEY UNCERTAINTIES & SENSITIVITIES

- Technology Advancements
- Energy Price Fluctuations
- Policy Changes

ECONOMIC INPUTS

- Net Present Value – Discount Rate
- Capital escalation rate
- Labor escalation rate

FINANCIAL MODEL

- Annual Costs
- Costs through Useful Life

TCO OUTPUT

- NPV over useful life
- Net savings or costs for conversion
- NPV of scenario cost differences

INVESTMENT COSTS

ELECTRIC



- Vehicle purchase
- Maintenance
- Electricity



- Charging equipment
- EVSE O&M
- Electrical upgrades

INTERNAL COMBUSTION

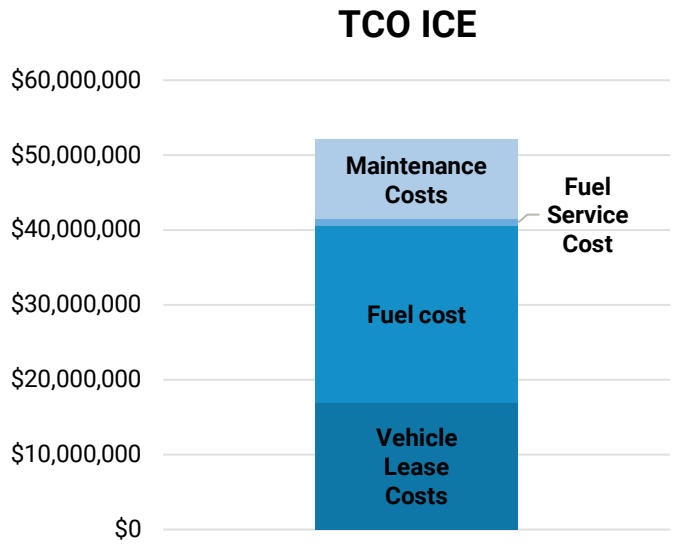


- Vehicle purchase
- Maintenance
- Fuel

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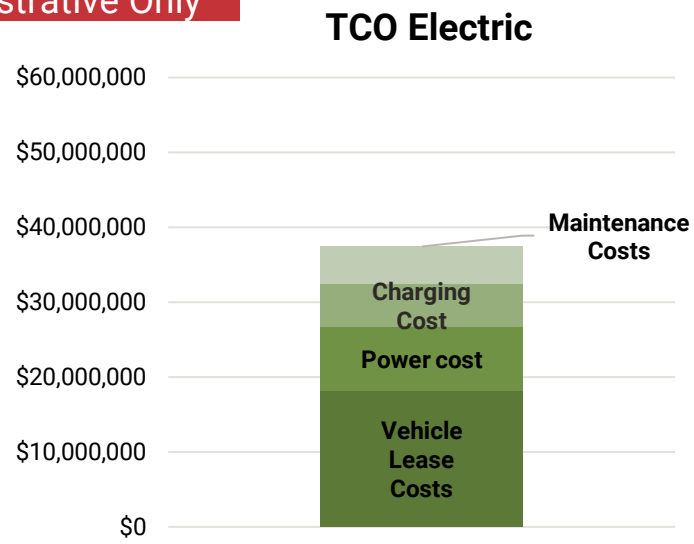
Electrification Costs Evaluated on a Total Cost of Ownership Model



TCO of a fleet of ICE vehicles may be **higher** if:

- Fuel costs are significantly higher than electric
- Maintenance costs are higher than electric
- Offsets lower vehicle costs

Illustrative Only



TCO of a fleet of electric vehicles may be **lower** if:

- Vehicle costs are declining over time, impacted by incentives
- Maintenance costs are expected to be lower
- Charging costs are expected to be lower but dependent on electric rates and charging times
- Low charging infrastructure cost but depend on charger selection and optimization

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Data and Analysis Assumptions

Costs and Escalation Inputs for the TCO Model

NPV Discount Rate:

- 7%

Input assumption Starting Year:

- 2024

Annual Capital Inflation Rate:

- 3%

Annual Labor/OPEX inflation Rate:

- 3%

Electric Power Projection Curves:

- EIA AEO 2023 Energy Prices: Transportation Electricity
  - Base Projection: Reference Case
  - Aggressive Projection: Low Oil Price: (Low Electric Costs)
  - Conservative Projection: Low Economic Growth (High Electric Costs)

Diesel Price Projection Curves:

- EIA AEO 2023 Energy Fuel: Transportation Diesel Fuel
  - Base Projection: Reference Case
  - Aggressive Projection: High Oil Price
  - Conservative Projection: Low Oil Price

Electric Vehicle Specifics:

- Electric Efficiency: Based on the EV alternatives
- Maintenance Costs: 60% of the ICE counterparts
- Salvage value: $0

ICE Vehicle Specifics:

- ICE Efficiency: Based on fleet data averages
- Maintenance Costs: Based on fleet data averages
- Salvage Value: $0

Fossil Fuel Starting Price:

- Renewable Diesel Pricing provided by Windsor: $3.9958/Gallon
- Unleaded Regular Gasoline Pricing provided by Windsor: $3.3936/Gallon

Electric Starting Price:

- PG&E BEV-2 Rates:
  - Summer Peak $0.41522
  - Summer Mid peak $0.20199
  - Summer Off Peak $0.17872
  - Winter Peak $0.41522
  - Winter mid peak $0.20199
  - Winter Off Peak $0.17872
  - Fixed charge $573.18

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Data and Analysis Assumptions

Schedule for Vehicle Replacement for Option.1 and Infrastructure Deployment

Non-ACF Vehicle Type	Vehicle Description	Replacement (Years)	Replacement (miles)	Vehicle Count
1	Pickup Truck	12	80,000	5
8	Passenger Vehicles	12	80,000	13

- Used assumptions provided by Windsor for benchmark replacement schedule
- Vehicles going into surplus in 2024 has been removed from the replacement schedule modeling:

Retired Vehicle
F-250 4 x 2 w/Utility body (Going to Surplus) –ACF Regulated
Ranger Regular Cab PU (Going to Surplus)
Sierra PU (Going to Surplus)

- Vehicle Type 5 Vacuum Truck is scheduled for 2029 replacement, and an ICE replacement has been deployed in the model
- No vehicles were replaced in 2024

Infrastructure Deployment

- Electrical infrastructure deployment takes place in 2025, and EVSE deployment takes place as the vehicles are replaced with EVs

ACF Vehicle Type	Vehicle Description	Replacement (Years)	Replacement (miles)	Vehicle Count
1	Pickup Truck	12	80,000	20
2	Utility Work Truck	12	80,000	12
3	Work Truck	12	80,000	4
4	Van	12	80,000	3
5	Vacuum Truck	12	80,000	1
6	Dump Work Truck	12	80,000	2
7	Bucket Work Truck	12	80,000	1

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Projected TCO of ACF Compliance Pathways

When comparing annual Costs between scenarios, ACF Option 2 is more cost-effective compared to Option 1 and No ZEV Procurement

Scenario: ACF Option 1

- ACF Purchase Requirement
- Passenger vehicle transition plan
- EVSE deployed with EV procurement

Total Transition Costs = $7.1 Millions

Scenario: ACF Option 2

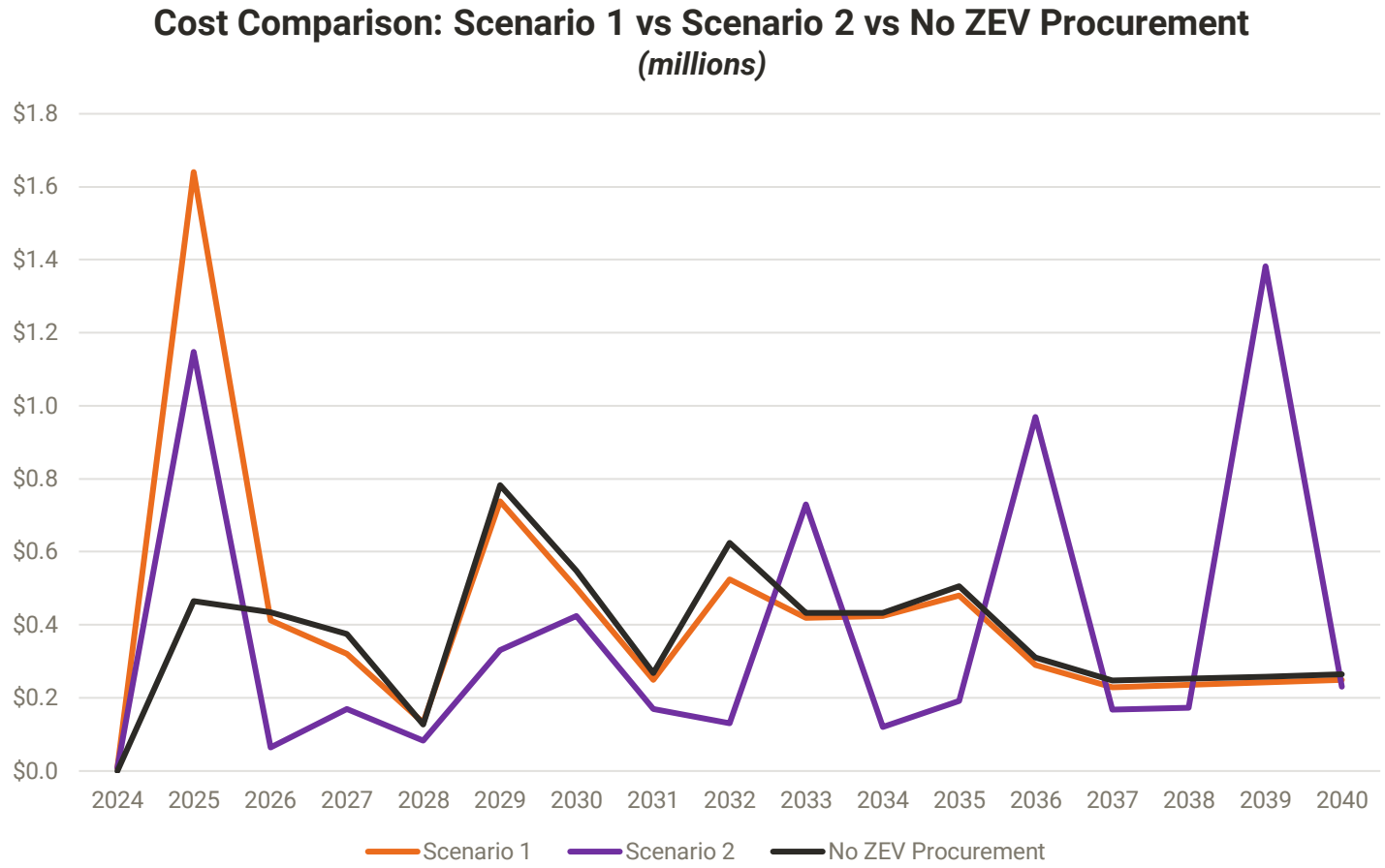
- ACF Milestone Schedule
- Passenger vehicle transition plan
- EVSE deployed with EV procurement

Total Transition Costs = $ 6.5 Millions

Scenario: No ZEV Procurement

- Based on benchmark vehicle replacements derived for Option 1
- No ZEV purchases, only ICE replacements

Total Transition Costs = $6.3 Millions



Notes:
1. Costs excludes EV charging infrastructure and installation
2. Costs include EV incentives and rebates (*Option 1 - Total Rebates*: $477,250, *Option 2 - Total Rebates*: $368,250)

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Projected Vehicle Cost of ACF Pathways

Option 2, ZEV fleet transition is anticipated to yield ~$0.6 M in reduced costs when compared to the Option 1 scenario

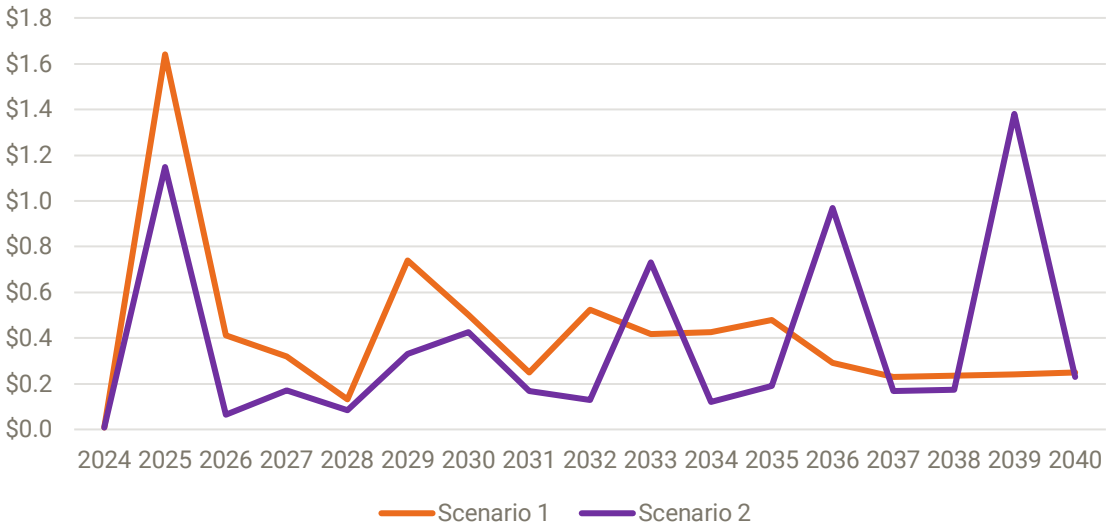
Option 1 | Purchase Requirement (Staff Preferred)

- 2024-2026: 50% of ACF regulated vehicle purchases must be ZEV
- 2027-: All ACF regulated vehicle purchases must be ZEV
- Passenger vehicle transition plan (new purchases will be ZEV)

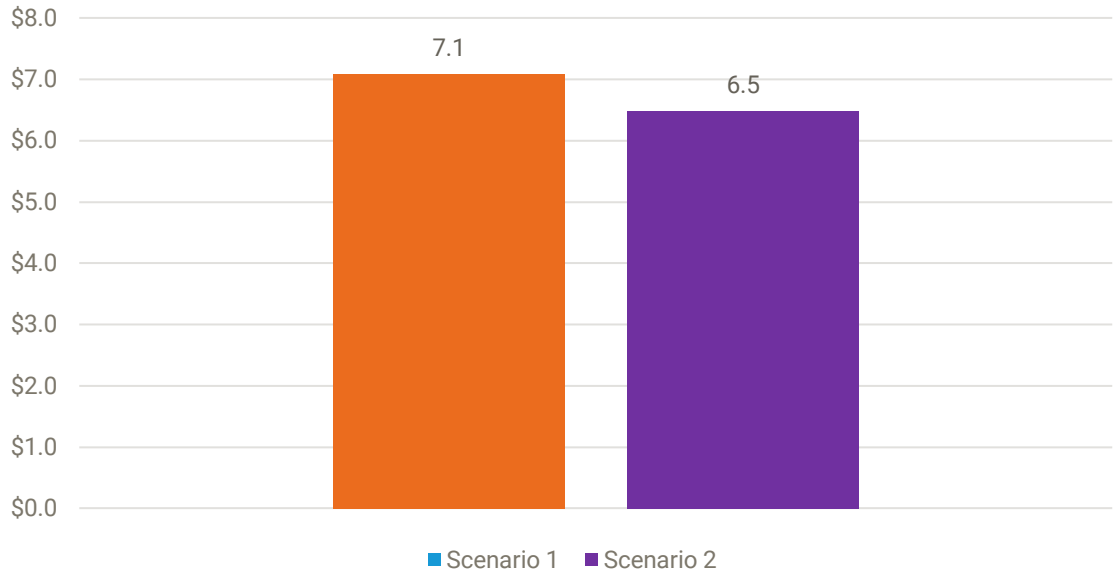
Option 2 | ZEV Milestone Schedule

- ZEV Milestone schedule drives ZEV purchases
- Passenger vehicle transition plan (new purchases will be ZEV)

Annual Cost Comparison *(millions)*



Total Cost Comparison *(millions)*



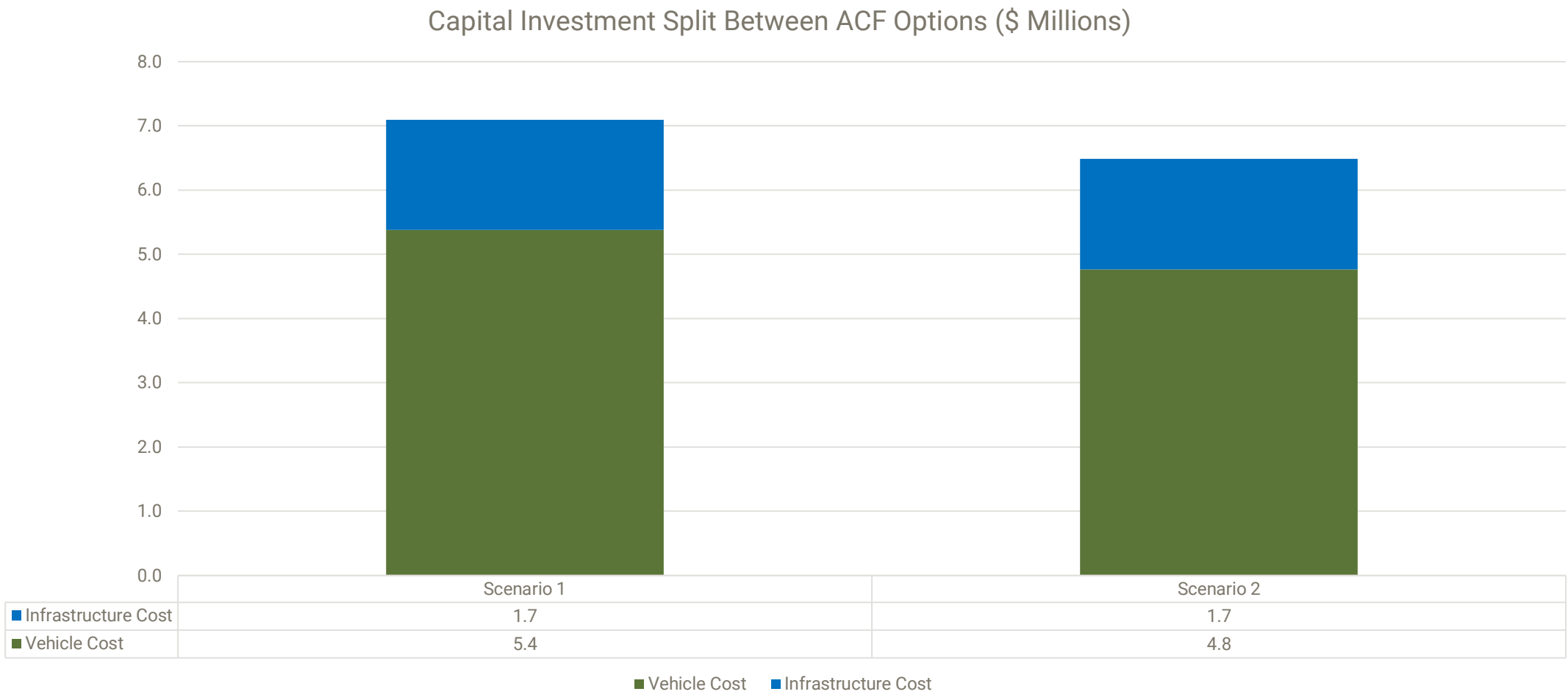
Notes:
1. Costs excludes EV charging infrastructure and installation
2. Costs include EV incentives and rebates (*Option 1 - Total Rebates*: $477,250, *Option 2 - Total Rebates*: $368,250)

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Projected Vehicle Cost of ACF Pathways

Split of Capital Investment between Vehicles and Infrastructure



	Scenario 1	Scenario 2
Infrastructure Cost	1.7	1.7
Vehicle Cost	5.4	4.8

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CARB ACF Exemption & Clarification

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Least Viable Analysis | Scoring Summary

Metric	Definition
Range	Capability of EV alternative to meet operational requirements with regards to duty cycle, or vehicle miles traveled.
GVWR	Gross Vehicle Weight Rating. Suitability of EV alternative to meet required GVWR of the current GVWR of fleet vehicles.
Configuration	Suitability of EV alternative to meet the required height, weight, width, length, and vocational body of current fleet vehicles.
Availability	Market availability of EV alternatives.

Color	Score	Definition
	1	High
	2	Medium
	3	Low

Suitability Score = Avg. Score of Key Metrics
The lower the more readily suitable today

		Range	Payload	GVWR	Configuration	Availability	Suitability
Passenger Vehicle	**Sedan**						1.00
	SUV						1.00
Pickup Truck							1.00
Van							1.00
Work Truck							1.40
Dump Work Truck							1.60
Utility Work Truck							2.00
Bucket Work Truck							2.20
Vacuum Truck							3.00

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Least Viable Analysis | Suitability

Suitability	Vehicle Type	Suitability Overview	Barriers to Adoption
High	Sedan - Passenger Vehicle SUV - Passenger Vehicle Pickup Truck Van	**High suitability.** EV alternatives will meet operational requirements and should present no significant concerns with obtainable availability.	**No significant barriers to adoption.** Vehicle types have a multitude of OEM offerings and are the most common and widely adopted EV's on the road.
Low	Vacuum Truck	**Low to No suitability.** No ZEV alternatives on the market to meet requirements for these vehicle types.	**Significant barriers to adoption; not feasible near term.** Fleet Manager can take following actions: ✓ Apply for ACF Exemptions until suitable alternatives enter the market. ✓ Monitor the market for OEM announcements. ✓ Potentially engage OEMs to pilot vehicles to help accelerate the market and become an early adopter.

ZEV Unavailability Exemption Applicability

- For vehicles without ZEV alternatives.
- CARB will publish the ZEV Purchase Exemption List in next 8 months
- Streamlined list for evaluation includes; boom truck, dump truck, bucket truck, tank truck, water truck, vacuum truck, crane trucks, concrete mixers and more.
- Will not include pickups, buses, box trucks, vans, or tractors.

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Least Viable Analysis | Suitability

Suitability	Vehicle Type	Suitability Overview	Barriers to Adoption
Medium	**Work Truck**	Representative EV GVWR is 14,500 lbs. while ICE GVWR ranges from 16,001 - 26,000 lbs. so may not be an exact match but presents no significant concerns.	There are a few OEM offerings however, expected to ramp up quickly due to configuration simplicity and high market demand.
	Dump Work Truck	Representative EV GVWR of 14,000 – 16,000 lbs. But the configuration of Dump Trucks can vary slightly, EV alternative may not be an exact match for transition at this time.	One OEM offering currently, presenting procurement challenges. Meeting configuration and payload requirements to perform job duties.
	Utility Work Truck	Representative EV GVWR of 14,000 – 16,000 lbs is higher than the ICE representative and will likely not be an exact match as configurations can vary. The current dominant Class 2 F250 fleet don't have a direct replacement in EV form.	One OEM offering currently, presenting procurement challenges. Working with OEM to properly upfit vehicle body.
	Bucket Work Truck	Representative EV range (100 miles) appears to be sufficient compared to the average daily mileage of 41 miles. Range concerns present if Bucket Truck operates double its average duty cycle. Also the GVWR of the representative EV may be heavier than the 16,001 - 19,500 of the existing ICE vehicles in the fleet.	One OEM offering currently, presenting procurement challenges. Working with OEM to properly upfit vehicle body; Power Take Off equipment needed adds further challenges.

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Vehicle Exemption Process and Expectations

1 Purchase Exemptions

- Only granted if necessary to comply when replacing qualified vehicles in the fleet.
- If not making any purchases regulated by ACF during the appliable year, no need to apply for an exemption.
- ZEV Purchase Exemption List to be published no later than January 1, 2025.

2 Exemption Application

Submit email 45 days prior to compliance to TRUCRS@arb.ca.gov with:

- Fleet TRUCRS ID
- Vehicle VIN, make, model, weight class
- Pictures of entire left and right sides and the odometer reading
- List of any frame attachments to support or perform the primary intended function of vehicle
- Make and model of the body added to the chassis, if applicable
- Documentation from 2+ manufacturers that offer ZEV or NZEV vehicle/chassis, stating they do not offer the vehicle

3 Exemption Approval

- Notified by email within 45 days
- One year to complete new ICE order
- Conditions for approval to remain valid
- If the needed vehicle is available for purchase, CARB will supply name of manufacturer and extension will not be approved
- No appeals if declined

4 Exemption Purchase

Submit email within 30 days to TRUCRS@arb.ca.gov with:

- New ICE vehicle purchase agreement
- Pictures of VIN/GVWR label
- Pictures of drivers' side of vehicle with license plate visible
- Pictures of entire left and right sides
- Fleet owners must keep copies of all documents submitted for the ZEV Purchase Exemption for a period of at least 5 years to be made available to CARB upon request

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Available exemptions and extensions

ZEV Unavailability Exemption	• Vehicles without ZEV alternatives. • CARB will provide a list of exempted vehicles by 2025. • Will not include pickups, buses, box trucks, vans, or tractors.	**Fleet Suitability Analysis** Vehicles identified to have no available or suitable alternatives
Backup Vehicle Exemption	• May purchase ICE if annual mileage is less than 1,000 miles. • Excludes mileage accrued while operating in support of a declared emergency event.	**Vehicle Utilization Analysis** Vehicles identified to travel less than 1,000 miles annually
Daily Usage Exemption	• If the daily usage needs of a given configuration cannot be met by available ZEVs, the fleet owner may request an exemption to purchase a new ICE vehicle with a CA-certified engine.	**Fleet Suitability Analysis** **EV Max Range Assessment**
Mutual Aid Vehicle Exemption	• Fleet owner can apply for an exemption to purchase ICE vehicles for up to 25 % of the fleet if the vehicles are for emergency response services to fulfill signed mutual aid agreements.	
Waste & Wastewater Fleets	• Must be exclusively fueling vehicles with Bio-Methane. • Must be implementing Organic Waste Diversion Programs. • Defers ZEV requirements to 2030 if elected ZEV milestone path.	

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ACF Exempted Vehicles for State & Gov. Fleets

Daily Usage Exemption

(a) Exemption considers whether the daily mileage (or energy usage) of an available battery-electric vehicle (BEV) of the needed configuration can meet the daily mileage or usage needs of the fleet when no other type of ZEV is available.

(b) Does not apply to a vehicle configuration that is available as a fuel cell electric vehicle or as a NZEV with minimum all-electric range until the 2035 model year, or if a BEV with a high battery energy capacity is available.

(c) A fleet owner may request a Daily Usage Exemption if the fleet is in compliance and at least ten percent of their California fleet are ZEVs or NZEVs, regardless of compliance method used.

- ZEV Purchase Schedule may apply no earlier than when the vehicle model year of the ICE vehicle being replaced reaches 13 years old.
- ZEV Milestones Option may apply if the fleet owner demonstrates the next applicable upcoming ZEV Fleet Milestone cannot be reached without requesting and obtaining exemptions for all other ICE vehicles in their California fleet and no later than 1 year before the next applicable ZEV Fleet Milestone compliance date.

How to apply?

A fleet owner may request a Daily Usage Exemption if the fleet is in compliance and at least ten percent of their California fleet are ZEVs or NZEVs, regardless of compliance method used.

- Demonstrate the California fleet complies with all applicable requirements by identifying the TRUCRS ID.
- ICE vehicle is to be replaced by submitting the make, model, weight class, configuration, and photograph of the vehicle.
- Comparable BEV in the same weight class and configuration has the highest available manufacturer's rated energy capacity. Submit the make, model, weight class, configuration, and rated energy capacity of the identified BEV.
- The calculated range of the BEV in miles, per section 2015.3(b)(3), or measured energy usage as specified in section 2015.3(b)(3)(A), of a BEV operated on similar assignments.
- A daily usage report for each ICE vehicle of the same configuration for 30 consecutive workdays within the past 12 months of daily mileage, and energy used if applicable. Fleets with mutual aid agreements may select a 30-day period from within the last 5 years. The vehicle mileage (or energy usage) in determining eligibility for the exemption will exclude the 3 highest daily readings.
- Description of daily assignments or routes of existing vehicles of the applicable configurations and explanation of why BEVs cannot be charged during the workday or during driver rest periods.

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ACF Exempted Vehicles for State & Gov. Fleets

Emergency vehicles defined in CA Vehicle Code Section 165:

(a) Any publicly owned and operated ambulance, lifeguard, or lifesaving equipment or any privately owned or operated ambulance licensed by the Commissioner of the California Highway Patrol to operate in response to emergency calls.

(b) Any publicly owned vehicle operated by the following persons, agencies, or organizations:

- (1) Any federal, state, or local agency, department, or district employing peace officers as that term is defined in Chapter 4.5 (commencing with Section 830) of Part 2 of Title 3 of the Penal Code, for use by those officers in the performance of their duties.
- (2) Any forestry or fire department of any public agency or fire department organized as provided in the Health and Safety Code.

(c) Any vehicle owned by the state, or any bridge and highway district, and equipped and used either for fighting fires, or towing or servicing other vehicles, caring for injured persons, or repairing damaged lighting or electrical equipment.

(d) Any state-owned vehicle used in responding to emergency fire, rescue, or communications calls and operated either by the Office of Emergency Services or by any public agency or industrial fire department to which the Office of Emergency Services has assigned the vehicle.

(e)(1) Any vehicle owned or operated by a federally recognized Indian tribe used in responding to emergency, fire, ambulance, or lifesaving calls. For the purposes of this section and the provisions of Sections 2501 and 2510, a vehicle used in responding to emergency, fire, ambulance, or lifesaving calls owned or operated by a federally recognized Indian tribe is considered an authorized emergency vehicle.

(2) Any vehicle owned or operated by any department or agency of the United States government when the vehicle is used in responding to emergency fire, ambulance, or lifesaving calls or is actively engaged in law enforcement work.

(f) Any vehicle for which an authorized emergency vehicle permit has been issued by the Commissioner of the California Highway Patrol.

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ACF Exempted Vehicles for State & Gov. Fleets

Declared Emergency Response Exemption

- Vehicle operation that occurs under contract to support a declared emergency event may be excluded from the California fleet.
- Reporting in TRUCRS is not required if the vehicle operator has proof of the contract with the emergency management agency.

Mutual Aid Assistance Exemption

- Fleet owners that have mutual aid agreements to send vehicles to help others during a declared emergency event may request an exemption to continue purchasing new ICE vehicles by excluding up to 25% of the fleet from the ZEV requirements. Fleet owners may initially apply for the exemption after the first 25% of the fleet are ZEVs.
- Extensions will not be granted if available ZEVs have mobile fast charging or fast fueling capabilities. This exemption does not apply to pickup trucks, buses, box trucks, vans, tractors, vehicles available as ZEVs with fast mobile fueling/charging, nor NZEVs.
- An eligible fleet owner can apply by submitting information by email. This exemption applies to the Model Year Schedule, the ZEV Milestones Option, and the ZEV Purchase Schedule.

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CARB Clarifying Questions on ACF

Vehicles in-scope for ACF

- **Vehicles with GVWR over 8,500 lbs**
- F-150 Lightning standard range GVWR is 8,250 so it's not considered under the scope of ACF regulation (not contributing the 1:1 ZEV-ICE purchase)
- "Package delivery vehicle" with GVWR less than 8,500 lbs with 100 cubic feet of cargo-carrying volume for package delivery or mail will be considered in-scope for ACF

Renting or Leasing vehicles

- For vehicles rented or leased, the owner shall be presumed to be the rental or leasing entity for purposes of compliance
- If the rental or lease agreement for the vehicle is for one year or longer and the terms of the agreement identifies the renting operator or lessee as the party responsible for compliance with state laws, then renting party will need to comply with ACF.

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CARB Clarifying Questions on ACF

Retirement of vehicles

- For State & Local Government (SLG) fleets following the default ZEV purchase schedule, they may continue to operate existing vehicles as long as they want;
- There is no requirement to remove or retire vehicles in ACF;
- ACF is vehicle model year specific, and a SLG fleet may change the engine as long as the engine is same model year or newer;

Non-Repairable Vehicle Exemption

- This exemption is available for a fleet owner that needs to temporarily replace an existing vehicle due to an accident or other one-time ev;ent beyond the fleet owner's control
- Examples include fire or catastrophic failure, that damages both the engine and vehicle such that the vehicle is not repairable;
- Fact sheet on Non-Repairable Vehicle Exemption

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Performance Disclosure

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