Stantec

Los Alamos County Fleet Conversion Plan

The County Fleet Conversion Plan is a comprehensive report guiding strategic decision-making and ensuring a smooth transition to a sustainable fleet.

Stantec Consulting Ltd.

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ATTACHMENT B

Revision Record

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Executive Summary

To support the carbon-reduction goals established in the 2024 Climate Action Plan, Los Alamos County engaged Stantec to develop a Fleet Conversion Plan aimed at reducing greenhouse-gas emissions from the County's fleet. The innovative and progressive environment for Los Alamos County to pursue fleet electrification will be assessed against the operational and capital constraints, all while considering the greenhouse gas emission reduction goals of the Climate Action Plan.

Assessment of the County fleet included a Fleet Operational Assessment and an Electric Vehicles (EVs) market scan for all County fleet vehicles. The results of this assessment provided data to determine to what degree currently available EVs could serve the County's operational requirements. While not all County vehicles can currently be transitioned successfully to EVs, the development of Transition Phases enables the County to continue planning for transition over the next 25 years as electric vehicle technology improves.

Phase 1

Vehicles most suitable for electrification, targeted for transition between 2025-2035.

Phase 2

Vehicles with moderate operational constraints and limited market options, targeted for 2035-2043 transition.

Phase 3

Vehicles with significant constraints and no available market options, targeted for 2044-2050 transition, when the EV market may have advanced and more EVs may be available.

Critical to planning the deployments of EVs over the next 25 years was the projection of current and future vehicle retirement. Projections of potential vehicle procurement were developed using the County's actual replacement practices and relied on current vehicle conditions like vehicle age, mileage, and maintenance costs, all while considering the County's Vehicle Replacement Policy. Four cycles of vehicle procurement and retirement were developed from 2027 through 2050. This Fleet Procurement Timeline assumed that replacement vehicles would be in service for a similar length of time as the vehicle being retired.

Using the developed Fleet Procurement Timeline two strategies for EV implementation were evaluated:

Scenario 1: EV Policy

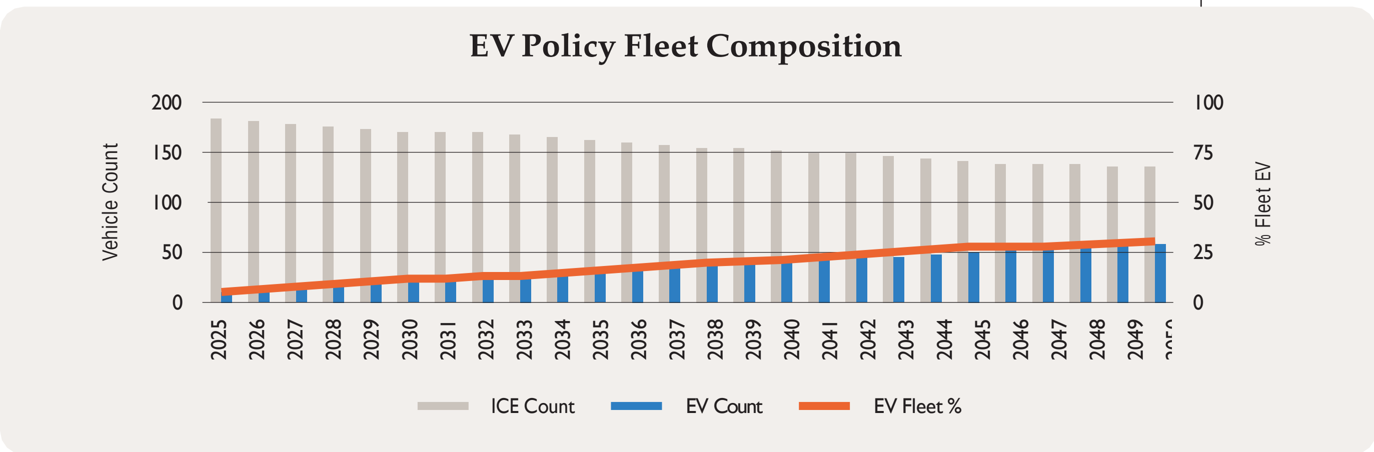
Evaluates the fleet transition to zero-emission vehicles by relying on the County's existing two vehicle per year transition policy.

Scenario 2: Climate Action Plan (CAP) Policy

Evaluates the fleet transition to zero emission vehicles by strategically transitioning vehicle to EV with the goal of achieving carbon neutrality by 2050, and align with the County's Climate Action Plan Goal where possible.

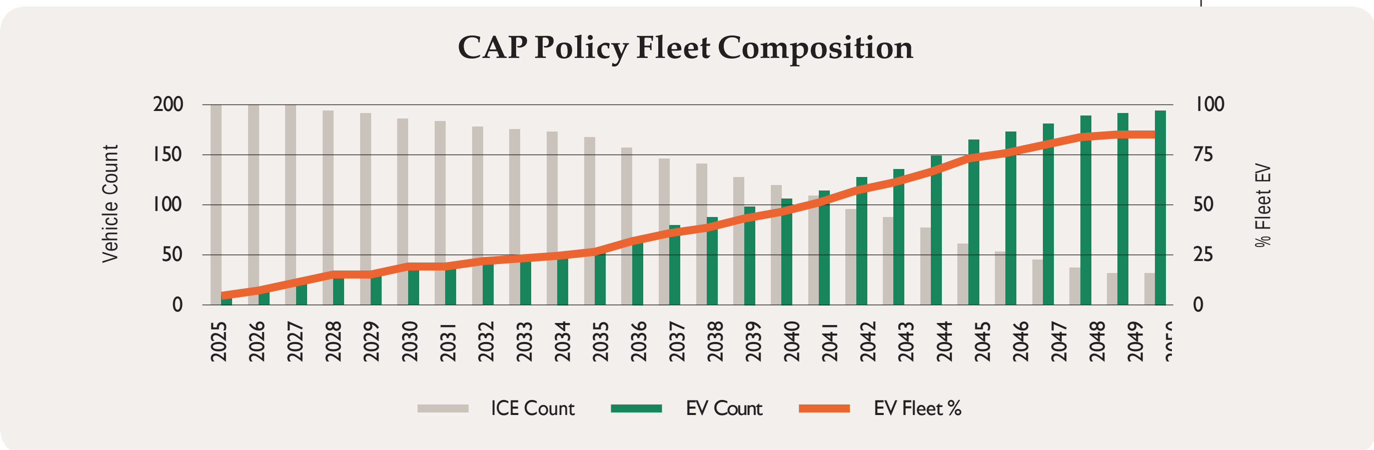
In Scenario 1, the current EV Policy implements fleet electrification at a slow, incremental pace. Each year, the County converts two internal combustion engine (ICE) vehicles to electric. As existing electric vehicles reach the end of their useful life, they are replaced with new EVs, which increases the number of EV purchases in some years. Even with this replacement strategy, the fleet reaches only 31% electrification by 2050 and 100% after 2100, substantially limiting emissions reductions. This scenario excludes 32 specialized vehicles from conversion due to operational needs, such as specialized vehicles that are essential for emergency response.

Scenario 1:



In Scenario 2, the CAP Policy approach, achieves fully electrification of all operationally suitable vehicles by 2050, excluding 32 vehicles with operational constraints, such as specialized emergency-response vehicles. The County's Climate Action Plan goal of carbon neutrality by 2050 provided a goal but did not define when vehicles are transitioned. This phased strategy relies on a systematic assessment of vehicle utilization and zero-emission vehicle (ZEV) market conditions rather than fixed annual conversion quotas. This approach aligns with the County's existing replacement cycle to avoid premature retirements while allowing adequate time for proven medium- and heavy-duty ZEV options to reach commercial maturity.

Scenario 2:



The EV infrastructure recommendations are based on a full build-out of facility charging designed to support 86% of the fleet that is eligible to transition to EVs. This equates to 195 vehicles out of the County's total 227-vehicle fleet, with 32 vehicles excluded from electrification.

Site visits with County staff, data on fleet overnight location, and desktop review of County facilities determined the location of charging with the quantity defined by fleet conversion timelines. Charging infrastructure is deployed using a phased approach that aligns directly with the fleet conversion timelines. The number and type of chargers (Level 2 or Level 3/DCFC) are determined by the CAP Policy implementation strategy needed to achieve the 86% electrified fleet. In addition, total power-load projections are provided for each facility that will support electric vehicles. A priority driven list of all facilities and locations for charging infrastructure the County can use as a guide to deployment can be found in Section 4.1.

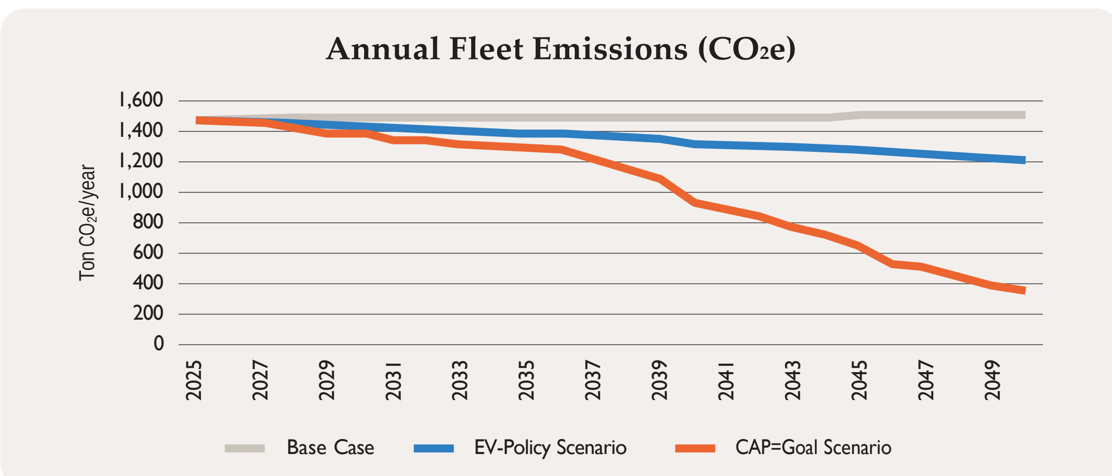
The financial assessment evaluated the capital and operational cost of implementing the EV Policy and CAP Policy Scenarios, using a total cost of ownership assessment that was then compared to an ICE-only Scenario (i.e., no additional transition to EVs). Sensitivity analysis was conducted on the potential saving in maintenance costs from operating EVs as well as battery price trends.

The EV Policy has a 6% increase in the total cost of ownership over the implementation timeline (between 2026 and 2050) when compared against the ICE-only Scenario. The savings in maintenance (regardless of projected savings) and fuel economy are not enough to offset the added procurement cost and infrastructure investment.

The CAP Policy Scenario represents a 33% increase in the total cost of ownership when compared against the baseline. The total cost of ownership of EVs is due to the significantly higher purchase price of EVs currently on the market, and the large investment required for the charging infrastructure. More optimistic projections of maintenance savings reduce this total cost of ownership at 3% at most. Additionally, battery price trends that project lower battery prices put the CAP Policy as only slightly more expensive than the ICE-only Scenario. While there may be available funding opportunities to mitigate the added purchase price, it will be critical for the County to secure sustainable funding strategies and incentives that would enable the implementation of this Fleet Conversion Plan.

Importantly, the environmental emissions for the two different scenarios were analyzed, with a baseline ICE-only Scenario. If the County were to continue implementing their EV Policy of two new electric vehicles per year, reaching a 31% fleet electrification in 2050 would only eliminate 9% of the total greenhouse gas emissions over the implementation period (2026-2050). Once the County reaches a maximum 31% EV fleet, (past 2050), there would be an annual 18% emissions reduction when compared to the ICE-only Scenario.

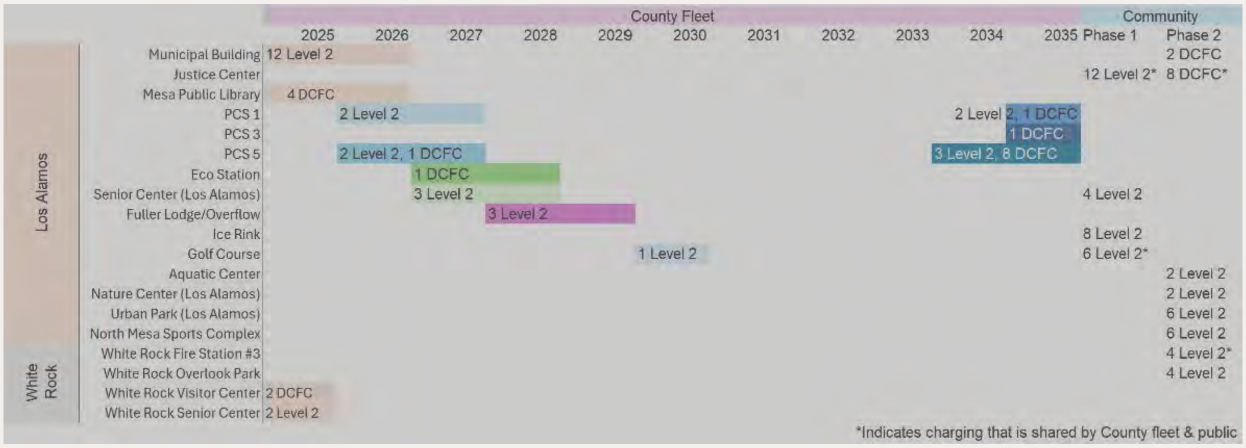
In contrast, the CAP Policy Scenario, which achieves 86% fleet electrification, would reduce total greenhouse gas emissions by 30% during the implementation period (2026–2050). After full implementation beyond 2050, this scenario would eliminate 76% of annual emissions compared to an ICE-only Scenario.



In conclusion, the Fleet Conversion Plan provides guidance for implementation, charging infrastructure considerations, guidance regarding training, and foundation skills, as well as specifics regarding charging infrastructure equipment and necessary upgrades. Key findings like charging infrastructure implementation timelines, projected power demand, and year-by-year cost projections for each assessed scenario are summarized in the figures below.

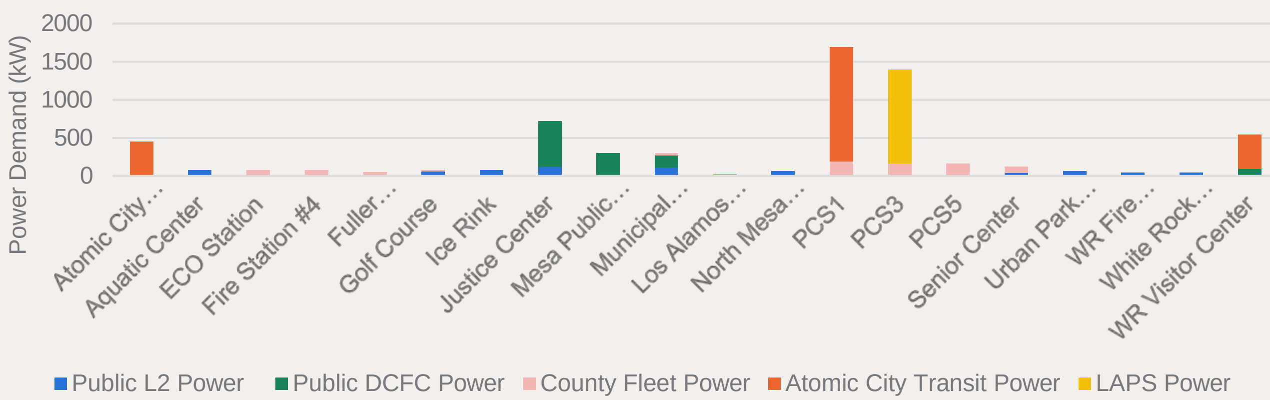
EV Policy Scenario summary figures:

Phase 1 (2025-2035) implementation for charging infrastructure with public charging

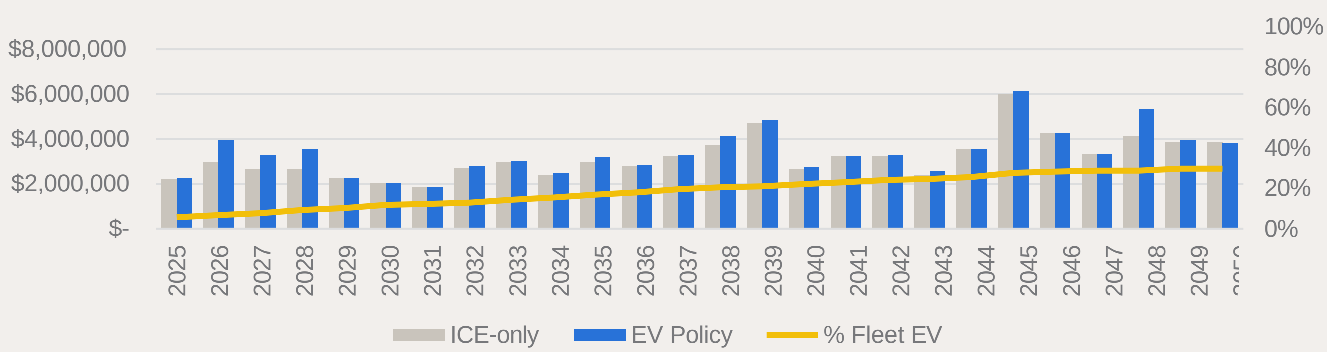


Full build out of power demand at County Facilities for fleet & public charging under EV Policy Scenario.

Facility Charging Power Demand under EV Policy Scenario

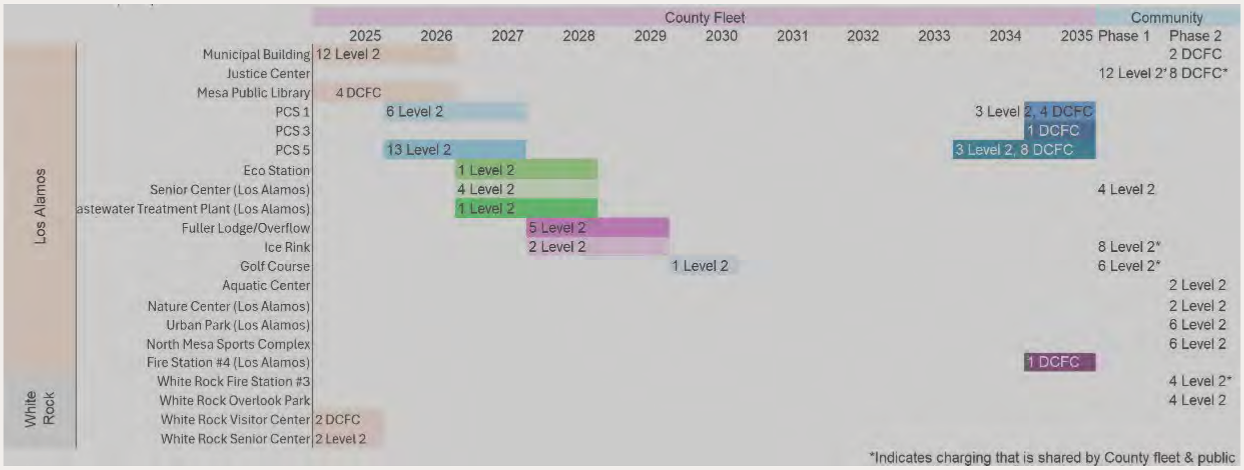


Annual Fleet Expenditure Totals Under EV Policy Scenario



CAP Policy Scenario summary figures:

Phase 1 (2025-2035) implementation for charging infrastructure with public charging



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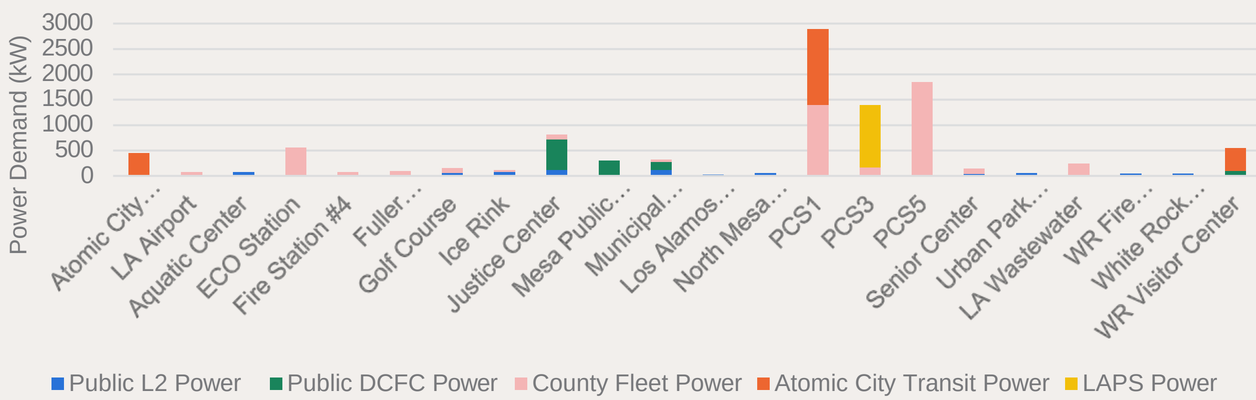

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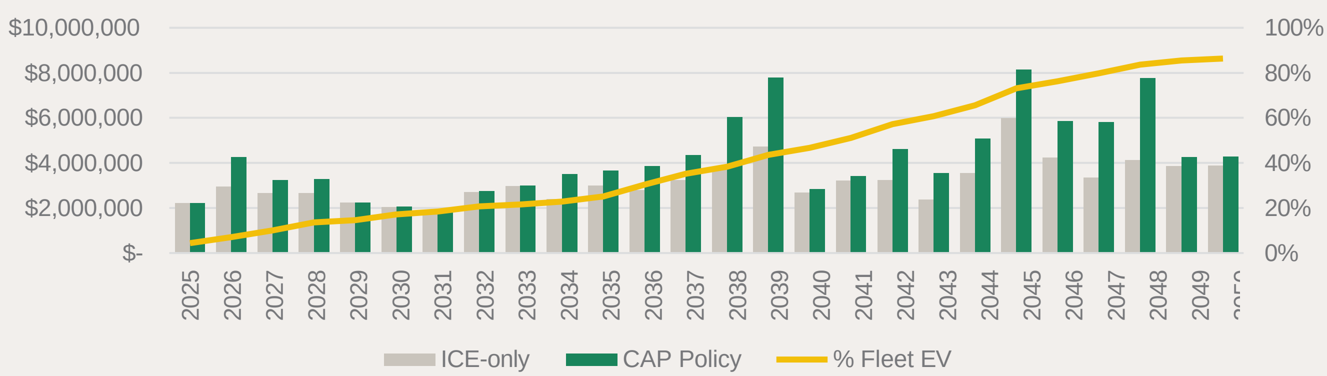


Acronyms / Abbreviations

Acronym / Abb.	Full Name
AC	Alternating Current
AHJs	Authorities Having Jurisdiction
ASEP	Automotive Service Educational Program
ASSET	Automotive Student Service Educational Training
BEB	Battery Electric Bus
BEV	Battery Electric Vehicle
CAT III/IV	Category III / Category IV (electrical measurement safety standards)
CO2e	Carbon Dioxide Equivalent
DC	Direct Current
DCFC	Direct Current Fast Charger
ESS	Energy Storage System
EV	Electric Vehicle
FCEV	Fuel Cell Electric Vehicle
GHG	Greenhouse Gases
ICE	Internal Combustion Engine
KPIs	Key Performance Indicators
kW	Kilowatt (power)
kWh	Kilowatt Hour (energy)
LAC	Los Alamos County
L2	Level 2, in reference to a type of charger
OCPP	Open Charge Point Protocol
OEM	Original Equipment Manufacturer
PHEV	Plug-in Hybrd Electric Vehicle
PPE	Personal Protective Equipment
SOC	State of Charge
V2G	Vehicle-to-grid
EV	Zero Emission Vehicle

Glossary

Term	Definition
Arc-flash	A dangerous electrical explosion caused by a short circuit or fault in a high-voltage system, producing intense heat and light.
Burn-out Zones	Designated areas where burning vehicles can be isolated to prevent fire spread and limit damage.
Demand Charges	Utility fees based on the highest level of power drawn during a billing period, often affecting charging costs.
DCFC	Direct Current Fast Charger with a max power output of 150 kW or higher
Fire Isolator Systems	Equipment such as fire blankets or aerosol suppression units designed to contain and slow vehicle fires, particularly in enclosed spaces.
Grid Greening	The process of increasing the share of renewable and low-carbon energy sources in the electrical grid mix.
Level 2 Charger	Charging equipment with a plug-in type of connection that ranges between 7 kW and 20 kW for the max output capacity.
Multiplexing	A vehicle wiring approach that reduces the number of wires by transmitting multiple signals over a shared pathway.
Oscilloscope	An electronic instrument used to visualize and measure electrical signals over time.
Plug-in Hybrid Electric Vehicle	Vehicles that utilize both an internal combustion engine and plug-in charging to charge the a battery. Propulsion occurs from both the engine and battery.
Smart Charging	Software-controlled EV charging that optimizes timing, rate, and energy use based on operational needs and electricity costs.
SOC (State of Charge)	The measurement of the available battery charge in a vehicle, expressed as a percentage of its total capacity.
Thermal Runaway	A rapid, uncontrolled increase in temperature within a battery cell that can lead to fire or explosion.

1 Introduction

In support of the Los Alamos Climate Action Plan (CAP), to reduce greenhouse gas emissions, increase zero emission vehicles, decrease air pollution, and increase fuel efficiency, Los Alamos County (the County) is preparing to transition its fleet to zero-emission vehicles (ZEV) through a phased and strategic approach. Furthering the goals of carbon neutrality by 2050 as part of the CAP, this transition plan will assess the strategies available to the County to continue and plan for replacing fossil fuel vehicles that reach the end of their useful lives with electric vehicles (EV).

The pace and direction of this transition are defined by the County's CAP but influenced by a policy environment at both the state and local levels.

Additionally, regulatory drivers provide a supportive environment for transition to EVs. These include the New Mexico Alternative Fuel Acquisition Act, mandating that 75% of light-duty fleet acquisitions meet alternative fuel or hybrid/electric criteria, and the Energy and Fuel Cost Savings Contracts program, enabling fleet owners to finance EVs and charging infrastructure through operational cost savings. While these do not have jurisdiction in Los Alamos County, they indicate the state's support of transitioning to EVs.

Although authority over emissions standards between the EPA and individual states is subject to ongoing legal review, New Mexico remains committed to supporting EV adoption through incentives and partnerships, signaling continued momentum for public fleet transitions. Locally, the County's CAP reinforces these efforts with targeted strategies to expand EV infrastructure, integrate EV readiness into building codes, and consider transitioning the County fleet in alignment with the NM state target to achieve a zero-emission vehicle fleet by 2035[1].

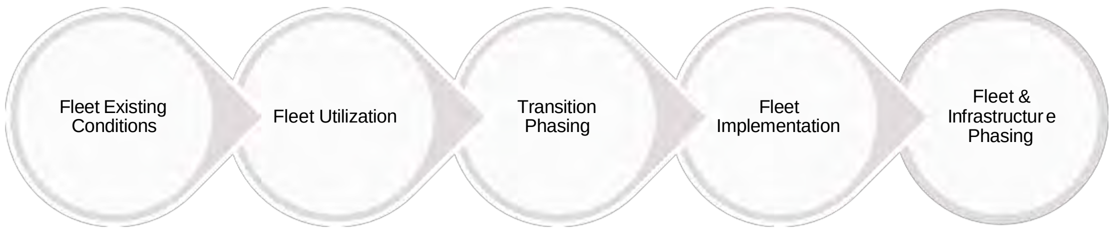
Taken together, these policies create a supportive framework for fleet electrification, ensuring that the County's vehicle replacement planning, infrastructure development, and operational modeling are aligned with community climate goals.

1.1 Conversion Plan Strategy

To support the County's transition to EV technology, a fleet conversion plan was developed to provide the County with appropriately sized and timed deployment of technology and infrastructure. The approach outlined in Figure 1-1 favors a logical transition informed by existing conditions, fleet utilization, and County operational and purchasing constraints. This culminates in a Fleet Implementation Strategy that provides two approaches to EV adoption, permitting the planning and budgeting for the deployment of supporting infrastructure.

[1] 2024 Los Alamos County Climate Action Plan; Strategy T1.4

Figure 1-1: Fleet Conversion Plan approach



The Existing Conditions and Market Scan Report (Appendix B) identified available battery-electric vehicles (BEVs) and fuel cell electric vehicles (FCEVs) across light-, medium-, and heavy-duty classes. Results from this report include:

- Light-duty vehicles: BEV options are widely available and align well with the County's operational needs.
- Medium- and heavy-duty vehicles: BEV options are more limited, and certain applications may still require interim hybrid or near-zero emissions solutions. While FCEVs could potentially electrify these vehicle classes through hydrogen fuel cells, the existing market lacks availability and proven large-scale deployments.

Due to the uncertainty of FCEVs, the Fleet Conversion Plan identifies BEVs as a more viable option for fleet transition and are referred to simply as electric vehicle (EV) throughout the plan.

To develop a thorough understanding of the County's fleet operations, site visits were conducted to observe how each facility functions and to inform the charging infrastructure planning process. The resulting preliminary charging locations, documented in Appendix C, outline the full EV buildout for each facility and align with the Fleet Implementation Plan, providing clear guidance on where and when charging infrastructure should be installed.

In addition to vehicle and infrastructure deployment, County processes will need to support the accompanying changes to operations and maintenance. As part of supporting recommendations, training programs are outlined to help County employees adapt to new EV technologies and maintenance practices, ensuring a smooth and well-supported transition. These programs are oriented towards operators, maintenance staff (including original equipment manufacturer (OEM) provided maintenance trainings), as well as emergency response coordination.

To support fiscal planning for the County's transition, a detailed financial analysis, incorporating all key elements across the vehicle lifecycle, was completed and includes:

- Capital Costs: Initial investments in vehicles and charging infrastructure.
- Operational Costs: Ongoing fuel/charging (diesel, gasoline, or electricity) and maintenance costs.

The financial model projects costs in future dollars based on the year each expense is incurred, providing a more accurate estimate of the overall financial impact. This model helps the County identify potential funding sources and plan for future capital requirements.

2 Fleet & Vehicle Analysis

Leveraging information gained from the existing conditions and market scan review (Appendix B), an approach to how the County could transition its fleet was developed. This first included understanding how the County utilizes its vehicles and where that utilization would be served by existing EV technology. Not all vehicles use cases can be currently served by commercially available technology and therefore it was critical to develop a strategy for the County to consult as they plan vehicle replacements.

To provide a strategy for transitioning to EVs, first the vehicle operations were assessed to determine nuances in composition and how the County uses their fleet. Next, transition phases were developed that incorporated the County's vehicle operations and market research, ensuring implementation occurs without compromising operational effectiveness.

Aiming to provide the County with a long-term tool for EV implementation, an EV Transition Dashboard was developed to view and analyze fleet data from the perspective of fleet implementation. Using the County's fleet list, service life, and operational information, the current condition of the fleet can be viewed. This tool has been provided to the County and staff have been trained in its features as well as how to use and maintain the database.

2.1 Fleet Operational Assessment

Stantec conducted several meetings with fleet managers to identify how the County utilizes its fleet vehicles. From these conversations, ten operational categories were identified including:

- Emergency Response – does the vehicle respond to emergencies?
- Schedule – how frequently is the vehicle used? (infrequently, daily, 24/7)
- Lunch – is a midday break taken at a facility (Municipal, Justice, etc.)?
- Distance – does the vehicle stay within the County?
- External load – is there accessory equipment being powered by the vehicle?
- Added equipment – does the vehicle have a specialized body type?
- Use type – does the vehicle tow, haul, or remove snow?
- Overnight location – is the vehicle taken home?
- User – is the user considered a supervisor or regular user?
- Notes – are there any specific details on utilization that would be valuable to know?

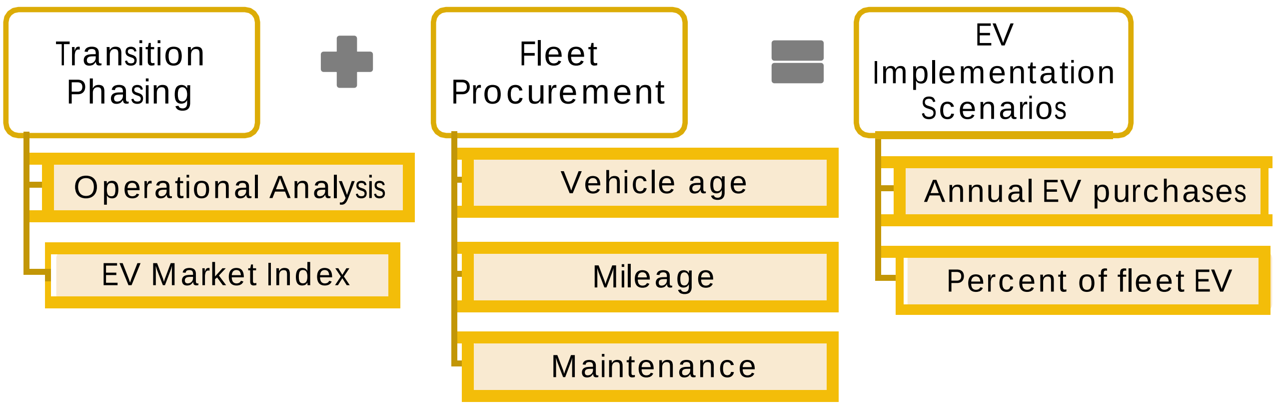
Each operational category was assigned responses based on the understanding of vehicle operation, gained through conversations with fleet users, division managers and department directors. Responses to each category (which are elaborated on below as operational constraints) were then assigned to each vehicle. These operational constraints provide data inputs, which were validated by County division managers.

Results from this assessment provided data on how the Transition Phasing was developed and informed fleet insights pertaining to the EV Transition Dashboard.

2.2 Transition Phasing

The process to identify an appropriate and realistic timeline for EV transition first requires an understanding of how well EVs can operate under the County's unique service conditions. Analysis of fleet operations (Section 2.2.1) and understanding of the EV market (Section 2.2.2) determines if each vehicle in the fleet could be transitioned to an EV.

Figure 2-1: Approach to development of Fleet Implementation Strategies



Next, to translate operational and market constraints into a timeline, Stantec applied a phased approach to EV transition. This approach (explained in Section 2.2.3) identifies three phases in which first "easy-to-electrify" vehicles (like sedans and pickup trucks) and then increasingly "difficult-to-electrify" vehicles (like incomplete truck chassis with specialized bodies and attached equipment) are eligible for EV transition. By doing this, vehicles are transitioned based on expected improvements in EV technology.

2.2.1 Operational Analysis

To assess operational constraints that could impact EV transition, Stantec created a scoring methodology based on utilization data gathered through fleet user interviews.

The chart below provides a visual representation of the operational assessment, where each operational use attribute was qualitatively scored based on its effect on EV suitability. Scores in green, marked as "No Impact," indicate that this attribute has little to no impact on the vehicle's ability to transition to an EV. This contrasts with the "Considerable Impact" scores in red that indicate this attribute would have significant impact on the vehicle's ability to transition to an EV.

Figure 2-2: Operations scoring options which when selected identified vehicle operational constraints (color coding to indicate scoring metric)

Emergency Response	No	Yes		
Schedule	Daily use	<Daily	On-call	
Lunch	Yes	No	N/A	
Distance	In county	Out of county		
External load	N	Y		
Added equipment	Non-modified	Service body	Specialized	
Use type	N/A	Snow removal	Towing	Hauling
Overnight Location	Facility	Take home		
User	Supervisor	Regular		

No impact
Some Impact
Significant Impact
Considerable Impact

Through interviews with fleet managers each vehicle was “scored” based on the attributes above. Each vehicle attribute (Emergency Response, Schedule, etc.) was assigned.

The score values applied to each category vary depending on the importance fleet users placed on operational categories. Therefore, the score ‘Service Body’ in the ‘Added Equipment’ score is greater than the ‘Take-Home’ score in the ‘Overnight Location’ category because the County identified where a vehicle “overnights” as more of a challenge to electrification than the added equipment on a vehicle.

The summation of scores across operational use attributes provided an overall transition score which is paired with the EV market index to provide a transition phase recommendation for each vehicle. Scores range from zero, “very easy to electrify”, to 22, “considerably difficult to electrify”.

2.2.2 EV Market Index

The next step in identifying a transition phase is to develop a recommendation based on the evaluation of external EV market conditions as they apply to the County’s fleet. This EV Market Index utilizes research completed during the Existing Conditions & Market Scan Report (Appendix B) and scores each vehicle type by how well it’s represented by the existing EV market. Vehicles are identified by body type and gross vehicle weight rating (GVWR) or class.

The chart below (Figure 2-3) shows that some vehicle body types are well represented by existing light duty EVs but medium- or heavy-duty vehicles less so. Using a 0-3 rating scale, lower value scores identify vehicles that are well represented in the market and are expected to be transitioned to EVs on a one-to-one basis. As numbers increase in value, the transition becomes harder with fewer or no EV equivalents available within the current market.

Figure 2-3: EV Market Index which scores the availability of each vehicle class and body type in the existing EV market

	Pickup	SUV	Truck	Refuse Truck	Incomplete - Single Cab	Incomplete	Cargo Van	Van	Sedan	Step Van	Cutaway	Minivan	Incomplete - Double Cab
Class 1									0				
Class 1C	0	0											
Class 1D	1	0					0	0					
Class 2												2	
Class 2E	1	1										2	
Class 2F	1	1											
Class 2G	2						1						
Class 2H	2					3	1	1					3
Class 3	3				3	3					0		3
Class 4					3						0		
Class 5			3		3								
Class 6			3	3						3			
Class 7			3										
Class 8			2	2	3								

0 Well Represented | 1 Mostly available | 2 Challenging | 3 Difficult or N/A

Stantec includes this evaluation because while an EV may appear to be equivalent to an existing fossil fuel vehicle, other user experiences, other specifications or operating capabilities are not equivalent, suggesting that it may be prudent to let the EV market further mature before purchasing.

This is exemplified with incomplete (double or single) cab pickup trucks -often equipped with a specialty bed adding significant weight- which could be replaced with an EV of a higher class (due to greater weights from more battery and power requirements to move the same amount of mass) but would not have clearance or idling ability of existing ICE vehicles. Alternatively, while cutaways (specialized incomplete chassis outfitted to carry passengers[2]) are similar classes to the challenging to electrify incomplete chassis, the EV market for these vehicles is well represented due to the proliferation of electrification in transit operations.

2.2.3 Transition Phase Recommendations

Finally, Stantec took the operational constraints paired with the EV Market Index to produce a Transition Phase for each of the County's vehicles. The summation of the Utilization Scoring Matrix (Figure 2-2) and the Market Index (Figure 2-3) produced Transition Scores with ranges shown below in Table 2-1.

The intent of Transition Phases is to strategically and gradually increase the types of vehicles eligible for transitioning to EVs. By assigning timelines to transition scores, considerable time is provided for vehicle technology to mature and adequately meet the operational needs of County vehicles.

[2] Cutaways are included in the County Fleet Conversion Plan because these vehicles are operated by the Community Services Department's Senior Services to transport passengers. While cutaways may be found in transit operations, these vehicles are separate from Atomic City Transit and the transition plan summarized in Appendix A.

Each vehicle's Transition Score determines when it becomes eligible for EV replacement. Phase 1 (2025-2035) vehicles (score < 7) can transition to EV at their next replacement, regardless of timing. Phase 2 (2035-2043) vehicles (score 7-14) become eligible starting in 2035. Phase 3 (2044-2050) vehicles (score > 14) become eligible starting in 2043. Until a vehicle reaches its phase threshold, it will be replaced with another internal combustion vehicle.

Table 2-1: Transition Phase score and timelines

Transition Phase	Transition Score Range		Timeline
Phase 1	0	7	2025 - 2035
Phase 2	8	13	2036 – 2043
Phase 3	14	23	2044 - 2050

The Transition Phase recommendation pairs with the County’s natural vehicle replacement timeline which Stantec has projected in Section 3.1 Fleet Procurement . The Fleet Procurement Plan identifies how many vehicles are expected to transition to EV each year and informs the charging infrastructure Implementation Phases.

3 Fleet Implementation Strategy

Developing an implementation strategy for the County's fleet requires integrating Stantec's vehicle Transition Phasing recommendations with existing fleet procurement timelines and policies. To adequately plan for the installation of charging infrastructure, it is important to know how many and of what type of vehicle will be charging. A replacement timeline through 2050 provides the County with necessary information to ensure charging infrastructure projects are adequately sized for future demand.

First, a replacement timeline projecting four service cycles was developed to project vehicle retirement and replacement through 2050. The first cycle relies on current vehicle conditions: age, mileage, and maintenance costs. The following cycles (two through four) use a projected service life (age in 2025 plus projected years until retirement) to estimate the subsequent retirement years. Where the projected total service life was outside the bounds of reasonable retention, the County's vehicle retention policy provided service life years, which is dependent on the vehicle type and use specified in the retention policy.

Next, Implementation Strategies were developed under two scenarios: implementation through a two EV transitions per year policy and a CAP-based policy to transition 86% of the fleet to EV operations by 2050. Both implementation strategies use the Fleet Procurement Timeline to identify total number of internal combustion engine (ICE) and electric vehicles, replaced each year as well as previously developed Transition Phases to determine which vehicles are transitioned to EV.

These scenarios provide the County with two actionable options in which to plan their EV deployments. Integrated into the ZEV Transition Dashboard, the Fleet Procurement Timeline identifies when a vehicle needs to be retired, and the Implementation Plans identify what type of vehicle (ICE or EV) to procure. The County will need to use this information to plan vehicle procurements further in advance, ensuring that infrastructure projects (Section 4) are completed before EVs are delivered.

3.1 Fleet Procurement Timeline

Currently, the County plans its vehicle replacements based on several factors including the replacement policy, fleet manager knowledge of the vehicles, and available funds. This approach serves the County well, maximizing vehicle utility, but can be improved to provide long range projections for when vehicles could be retired. Stantec took factors used by the County to determine service life into account to create a projection of when each vehicle could be expected to be retired and replaced.

Stantec's retirement year projection relies on Los Alamos' replacement policy to set vehicle retention benchmarks. Where it differs is in including allowances for retaining a vehicle longer if the total maintenance cost is currently low; below 75% of purchase price. To achieve this projection, vehicle retention benchmarks are averaged, including current age, mileage, and maintenance costs. This provides a measure of the amount of service life a vehicle has consumed and based on the age of the vehicle, an estimation of remaining service years.

Once remaining service years were estimated, a retirement timeline for the County fleet could be projected. This fleet procurement timeline represents the vehicles projected to be retired in any given year based on the service life consumed, and further projects retirements based on the total number of years a vehicle operated to consume all its service years.

This projection provides a timeline that is inclusive of transitioning about 20 vehicles a year and allows integration of Transition Phasing (as outlined in the prior section) to identify the number of EV procurements each year through 2050. This Fleet Procurement Timeline is critical to determine when the appropriate amount of infrastructure is needed to charge EVs and attempts to be more representative of the actual vehicle retention practices of Los Alamos County.

3.2 Implementation Strategies

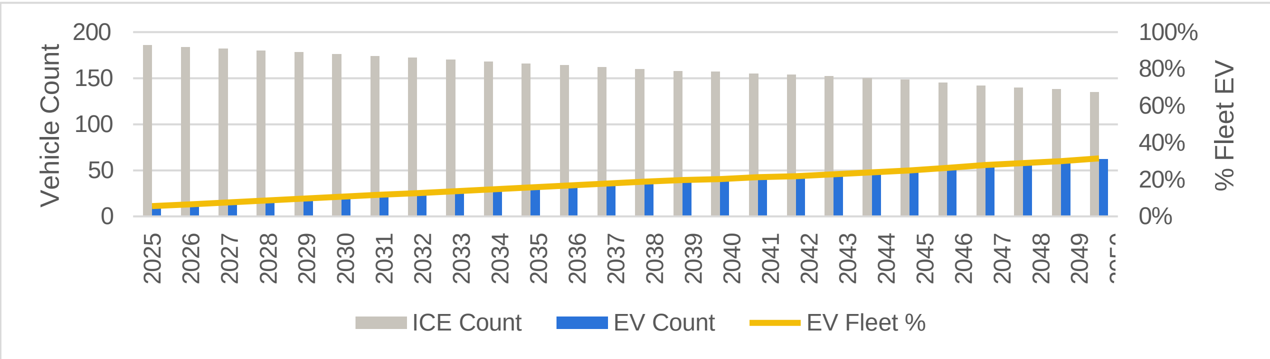
Two 25-year EV transition strategies were developed: an EV Policy plan (gradual, conservative) and CAP Policy plan (accelerated transition, aligned to meet 2050 emission reduction targets).Comparing these two strategies allows the County to balance emission reduction goals against increased capital investment, explored further in the Financial (Section 6) and GHG Emissions (Section 7) analyses.

Both strategies exclude 32 vehicles (14% of the 229-vehicle fleet) deemed infeasible for electrification due to specialized operational requirements like forest firefighting, bomb response, and fuel transportation. Due to the challenging nature of the operations completed by these vehicles, excluding them from transition ensures uninterrupted operations. Financial and GHG analyses address the full fleet, including these excluded vehicles in annual costs and emission analysis.

3.2.1 EV Policy Scenario

This Scenario (EV Policy) utilizes the County's existing EV policy of transitioning two vehicles from ICE to EV every year. The application of this policy on the procurement timeline, shown in Figure 3-1 results in a steady increase in the percentage of EVs within the County's fleet.

Figure 3-1: EV Policy Fleet Composition through 2050

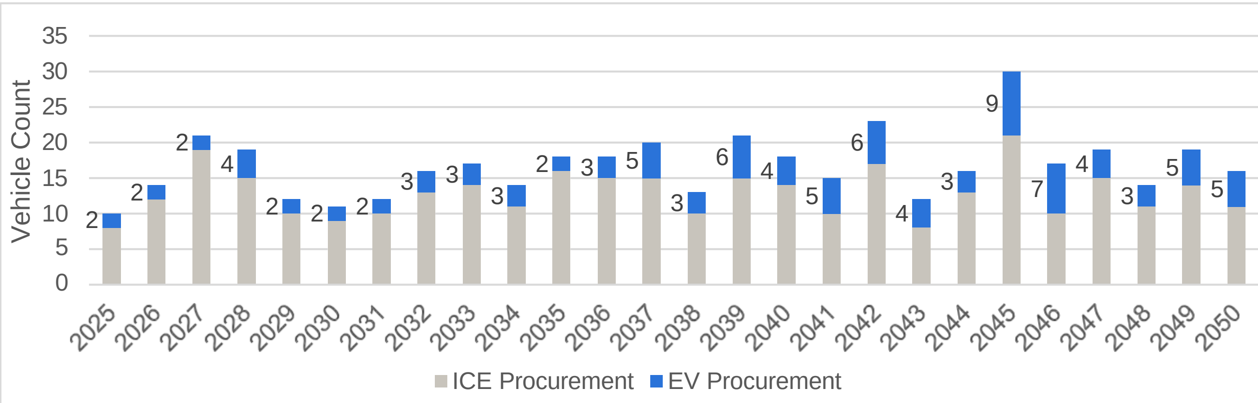


This EV implementation strategy will result in 31% (62 vehicles) of the County's fleet being transitioned to EVs by 2050; well short of the 100% carbon neutral emission goals outlined in the CAP. At a two vehicle per year transitioning rate, the County would not reach a 100% zero-emission fleet until after the year 2100.

Transition Scores (as outlined in Section 2.2) were used to determine which vehicles would be transitioned each year. Of the vehicles projected for retirement, the two with the lowest Transition Score (most suited for transition) were identified to be replaced with EVs.

Each year, the County replaces two ICE vehicles with two electric ones. As the number of EVs in the County fleet increases and older EVs wear out, they will also be in need of replacement with new EVs. Figure 3-2 shows yearly vehicle purchases, with EV purchases highlighted in yellow and labeled. This includes both new EV transitions and replacements of old, worn out EVs.

Figure 3-2: EV Policy Vehicle Procurement through 2050 (count of EV purchases labeled)



The County's oldest electric vehicles are two 2014 Ford C-Max plug-in hybrid sedans, both of which are projected to be replaced in 2028. That year marks the first instance in which more than two EVs are procured. In 2028, the County transitioned two additional vehicles to electric, while also replacing the two 14-year-old plug-in hybrids with new EVs, resulting in a total of four EV purchases for that year.

As the percentage of electric vehicles in the County's fleet increases, the number of EVs reaching the end of their useful life and requiring replacement also grows. To manage this transition in a controlled and predictable manner, the plan recommends limiting EV replacements to no more than seven vehicles per year, in addition to the two vehicles transitioned annually. This results in a maximum of nine EV purchases in any given year.

These figures represent projected vehicle acquisitions across the fleet and are intended to support coordinated vehicle replacement and infrastructure planning. To aid implementation, the County can reference vehicle-specific recommendations through the ZEV Transition Dashboard.

The EV Policy timeline provides insight into how the County's current policy influences the pace and scale of EV adoption over time. Should the County maintain this pace of transition through 2050, 31% of the fleet will be EV by 2050.

3.2.2 CAP Policy Scenario

The CAP Policy Scenario was developed using a systematic, data-driven approach to align fleet electrification with the County's 2050 carbon neutrality goal while maintaining operational feasibility. The methodology included the following components:

1. Operational Assessment: each vehicle was assessed for its suitability for transition to EV based on operational requirements and available technology. The Operational Assessment provided a Transition Score for each vehicle.

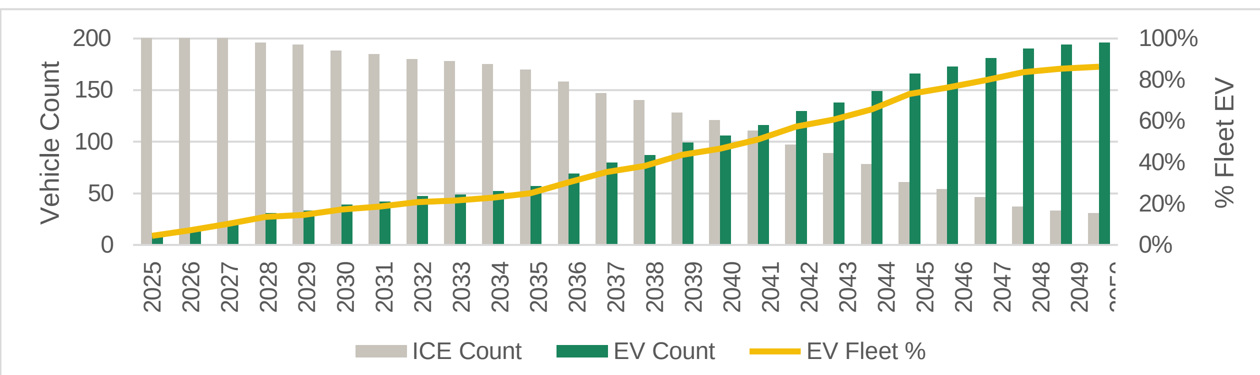
2. Procurement Timeline: the County's existing vehicle list and replacement policy were used to develop a 25-year replacement policy and project each vehicle's replacement cycles based on the fleet's utilization and maintenance data. County staff were involved in the development of this replacement plan and provided critical information on actual fleet management practices as well as approach validation.

3. Transition Phasing: Transition Scores were categorized into three Transition Phases (from easiest to most challenging to electrify), assigning a phase-of-transition to each vehicle. As each phase begins, vehicles scheduled for replacement that have a Transition Score pertinent to the first transition phase are replaced with EVs. Vehicles in more challenging transition categories are replaced with ICE vehicles early in the timeline and transitioned to EVs in later phases as technology matures.

This approach differs significantly from the current EV Policy (2 vehicles/year) by maximizing EV adoption at every natural replacement opportunity as shown in Figure 3-3. With the CAP Policy Scenario, the County would be able to transition 86% of their fleet to EVs by 2050. The remaining 14% that cannot be electrified within a 25-year timeline faces specific technical or operational barriers and were deemed infeasible for electrification due to specialized operational requirements like forest firefighting, bomb response, and fuel transportation.

While the County's CAP includes interim emission reduction targets as well as the potential for alignment with NM State transition goals, the plan uses the 2050 endpoint to provide flexibility in replacement timing. This allows the county to capitalize on technology improvements and cost reductions over the planning period.

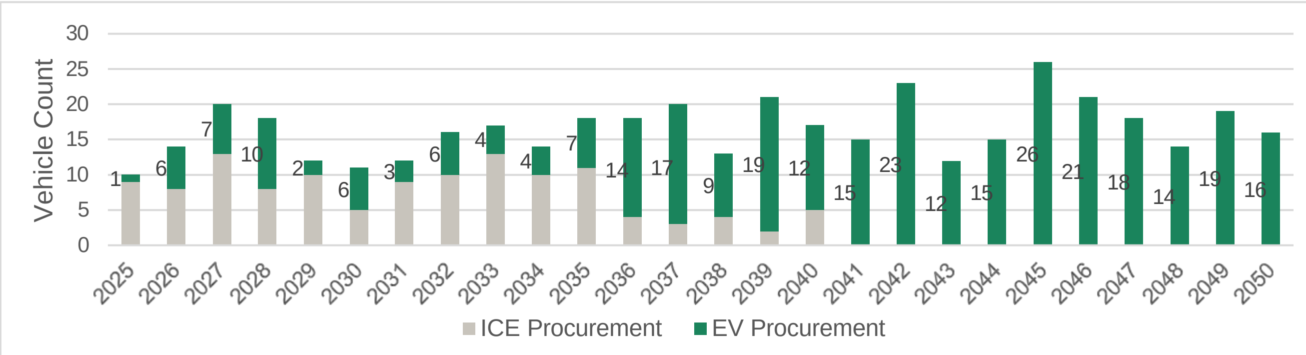
Figure 3-3: CAP Policy Fleet Composition through 2050



Using the Fleet Procurement Timeline in Section 3.1, the CAP Policy Scenario transitions ICE vehicles to EVs based on the Transition Phase Recommendations (described in Section 2.2.3) which progressively increases the variety of vehicles eligible to be transitioned to EV. Figure 3-4 above, shows the total number of vehicles projected to be procured annually and differentiates between a recommended EV or ICE procurement.

Broadly, the CAP Policy approach identifies vehicles that operationally can transition to EV and are projected to be replaced, instead of a strict quantity of vehicles or percentage of the fleet. By utilizing a phased implementation of EVs, over the 25-year timeline, vehicles that are more difficult to electrify would be replaced with ICE vehicles early and then transition to an EV in future years as technology matures.

Figure 3-4: CAP Policy Vehicle Procurement through 2050 (count of EV purchases labeled)



Critically, 14% of vehicles are not anticipated to transition within the 2050 timeline. These vehicles represent the most challenge to electrify or present the greatest risk of failure from reduced operational competency. These vehicles respond to fires, watermain breaks, and other critical, long duration operations. To consider electrifying these vehicles the County will need to take a systemic approach to determining if an EV replacement is viable. The following steps reflect the process used during the Fleet & Vehicle Analysis (Section 2):

1. Determine the EV equivalent exists,
2. Confirm the battery capacity and configurations satisfy operational requirements,
3. Assess cost feasibility.

Technology advancements will hopefully provide vehicles for all County services at attainable costs. A cost feasibility assessment is explored over the 25-year period in Section 6, but when the County assesses EV viability for the most challenging to electrify vehicles, this cost tradeoff is expected to be significant.

The next section identifies the “final buildout” EV charging infrastructure requirements for an 86% EV fleet. To align the amount of infrastructure needed as vehicles transition to an EV fleet, the County will need to determine the most appropriate implementation strategy, EV Policy or CAP Policy Scenario. Sections 6 and 7 discuss the financial and greenhouse gas reduction impacts to provide additional perspective for the County to identify a path forward.

4 Facilities Assessment and Infrastructure Upgrades

Transitioning to an EV fleet will require substantial infrastructure support and operational changes. The infrastructure assessment is a critical step in evaluating the readiness and suitability of each facility to support current and future operational needs.

This section outlines not only the quantity, phase, and location of charging infrastructure but also the coordination between the County and the Department of Public Utilities (DPU) while deploying EV supportive infrastructure. Including risk assessment, fire protection, electrical safety, and emergency response planning, this creates an integrated plan to protect personnel, property, and operations. By addressing these elements alongside site-specific conditions and phased recommendations, the Facilities Assessment provides a holistic roadmap for a safe and scalable transition to a sustainable fleet.

4.1 Infrastructure Assessment

Evaluating the readiness and suitability of each County facility to support current and future operational needs, the necessary upgrades to deploy EVs are outlined in Table 4-1. Through site visits and desktop reviews with County Staff, existing assets, deficiencies, and opportunities for charging infrastructure were identified. The analysis includes site-specific conditions, electrical capacity, parking configurations, and phased recommendations for charger installations, all designed to support a strategic and scalable transition to a sustainable fleet.

Preliminary equipment siting for chargers supporting Phase 1 (2025-2035) can be found in Appendix C while Section 4.2 discusses infrastructure timing and the tools to support County Staff to plan and successfully deploy EVs across the fleet.

Of the 21 sites included in the Fleet Conversion Study, 16 received site visits with one unplanned visit to the Aquatic Center which was not initially part of this study. This included a full walkthrough of the Pajarito Cliff Sites (PCS) which comprise PCS 1 through 5.

The following table summarizes observed conditions and relevant notes for each assessed facility, including key operational details, parking lot characteristics, and any ongoing or planned modifications. For planning purposes, all locations controlled by the County with planned charger deployments are listed and understood to be dependent on actual fleet procurements and available funding.

Table 4-1: LAC Facilities Assessment Summary with CAP Policy charging recommendations (alphabetical with White Rock locations separated)

Facility	Priority	Comments	Parking Lot Conditions	Existing Electrical Equipment	Existing Charging Plugs	Proposed Charging Phase 1 (2025-2035)	Proposed Charging Phase 2 (2036-2043)	Proposed Charging Phase 3 (2044-2050)	Power Projections (kWh)
Municipal Building 1000 Central Ave, Los Alamos • 27 light-duty vehicles o 5 EVs (2 PHEV, 3 EV) • 1 medium-duty vehicle	1	• ADA spots were added with new EV charging infrastructure. • Recommendations for charging: o Fleet charging – RFID. • Public charging – paid.	• Consistently flat, large parking lot in the center of Los Alamos.	• 225kVA transformer.	• Level 2 chargers are currently under construction. Once completed there will be (12) Level 2 handles. • (2) DCFC will be operational again with new Level 2.	• No proposed fleet charging infrastructure.	• (3) Level 2; one shared each among PW Engineering, County Assessor, and Community Development-Building.	• Six vehicles identified as take-home.	765
Mesa Public Library 2400 Central Ave, Los Alamos 1 light-duty vehicle	2	• Fleet charging – loading dock area. • Fleet vehicle used for book transport.	• Upper (public) lot graded toward main road; flattest spots are nearest to library. • Loading dock slightly graded.	• Loading Dock: 1200-amp panel, 480kVA - can support L3 for (1) fleet vehicle.	• Public DCFCs (4) handles are being implemented for use by the public as well as fleet.	• No additional proposed fleet charging infrastructure; Library Services vehicle assumed to use public DCFC.	• No proposed fleet charging infrastructure.	• No proposed fleet charging infrastructure.	300
WR Visitor Center 115 State Road #4, White Rock 0 assigned fleet vehicles	3	• Common parking lot for visitors to Bandelier National Monument. • Average visitor stay is 3–5 hours.	• Side (W) lot and back (N) lot – public parking; slight grades throughout.	• Existing 75 kVA transformer (not big enough to support additional EV Chargers),	• (2) public DCFC plugs.	• No proposed fleet charging infrastructure.	• No proposed fleet charging infrastructure.	• On-route charging for Atomic Transit located at WR Visitor Center; see Appendix A.	545
WR Fire Station #3 129 State Road #4, White Rock 0 assigned fleet vehicles	4	• Public and fleet charging planned. • Building used for council meetings; EV chargers can be placed in east lot. • Fleet includes three trucks assigned to Fire Station #4; two (Fire Marshal vehicles) can be converted to EVs.	• Side (E) lot – flat; public use. • Back (N) lot – employee and fleet parking; gated; grade not observed due to restricted access.	• 277/480 60 amps.	• No existing charging infrastructure.	• (4) Level 2 plugs shared among Fleet & Community proposed as part of Community Charging Plan.	• No proposed fleet charging infrastructure.	• No proposed fleet charging infrastructure.	40
PCS 1 101 Camino Entrada, Los Alamos • 21 light-duty vehicles • 16 medium-duty vehicles 9 heavy-duty vehicles	5	• Shared building and parking lot with Atomic City Transit. • Fleet vehicles parked on side (W) lot near building and along back (S) lot. • In winter, garage space used for snow plow trucks; common-use fleet vehicles remain outside.	• Side (W) lot – flat; rows near building for fleet use, opposite rows for Atomic City Transit. • Back (S) lot – flat; located in front of garage doors along rear of building. • Front (N) lot – employee parking; relatively flat.	• 500kVA transformer, to be replaced with 1000kVA. • 1000kVA transformer will be at full capacity for the bus chargers & defrosters. • Existing 480AMP panel, need to add another.	• 3 EVs are operated out of PCS1 and utilize Level 1 chargers plugged into a 110V wall outlet.	• (6) Level 2; one shared among Transit Division.	• (3) Level 2; two shared among Transit Division and one shared among Traffic and Streets • (4) DCFC shared among Traffic and Streets.	• (3) Level 2; two for Facilities Maintenance and one shared among Transit Division. • (12) DCFC. • Atomic Transit (not phased in this report): (9) Level 2 and (9) DCFC.	2,897
Senior Center (Los Alamos) 101 Bathtub Row, Los Alamos • 4 light-duty vehicles	6	• Back parking lot and overflow lot, behind building (S) commonly used for Senior Citizen Services vehicle parking.	• Back (N) lot – flat; suitable for EVs. • Side (E) lot – flat; contains existing ADA spots; has building entrance. • Front (S) lot – graded; less ideal for public EV	• 300kVA transformer (back of building). • 225amp panel in closet (120/208).	• No existing charging infrastructure.	• (4) Level 2; one shared and three dedicated among Senior Citizen Services.	• (2) Level 2; one shared and one dedicated among Senior Citizen Services. • (4) Level 2 plugs proposed as part	• No proposed fleet charging infrastructure.	139

Facility	Priority	Comments	Parking Lot Conditions	Existing Electrical Equipment	Existing Charging Plugs	Proposed Charging Phase 1 (2025-2035)	Proposed Charging Phase 2 (2036-2043)	Proposed Charging Phase 3 (2044-2050)	Power Projections (kWh)
2 medium-duty vehicles			charging; contains existing ADA spots; main entrance to building.				of Community Charging Plan.		
Fuller Lodge/Overflow 2132 Central Ave, Los Alamos 6 light-duty vehicles	7	• Charging location should consider where fleet is currently located.	• South lot near Central recommended for charging. Assumed close to existing electrical equipment.	• Desktop review; existing electrical unknown.	• No existing charging infrastructure.	• (5) Level 2; one plug shared among PW Custodial and four dedicated plugs.	• (1) Level 2.	• No proposed fleet charging infrastructure.	99
Justice Center 2500 Trinity Drive, Los Alamos • 52 light-duty vehicles • 2 medium-duty vehicles 1 heavy-duty vehicle	8	• Fleet charging – rear (W) lot for police. • Public charging – front (E) lot. • Initial EV deployment planned for traffic enforcement. • No EV use planned for prisoner transport. • Long-term goals include EVs for road patrol and trucks for off-road use. • Employee concerns: Some officers take vehicles home, up to 60+ miles; reduced battery performance in cold weather. • Public chargers can use Level 2 equipment.	• Side (E) lot and half of front (S) lot – flat, public use. • Side (W) lot and half of front (S) lot – flat, fleet/police use.	• 480/277kVa Main - 1200 AMP. • There is 1 spare breaker on the panel, but it's not enough to support charging. • The backup generator cannot cover EV's if power loss occurs. • Transformer on (W) corner of lot is 750kVA.	• No existing charging infrastructure.	• No proposed fleet charging infrastructure.	• (3) Level 2, LAPD Management. • (2) DCFC shared among Emergency Management. • 30 vehicles identified as take-home transition. • (10) Level 2 and (8) DCFC plugs proposed as part of Community-Wide EV Charging Plan.	• 16 vehicles identified as take-home transition. • 4 vehicles excluded from transition.	812
Eco Station 3701 E. Jemez Rd, Los Alamos • 3 light-duty vehicles • 2 medium-duty vehicles 12 heavy-duty vehicles	9	• F-150 used for travel between White Rock and this facility. • Overnight charging is acceptable at this location.	• Side (E) lot – flat; fleet vehicle parking only.	• 208/120V 3-Phase 4-Watt 400amps. • Small panel can support 1 charger. • Main Panel: 800 AMP.	• No existing charging infrastructure.	• (1) Level 2.	• (5) DCFC: four shared and one dedicated among Environmental Services.	• (1) Level 2 shared among Environmental Services. • (2) DCFC; one shared and one dedicated among Environmental Services. • One vehicle excluded from transition.	558
Ice Rink 4475 West Jemez Rd, Los Alamos 2 light-duty vehicles	10	• Vans used daily for travel between locations. • Fleet vehicles are shared with Aquatic Center depending on season • Occasionally used for towing. • Occasionally driven long distances (e.g., 350 miles to Hobbs, NM.	• Front (N) lot – flat; public use. • Side (W) lot – slight grade; public and fleet use.	• Overhead Lines - primary, transformer, Secondary (Likely won't be used for EV's, will propose a tap off the primary wires and utilize a new transformer).	• No existing charging infrastructure.	• (2) Level 2. • (8) Level 2 plugs proposed as part of Community-Wide EV Charging Plan. • Phase 1 (2025-2035) Fleet charging could depend on public infrastructure with a total of (8) Level 2 plugs supporting Fleet	• No proposed fleet charging infrastructure.	• No proposed fleet charging infrastructure.	113

Facility	Priority	Comments	Parking Lot Conditions	Existing Electrical Equipment	Existing Charging Plugs	Proposed Charging Phase 1 (2025-2035)	Proposed Charging Phase 2 (2036-2043)	Proposed Charging Phase 3 (2044-2050)	Power Projections (kWh)
						and Community needs.			
PCS 5 101 Camino Entrada, Los Alamos • 34 light-duty vehicles • 14 medium-duty vehicles 5 heavy-duty vehicles	11	• Employee concern about losing parking spaces to EVs in front (N) lot. • Client requests separate meters or cost-tracking for each department. • Back row (S of building) fully occupied by fleet vehicles by end of day.	• Front (N, NE) lots – flat; employee parking. • Back (S) lot – flat; fleet use.	• The electric room has a fixed generator. • 480/800AMPs Panel. • Transient voltage surge suppressor.	• 2 EVs are operated out of PCS1 and utilize Level 1 chargers plugged into a 110V wall outlet.	• (13) Level 2; one each shared among Water Production, Parks Maintenance, and Meter Readers, all other plugs dedicated.	• (3) Level 2. • (8) DCFC; one each shared among GSW, Water Production, Parks Maintenance, and Domestic Water.	• (13) DCFC one each shared among Water Production and Parks Maintenance. • Three vehicles identified as take-home. • Six vehicles excluded from transition.	1,839
Golf Course 4290 Diamond Dr, Los Alamos • 1 light-duty vehicle 1 medium-duty vehicle	12	• Fleet charging – RFID. • Public charging – paid. • Fleet data won't capture the new golf carts and golf course isn't open. Golf carts have separate charging area.	• Proposed Area (Near dumpster) is slanted towards building. Great spot for EV's but not within ADA requirements. • Middle row has less grade change. • Parking outside cart barn is relatively flat with existing ADA spots.	• Cart Barn: 208V, 1200 amps (likely using 400amp max). • Front corner: 300kVA - 800 amps.	• No existing charging infrastructure.	• (1) Level 2. • (6) Level 2 plugs proposed as part of Community-Wide EV Charging Plan. • Phase 1 (2025-2035) Fleet charging could depend on public infrastructure with a total of (6) Level 2 plugs supporting Fleet and Community needs.	• No proposed fleet charging infrastructure.	• (1) DCFC.	152
PCS 3 101 Camino Entrada, Los Alamos • 3 light-duty vehicles • 2 medium-duty vehicles 3 heavy-duty vehicles	13	• Facility is L-shaped. • Backup generator cannot support EV charging load. Stantec mentioned programming the generator to prioritize how energy would be distributed in case of an emergency.	• Side (E) lot – lined with garage doors; some parking for employee/fleet. • Loading dock (SE) – flat; contains two Administrative Services (warehouse) vehicles. • Common (E) lot – flat; used by LAPS buses and fleet vehicles.	• Electrical room near center of the building could support EVs, but the spaces outside would block doors. • Bottom of L (SE) has (300-1500kVA) transformer, 1600amp panel with pressure switch, 150amp panel w/ timer block heater.	• No existing charging infrastructure.	• No proposed fleet charging infrastructure.	• (1) DCFC shared among Fleet Management.	• (1) Level 2 • (1) DCFC. • Three vehicles excluded from transition.	1,387
Urban Park (Los Alamos) 2070 N Rd, Los Alamos 0 assigned fleet vehicles	14	• Electrical equipment assumed to be on N Rd, parking assumed on 42nd St.	• Norh lot may have an easier connection to utilities on Urban St.	• Desktop review; existing electrical equipment assumed on N Rd.	• No existing charging infrastructure.	• (6) Level 2 plugs proposed as part of Community Charging Plan.	• No proposed fleet charging infrastructure.	• No proposed fleet charging infrastructure.	60
Fire Station #4 (Los Alamos) 4401 Diamond Dr, Los Alamos	15	• No comments.	• Charger location dependent on preference of operators.	• Desktop review; existing electrical unknown.	• No existing charging infrastructure.	• No proposed fleet charging infrastructure.	• No proposed fleet charging infrastructure.	• No proposed fleet charging infrastructure.	75

Facility	Priority	Comments	Parking Lot Conditions	Existing Electrical Equipment	Existing Charging Plugs	Proposed Charging Phase 1 (2025-2035)	Proposed Charging Phase 2 (2036-2043)	Proposed Charging Phase 3 (2044-2050)	Power Projections (kWh)
• 4 light-duty vehicles • 2 medium-duty vehicles 1 heavy-duty vehicles								• Two vehicles identified as take-home. • One vehicle excluded from transition.	
Wastewater Treatment Plant (Los Alamos) 3598 Pueblo Canyon Rd, Los Alamos • 3 light-duty vehicles • 1 medium-duty vehicle 5 heavy-duty vehicles	16	• Vehicles shared between White Rock and Los Alamos wastewater facilities.	• Side (E) lot – flat; employee and fleet parking. • Side (NE) lot – slight grade; employee and fleet parking.	• 110amps, 500kVA transformer, 480-volt panel.	• No existing charging infrastructure.	• (1) Level 2.	• (1) DCFC shared amount Utilities – Waste Water.	• (2) DCFC. • Four vehicles excluded from transition.	242
WR Overlook Park 700 Overlook Rd, White Rock 0 assigned fleet vehicles	17	• Electrical equipment location unknown.	• Charging assumed near building.	• Desktop review; existing electrical unknown.	• No existing charging infrastructure.	• (4) level 2 plugs proposed as part of Community Charging Plan.	• No proposed fleet charging infrastructure.	• No proposed fleet charging infrastructure.	40
Airport (Los Alamos) 1040 Airport Rd, Los Alamos • 2 light-duty vehicles • 1 heavy-duty vehicle	18	• Two light- and one heavy-duty vehicles make up the Airport fleet. Light-duty vehicles could be smaller. Courtesy car (held back) could be a smaller 4 seat sedan, while the ¾ ton pick-up does snow plowing and hauling but 95% of trips could be done by golf cart. The heavy-duty pick-up plow snow and is excluded from transition.	• Charger location dependent on preference of operators.	• Desktop review; existing electrical unknown.	• No existing charging infrastructure.	• No proposed fleet charging infrastructure.	• No proposed fleet charging infrastructure.	• (1) Level 2 • One vehicle excluded from transition.	75
Nature Center (Los Alamos) 2600 Canyon Rd. Los Alamos • 0 assigned fleet vehicles	19	• No comments.	• Charging assumed in center lot.	• Desktop review; existing electrical assumed in center of parking area.	• No existing charging infrastructure.	• No proposed fleet charging.	• (6) Level 2 plugs proposed as part of Community-Wide EV Charging Plan.	• No proposed fleet charging.	20
Aquatic Center (Los Alamos) 2760 Canyon Rd, Los Alamos • 0 assigned fleet vehicles	20	• Side Lot (W, Only); Public & Ice Rink fleet, relatively flat. • Fleet vehicles are shared with Ice Rink depending on season; vehicles assigned to Ice Rink.	• Add Public charging.	• (2) 480/800 amp panels, 750kVA transformer.	• No existing charging infrastructure.	• No proposed fleet charging infrastructure. • (8) Level 2 plugs proposed as part of Community-Wide EV Charging Plan.	• No proposed fleet charging infrastructure.	• No proposed fleet charging infrastructure.	80
Atomic City Transit Center Los Alamos, NM 87544 • 0 assigned fleet vehicles	21	• No comments. • See Appendix A for further detail.	• On-route charging assumed at bus stop/layover stall.	• Desktop review; existing electrical assumed along west of parking.	• No existing charging infrastructure.	• No proposed fleet charging.	• No proposed fleet charging.	• (1) 450-kW on-route charger.	450

Facility	Priority	Comments	Parking Lot Conditions	Existing Electrical Equipment	Existing Charging Plugs	Proposed Charging Phase 1 (2025-2035)	Proposed Charging Phase 2 (2036-2043)	Proposed Charging Phase 3 (2044-2050)	Power Projections (kWh)
North Mesa Sports Complex 599 N Mesa Rd, Los Alamos	22	• No comments	• Charging assumed most convenient location.	• Desktop review; existing electrical assumed along southwest corner of parking.	• No existing charging infrastructure.	• No proposed fleet charging.	• (6) Level 2 plugs proposed as part of Community-Wide EV Charging Plan.	• No proposed fleet charging.	60
PCS 4 (LAPS) 101 Camino Entrada, Los Alamos • 12 light-duty vehicles • 28 medium-duty vehicles 23 heavy-duty vehicles (school buses)	23	• Los Alamos Public Schools (LAPS) have not expressed initial interest in transitioning; high-level analysis was included in this plan.	• Bus parking (S) – flat; adjacent to nearby transformer/panel. • Side (W & E) lots – flat; used for fleet and employee parking.	• Would tie into infrastructure proposed on PCS3. • 480AMPs panel – to be confirmed if separate.	• No existing charging infrastructure.	• No proposed fleet charging infrastructure.	• No proposed fleet charging infrastructure.	• (20) Level 2 proposed to charge support fleet. • (12) DCFC to charge school bus fleet.	0
Fire Department Training Center 132 DP Rd, Los Alamos 0 assigned fleet vehicles	24	• No comments.	• No considerations for charging.	• Desktop review; existing electrical unknown.	• No existing charging infrastructure.	• No proposed fleet charging infrastructure.	• No proposed fleet charging infrastructure.	• No proposed fleet charging infrastructure.	0
WR Library 10 Sherwood Blvd, White Rock 0 assigned fleet vehicles	25	• No comments.	• No considerations for charging.	• Desktop review; existing electrical unknown.	• No existing charging infrastructure.	• No proposed fleet charging infrastructure.	• No proposed fleet charging infrastructure.	• No proposed fleet charging infrastructure.	0
WR Senior Center 133 Longview Dr, White Rock 2 light-duty vehicles	26	• Both vehicles are grant funded.	• No considerations for charging.	• Desktop review; existing electrical unknown.	• (2) Level 2 charger.	• No proposed fleet charging infrastructure.	• No proposed fleet charging infrastructure.	• No proposed fleet charging infrastructure.	10
PCS 2 101 Camino Entrada, Los Alamos • 0 assigned fleet vehicles	27	• PCS 2 is used for vehicle maintenance but does not have any vehicles assigned.	• Not reviewed.	• Not detailed.	• No existing charging infrastructure.	• No proposed fleet charging infrastructure.	• No proposed fleet charging infrastructure.	• No proposed fleet charging infrastructure.	0
WR Wastewater Treatment Plant and Parks 580 Overlook Dr, White Rock 0 assigned fleet vehicles	28	• Fleet vehicles shared with and assigned to Wastewater Treatment Plant (Los Alamos).	• Front (SW) lot – flat; small; employee and fleet use only.	• Massive brand-new generator. • 750kVA transformer. • 277/480 1200 amps panel. • Eaton Transfer Switch. • Main panel: 100 amps. • 30kVA transformer (3-phase).	• No existing charging infrastructure.	• No proposed fleet charging infrastructure.	• No proposed fleet charging infrastructure.	• No proposed fleet charging infrastructure.	0

Not included in this study is Los Alamos National Laboratory (LANL) which has implemented significant infrastructure developments for their EV and PHEV deployments. Currently, LANL has 99 Level 2 chargers and 3 Level 3 chargers to support their 67 EVs and 110 PHEV (177 total) fleet. Most of their charging infrastructure has been deployed with ChargePoint with a few exceptions including chargers from Schneider and Leviton. As LANL moves forward with expanding their electric fleet, 14 Level 2 and 4 Level 3 chargers are planned to come online in 2025. Charging infrastructure at LANL is only for LANL Fleet and LANL employees and is not open to the public.

LAPS was involved in the development of the conversion plan but not included in the phased implementation. Review of LAPS specific data showed similar potential for electrification with school buses as "easy" to electrify but more evaluation of topography impacts are needed. The total charger count required to electrify LAPS vehicles operated out of PCS4 were included in planning. Due to the uncertainty of when LAPS vehicles will be electrified, all infrastructure is assumed to be deployed in Phase 3 (2044-2050).

Power loads associated with Atomic City Transit were also included in planning. A review of the Atomic City Transit ZE Transition Plan can be found in Appendix A. Sharing parking with PCS1, Atomic City Transit support vehicles were included in charging implementation at PCS1. Transit vehicle loads were included in projections for PSC1. Additionally, the Transition Plan identifies on-route charging at White Rock Visitor Center and Atomic City Transit Center; the power loads at White Rock Visitor Center reflect the added power requirements and are assumed to be deployed in Phase 3 (2044-2050).

Finally, as part of the Community-Wide EV Charging Plan, seven privately held locations were identified as most suitable for charging. The County is encouraged to coordinate with these entities as EV adoption increases. The table below identifies charging under the plans "high-adoption" scenario.

Table 4-2: High potential privately-owned charging locations

Location	Ownership	Level 2 Chargers	Level 3 Chargers	**Potential Charging**
Smith's Marketplace 751 Trinity Dr, Los Alamos	Private		2	150 kW
Smith's (White Rock)	Private		2	160 kW
Los Alamos Medical Center 3917 W Rd, Los Alamos	Private	16		100 kW
Los Alamos Co-Op 95 Entrada, Los Alamos	Private	5		50 kW
Los Alamos High School 1300 Diamond Dr, Los Alamos	Private	10		100 kW
Barranca Mesa Elementary 57 Loma Del Escolar St, Los Alamos	Private	10		100 kW
Wingate by Wyndham 2455 Trinity Dr, Los Alamos	Private	5		50 kW
Hilltop Shopping Center 3801 Arkansas Ave Suite B, Los Alamos	Private	2		20 kW

4.2 Infrastructure Implementation Plan

Aiming to provide the County with information, tools, and guidance on when and where to install chargers, the Infrastructure Implementation Plan aligns with fleet transition timelines and operational requirements. Charger implementation is anticipated to take 2 years for detailed site design, engineering, equipment procurement, and construction. Infrastructure deployment is intended to precede the delivery of EVs.

In conjunction with the ZEV Transition Dashboard, County Staff will need to confirm vehicles scheduled to be transitioned and then identify the site and specific location that will accommodate the charging infrastructure. The sections below outline the methodology to be followed to select and implement charging equipment across the County sites.

4.2.1 Charger Selection and Phasing

To identify the quantity and level of charging needed to support a future EV fleet, vehicle specifications were used to project the level of power needed from a charger. The underlying assumption is that larger vehicles have and will continue to have larger batteries, providing more energy to move the vehicle throughout a workday. Larger batteries require higher capacity chargers to transfer more energy over a given charging window such as dedicated level 2 (L2) or direct current fast chargers (DCFC).

Figure 4-1: Charger assignments by class & make

	Pickup	SUV	Truck	Refuse Truck	Incomplete - Single Cab	Incomplete	Cargo Van	Van	Sedan	Step Van	Cutaway	Minivan	Incomplete - Double Cab
Class 1									0				
Class 1C	0	0											
Class 1D	1	0					0	0					
Class 2												0	
Class 2E	1	1										0	
Class 2F	1	1											
Class 2G	2						1						
Class 2H	2					3	1	1					3
Class 3	3				3	3					1		3
Class 4					3						1		
Class 5			3	3	3								
Class 6			3							3			
Class 7			3										
Class 8			3	2	3								

0	L2	2-to-1
1	L2	1-to-1
2	DCFC	2-to-1
3	DCFC	1-to-1

The figure above shows the charger level and configuration based on vehicle class and body type. Charger assignments identify between shared and dedicated, as well as between L2 and DCFC infrastructure. Shared infrastructure indicates that two vehicles would share a single charger (2-to-1). At the implementation level, sharing is only between vehicles operated by the same department. Infrastructure sharing was restricted to the department level due to the complexity of cross-department coordination. Departments will still need to internally coordinate charging to ensure operational reliability.

The total charger count, and therefore the implementation timeline of charging infrastructure, depends on the County's decision between continuing with the existing two EV procurement policy (EV Policy) or pursuing a more aggressive decarbonization strategy (CAP Policy), more closely alighted with the Climate Action Plan.

Table 4-2 identifies the charging infrastructure needed to support EVs under both scenarios at County-controlled facilities and locations. For each location the table shows:

- Current baseline: existing charging handles or those currently under construction
- Phased deployment: new chargers required in each phase to support projected EV purchases under the EV Policy and CAP Policy Scenarios.

The implementation phases are intended to provide a framework for the County to plan infrastructure deployments, not prescriptive years when chargers must be available. Infrastructure implementation should precede the planned fleet procurements spanning the following periods:

- Phase 1: 2026-2035, 11 years with 25% of fleet transitioning to EV
- Phase 2: 2036-2043, 8 years with 36% of the fleet transitioning to EV
- Phase 3 2044-2050, 7 years with 25% of the fleet transitioning to EV

In addition to County Fleet charging infrastructure, Table 4-2 includes details about community-focused charging[3] and charging infrastructure for Atomic Transit.

Table 4-3: Phased charger implementation (EV Policy top row, CAP Policy second row, Community focused charging or Atomic Transit on third row), alphabetical with White Rock locations separated

Facility	Present Day Existing Handles/Plugs	Scenario	Phase 1 (2025-2035)		Phase 2 (2035-2043)		Phase 3 (2044-2050)	
			L2	**DCFC**	**L2**	**DCFC**	**L2**	**DCFC**
Airport	-	EV Policy	-	-	-	-	-	-
		CAP Policy	-	-	-	-	1	-
Aquatic Center	-	Community	8	-	-	-	-	-
Eco Station	-	EV Policy	-	1	-	-	-	
		CAP Policy	1	-	-	5	1	2
Fire Training Center	-	EV Policy	-	-	-	-	-	-
		CAP Policy	-	-	-	-	-	-
Fire Station #4	-	EV Policy	-	-	-	-	-	-
		CAP Policy	-	-	-	1	-	-
Fuller Lodge	-	EV Policy	3	-	-	-	-	
		CAP Policy	5	-	1	-	-	-
Golf Course	-	EV Policy	1	-	-	-	-	-

[3] Community focused charging detailed in the Community-Wide EV Charging Plan with application to LAC Fleet charging included in Table 4-1. Private property well suited for community charging is also included in the Community-Wide report but are not included in this report.

Facility	Present Day Existing Handles/Plugs	Scenario	Phase 1 (2025-2035)		Phase 2 (2035-2043)		Phase 3 (2044-2050)	
			L2	**DCFC**	**L2**	**DCFC**	**L2**	**DCFC**
		CAP Policy	1	-	-	-	-	1
		Community	6	-	-	-	-	-
Ice Rink	-	EV Policy	-	-	-	-	-	-
		CAP Policy	2	-	-	-	-	-
		Community	8	-	-	-	-	-
Justice Center [4]	-	EV Policy	-	-	-	-	-	-
		CAP Policy	-	-	3	2	-	-
		Community			10	7		
Mesa Public Library	(4) DCFC (in progress)	EV Policy	-	-	-	-	-	-
		CAP Policy	-	-	-	-	-	-
		Community	-	-	-	-	-	-
Municipal Building	(12) Level 2 (in progress), (2) DCFC	EV Policy	-	-	2	-	2	-
		CAP Policy	-	-	3	-	-	-
		Community	-	-	-	2	-	-
Nature Center (LA)*	-	Community	-	-	2	-	-	-
*N. Mesa Sports Complex**	-	Community	-	-	6	-	-	-
PCS1	(2) Level 1	EV Policy	2	-	2	1	3	-
		CAP Policy	6	-	3	4	3	12
		Atomic Transit	-	-	-	-	9	0
PCS3	-	EV Policy	-	1	-	1	1	-
		CAP Policy	-	-		1	1	1
PCS4	-	LAPS		-	-	-	20	12
PCS5	(2) Level 1	EV Policy	2	1	3	-	-	-
		CAP Policy	13		3	8		13
Senior Center (LA)	-	EV Policy	3	-	1	-	1	-
		CAP Policy	4	-	2	-	-	-
		Community	4					
Urban Park (LA)*	-	Community	6	-	-	-	-	-
	-	EV Policy	-	-	-	-	-	-

[4] No immediate need was identified to install DCFC chargers at the Justice Center to support fleet charging at this location. Given that the majority of police vehicles are taken home, any future DCFC at this location will provide flexibility and resiliency to the County vehicles at this location and it will help further develop a network of fast chargers across the County that can be shared with the community.

Facility	Present Day Existing Handles/Plugs	Scenario	Phase 1 (2025-2035)		Phase 2 (2035-2043)		Phase 3 (2044-2050)	
			L2	**DCFC**	**L2**	**DCFC**	**L2**	**DCFC**
Wastewater Treatment Plant (LA)		CAP Policy	1	-	-	1	-	2
White Rock Fire Station #3	-	Community	4	-	-	-	-	-
White Rock Library	-	Community	-	-	-	-	-	-
*WR Overlook Park**	-	Community	4	-	-	-	-	-
White Rock Senior Center	(2) Level 2	Community	-	-	-	-	-	-
White Rock Visitor Center	(2) DCFC	Community	-	-	-	-	-	-
		Atomic Transit	-	-	-	-	-	1 on-route
Wastewater Treatment Plant and Parks	-	EV Policy	-	-	-	-	-	-
		CAP Policy	-	-	-	-	-	-

**Community only locations, controlled by the County, not considered or used for Fleet charging.*

The recommendations above are based on a total build-out of infrastructure to support EV transition based on an EV Policy Scenario (top row of each facility) compared to CAP Policy Scenario (bottom row of each facility) for a 100% transition of the feasible vehicles by 2050. Infrastructure projects (assumed to be no more than one project per location per phase) were developed to provide the minimum level of infrastructure needed to support the vehicles transitioned in that phase. This approach aims to reduce upfront costs of purchasing chargers while maximizing those installed through shared charging within departments.

On a year-by-year- basis, charging infrastructure deployments are shown below. These deployments indicate when a facility will need charging to support EV transition; this is based on the Fleet Procurement Timeline and associated Implementation Strategies. As high-level estimates the costs below aim to give an indication of how much all-in infrastructure development could cost. This includes electrical upgrades, site work, charger, and labor costs based on the cost sheets and estimates provided by the County from its charger project at the Municipal Building.

Importantly, the tables below included charging identified in the Community-Wide EV Charging Plan (Community) for the benefit of planning and minimizing site disruption. The cost of community charging is not included in the estimated costs.

Table 4-4: Charging infrastructure cost and deployment timeline for EV Policy Scenario

	EV Policy[5]	Phase	Proposed Charging Infrastructure Location
2026	$965,682	Phase 1 (2025-2035)	PCS1 (2 L2) PCS5 (2 L2, 1 DCFC)
2027	$592,964		LA Senior Center (3 L2 Fleet, 4 L2 Community) Eco Station (1 DCFC)
2028	$855,311		Fuller Lodge (3 L2)
2030	$24,806		Golf Course (1 L2 Fleet, 6 L2 Community)
2034	$74,419	Phase 2 (2035-2043)	PCS5 (3 L2)
2035	$220,742		PCS1 (2 L2, 1 DCFC) PCS3 (1 DCFC)
2036	$49,613		Municipal Building (2 L2)
2041	$24,806		Justice Center (3 L2, 2 DCFC)
2043	$124,176	Phase 3 (2044-2050)	Fuller Lodge (1 L2)
2045	$24,806		Fire Station #4 (1 DCFC)
2047	$24,806		LA Senior Center (1 L2)

The implementation under the CAP Policy Scenario differs substantially as shown below.

[5] See section 6.1.2.4-Facility Infrastructure and Charging Equipment for cost inputs breakdown

Table 4-5: Charging infrastructure cost and deployment timeline for CAP Policy Scenario

	CAP Policy	Phase	Proposed Charging Infrastructure Location
2026	$1,252,213	Phase 1 (2025-2035)	PCS1 (6 L2) PCS5 (13 L2)
2027	$539,284		LA Senior Center (4 L2 Fleet, 4 Community) Eco Station (1 L2) LA Wastewater Treatment Facility (1 L2)
2028	$564,090		Ice Rink (2 L2 Fleet, 8 Community) Fuller Lodge (5 L2)
2030	$24,806		Golf Course (1 L2 Fleet, 6 Community)
2034	$1,106,849		PCS5 (3 L2, 8 DCFC)
2035	$655,148		PCS1 (6 L2) PCS3 (1 DCFC) Fire Station #4 (1 DCFC)
2036	$502,243	Phase 2 (2036-2043)	Eco Station (5 DCFC) Municipal Building (3 L2)
2037	$96,806		Justice Center (Fleet: 3 L2, 2 DCFC; Community: 10 L2, 7 DCFC)
2039	$24,806		Fuller Lodge (1 L2)
2040	$85,565		LA Wastewater Treatment Facility (1 DCFC)
2041	$49,613		LA Senior Center (2 L2)
2042	$195,936		Eco Station (1 L2, 2 DCFC)
2043	$1,101,197		PCS1 (Fleet: 3 L2, 12 DCFC; Atomic Transit: 9 L2)
2045	$281,501	Phase 3 (2044-2050)	LA Wastewater Treatment Facility (2 DCFC) PCS3 1 L2, 1 DCFC)
2047	$1,112,343		PCS5 (13 DCFC)
2049	$171,130		Golf Course (1 DCFC) LA Airport (1 L2)

The investment in infrastructure not only depends on deployment of EVs but also on the capacity of existing electrical equipment. Due to substantial power needs, electrical systems often need to be upgraded when deploying. Close coordination between the County and DPU will be essential, and EV charging infrastructure needs should be incorporated into general electrification plans for County facilities.

4.2.1.1 Master Planning and DPU Coordination

Developing a site-specific master plan, in the context of this planning report, involves a comprehensive, and long-term "big picture" strategy to implement charging infrastructure. The County could elect to develop master plans for each facility with multiple charger deployments to ensure cohesive facility development. The County could reduce costs on design and engineering by trenching and laying conduit during earlier stages of the project for all subsequent phases at a facility. While this approach front loads effort and cost, it efficiently deploys construction funding and minimizes disruption to County operations.

Under the CAP Policy Scenario, the following facilities would benefit from up-front master planning efforts:

- Eco Station – separate equipment deployments across all three phases. Electrical equipment should be sized for full buildout during first phase.

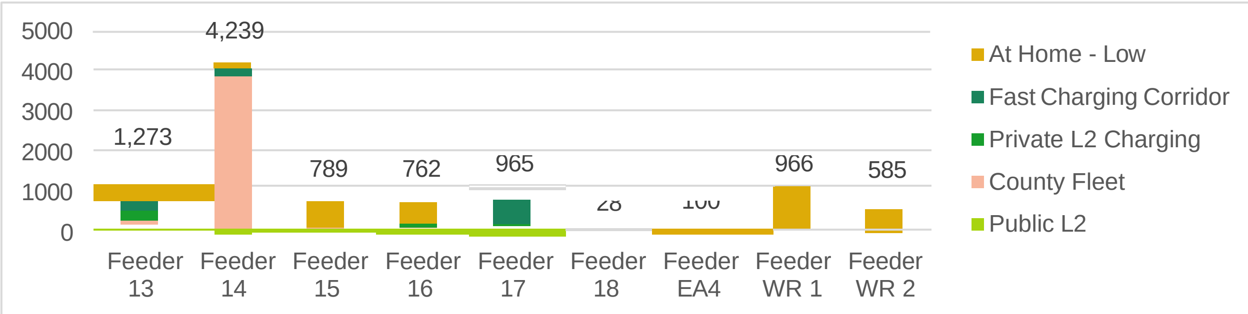
- Fuller Lodge/Overflow – Phase 1 (2025-2035) and 2 deployments; conduit should be laid for all phases, one parking stall wiring could be capped and implemented in Phase 2 (2035-2043).
- Golf Course – Fleet and Community charging should be developed as one. Electrical sized for added DCFC in Phase 3 (2044-2050) or alternative electrical equipment plan developed.
- Municipal Building – additional deployment in Phase 2 (2035-2043) required to support the 28 fleet vehicles domiciled out of the Municipal Building.
- PCS [1, 3, 4, 5] – the larger PCS facility will benefit from master planning to minimize the number of times electrical equipment needs to be upgraded. These facilities within PCS will need charger deployment coordination across all three phases.
    - PCS 1
    - PCS 3
    - PCS 5
- LA Senior Center – in addition to the 4 public charging handles, charging to support the four light-duty and two medium duty vehicles are located here. Charging deployment starts in Phase 1 (2025-2035) but final buildout is completed in Phase 2 (2035-2043).
- LA Wastewater Treatment Plant – charging expansion is required during all three Phases.

Importantly, master planning for facilities can ensure that electrical equipment (transformers, switchgear, generators, etc.) are sized for the full buildout, reducing the risk of under sizing equipment and later needing to replace and upgrade equipment.

Finally, should the County elect to develop master plans their facilities, long-range coordination with DPU would be more effective. This coordination will be critical to ensure electrical feeders have adequate capacity to provide for an increased demand from EV charging. As part of the Community Infrastructure Plan, three EV adoption scenarios for residents of Los Alamos County were assessed to help prepare DPU for the potential demand expected along each feeder.

The three scenarios below include the expected demand for County fleet charging, projected at home charging for county residents, and demand from proposed community charging locations (stations at private or public sites, and fast charging corridor). The Low-EV Adoption Scenario uses the EV-Policy Implementation Strategy to predict fleet charging demand.

Figure 4-2: 2050 Power Demand for Low-EV Adoption Scenario



For both the Medium- and High-EV Adoption Scenarios, the CAP-Policy Implementation Strategy provides the fleet charging demand.

Figure 4-3: 2050 Power Demand for Medium-EV Adoption Scenario

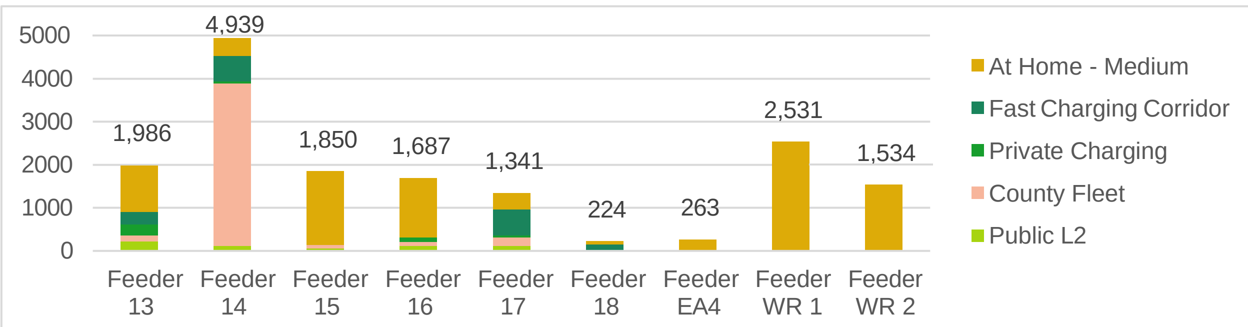
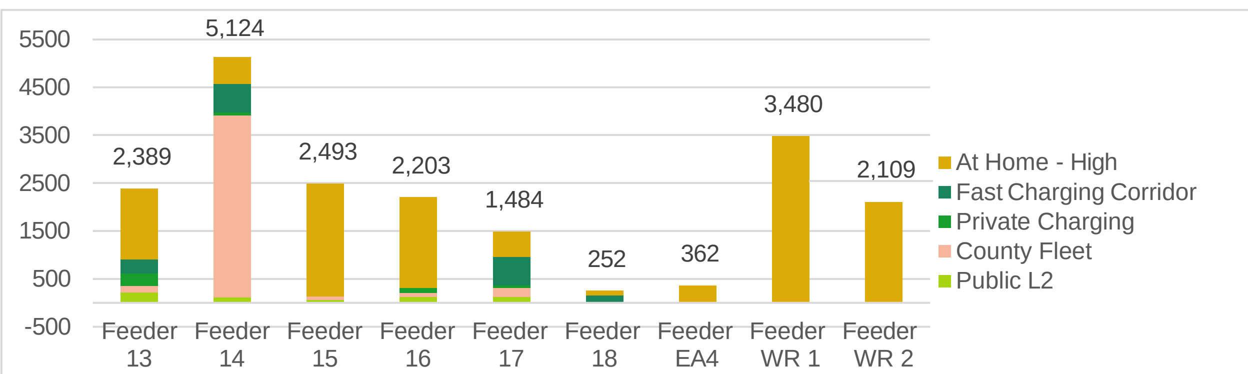


Figure 4-4: 2050 Power Demand for High-EV Adoption Scenario



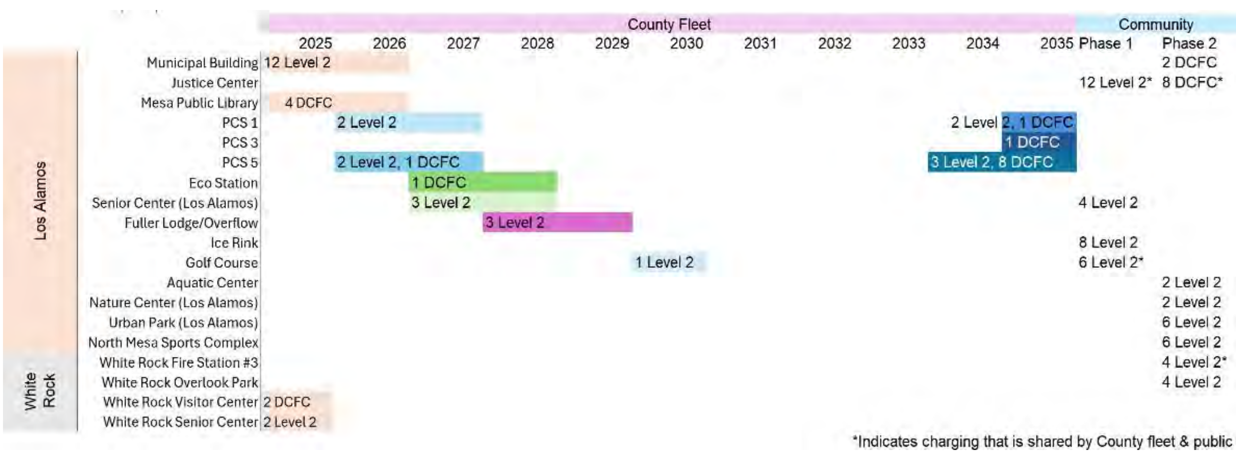
The County and DPU will need to coordinate on the EV adoption path the County plans on adopting ,as well as assess trends within public EV adoption.

4.2.2 Phase 1 Charger Siting & Deployment

As part of facility site visits and desktop review, a high-level consideration of where charging could be located was developed. Preliminary charging siting was identified for the ten County facilities with charging under the CAP Policy Implementation in Phase 1 (2025-2035). Siting of chargers was based on proximity to existing electrical equipment (to minimize trenching costs), basic understanding of site utilization and physical constraints, as well as input from County staff.

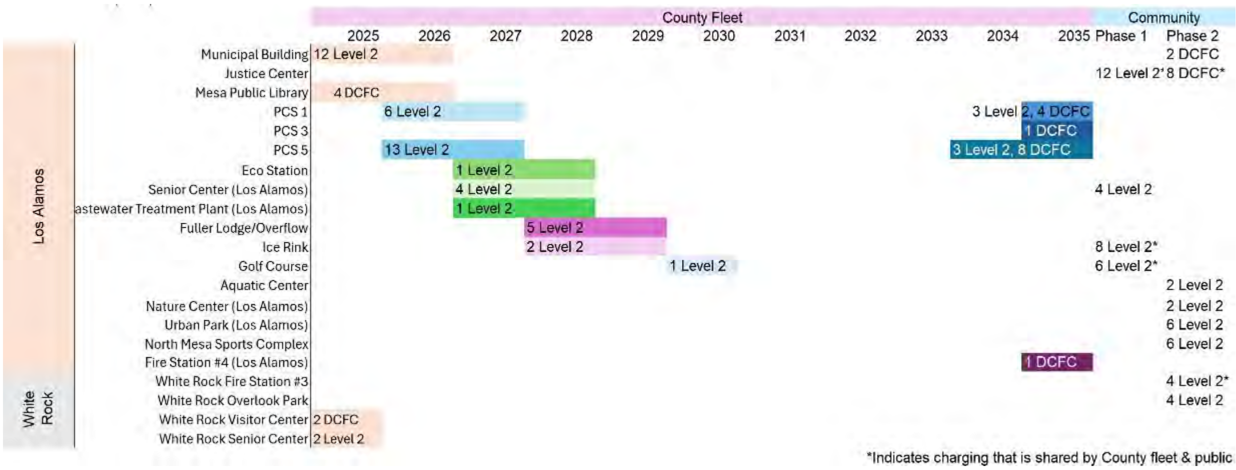
The timed deployment that corresponds to the purchase of EVs at each facility is shown below. Under the EV Policy Scenario fewer chargers are deployed. The figure below also includes public charging identified in the Community Infrastructure Plan at County facilities that have Fleet vehicles; not all public charging at County owned locations is shown below. This chart only shows facilities that need chargers to support vehicles deployed in Phase 1 (2025-2035) and is intended to help the County determine when and how many chargers are needed, across fleet and public infrastructure. Charging that could be shared between the fleet and public vehicles are indicated with an asterisk.

Figure 4-5: Fleet charging deployed in Phase 1 (2025-2035) under EV Policy Scenario with public charging by phase



Under the CAP Policy Scenario, there are more chargers required to support more vehicles transitioned.

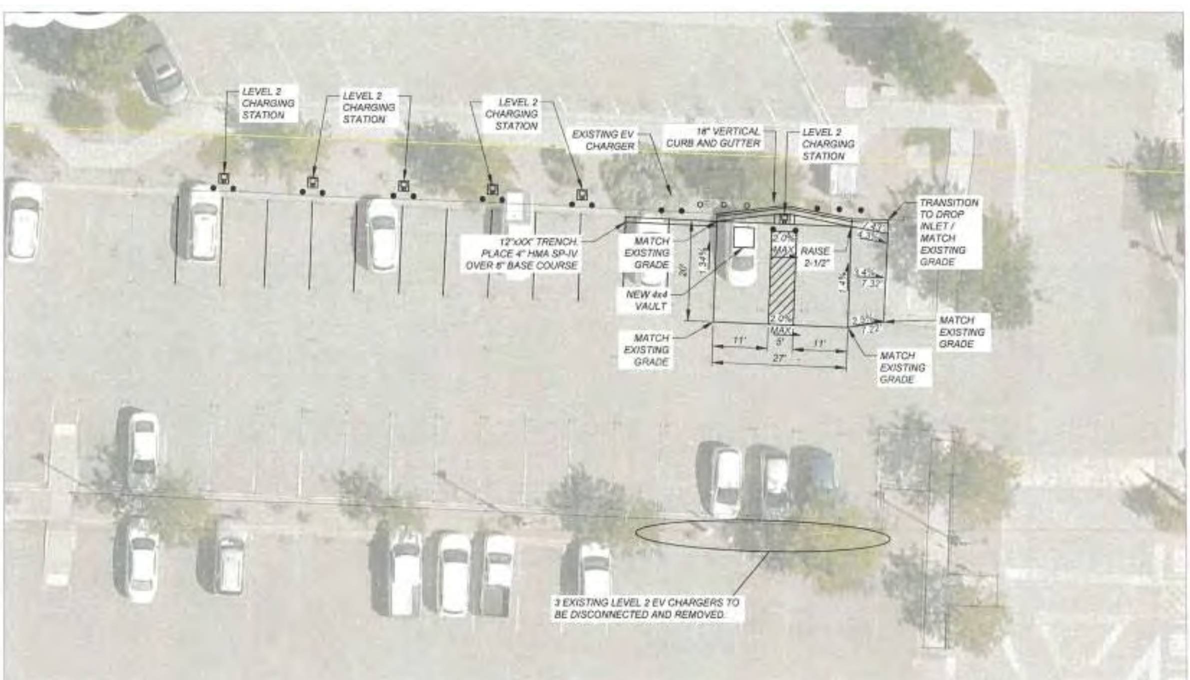
Figure 4-6: Fleet charging deployed in Phase 1 (2025-2035) under CAP Policy Scenario with public charging by phase



In addition to the timelines above, preliminary charging siting under the CAP Policy Scenario with aerial views of these facilities can be found in Appendix C with preliminary charger siting.

Importantly, preliminary charging siting developed as part of this planning document differ substantially from detailed designs. Shown in Figure 4-7 are the detailed design site plans developed for the six chargers (a total of 12 charging plugs) constructed at the Municipal Building.

Figure 4-7: Detailed design for charging at the Municipal Building



The County should pursue the development of facility-specific designs using this Conversion Plan as a framework. Each facility requires a master electrical plan that includes the phases of infrastructure installation. This approach allows the County to construct charging infrastructure incrementally while ensuring designs accommodate full buildout capacity.

4.2.3 Resiliency

To maintain power during both scheduled and unscheduled power outages, one practical approach includes using temporary mobile diesel generators, as these offer a flexible and scalable solution. A generator with sufficient capacity to run for one full day is recommended for short-term outages, while longer durations can be accommodated with additional diesel fuel storage on-site or through scheduled fuel deliveries. The anticipated outage length, local policies, and environmental regulations will influence the total fuel requirements and storage needs.

Whether a permanent or mobile generator is selected, the generator should be positioned close to its distribution panel to streamline the connection process. If the County opts for a permanent generator, protective barriers like bollards are recommended around the equipment yard for security, though mobile generator setups may allow for removable or adjustable barriers to accommodate different scenarios.

Alternatives to fossil fuel powered generators include battery backups and/or onsite solar. While these present appealing emissions reduction measures, they present space and fiscal barriers. First, battery electric storage systems (BESS) offer backup power solutions with options for peak shaving[6] schemes but can take up significant parking space. Additionally, the surface area required to produce meaningful energy to charge an EV fleet from photovoltaic solar is substantial; often acres are required, well beyond usable parking areas. Finally, the upfront costs of BESS and/or photovoltaic solar are substantial. Should the County pursue these resiliency tools, a full study of solar potential, cost benefit analyses, and emissions reductions should be completed for each site considered.

Temporary mobile generators are primarily intended for short-term emergency situations, such as imminent or actual blackouts. Backup power generation at the scale the County will need to charge a full EV fleet is substantial. It is recommended that backup power generation is acquired via a mobile generator service.

4.2.4 Take-Home Charging

Transitioning take-home vehicles to zero-emission models requires addressing residential charging infrastructure and establishing clear policies for equipment installation, energy cost reimbursement, and employee eligibility. Currently, vehicles taken home are primarily police vehicles, but Fire Department and

[6] Peak shaving is the practice of reducing electricity demand during peak periods by using stored energy or shifting loads, which helps lower costs and ease grid strain.

Electrical Distribution Departments also have vehicles taken home. The County has several strategic options to support this transition while managing costs and operational complexity.

The County could pursue one of two primary strategies for take-home EV charging. First, the County could prioritize plug-in hybrid electric vehicles (PHEVs) over BEVs and require all charging to occur at County facilities. This approach minimizes upfront infrastructure investment and maintains centralized control over charging operations. However, this strategy places significant demand on the County's fleet charging network, potentially requiring infrastructure expansion and creating scheduling constraints for employees who must charge vehicles during work hours or return to County facilities specifically for charging.

Alternatively, the County could establish a residential charging program that installs Level 2 charging equipment at eligible employee residences. This approach distributes charging demand, provides greater operational flexibility for employees, and maximizes the electric range utilization of both PHEVs and BEVs. The County should establish clear eligibility criteria including availability of dedicated off-street parking, home ownership or landlord coordination and approval, adequate electrical service capacity at the residence, and employee commitment to the take-home EV program. The County will need to determine if the charging infrastructure is owned by the County or the employee, and what policies or regulations are impacted by this. This model requires higher upfront capital investment but reduces strain on centralized fleet charging infrastructure and better supports the County's long-term electrification goals.

Regardless of the infrastructure approach selected, vehicle telematics will play a critical role in tracking energy consumption and supporting employee reimbursement for residential charging costs. Telematics-based monitoring is the preferred method for measuring electricity use because it is agnostic to charger type, charging network, or charging location—whether employees use County-provided Level 2 chargers, public charging stations, or standard 120-volt outlets. The telematics system records all charging events with corresponding energy consumption (kWh), enabling accurate calculation of reimbursement amounts. The County would reimburse employees for actual electricity consumed by applying local utility rates, which can be uploaded to the telematics platform to account for variable time-of-use pricing structures. This approach ensures transparency, creates auditable records for compliance, and avoids the administrative complexity and potential inequity of flat-rate stipends.

Successfully integrating take-home vehicles into the County's fleet transition strategy requires clear, comprehensive policy documentation and proactive communication with affected employees and the public. It is strongly recommended that the County develop a formal Take-Home Electric Vehicle Policy prior to assigning any electrified take-home vehicles. This policy should clearly define eligibility criteria for take-home vehicle assignment, restrictions on commute distance or daily mileage, responsibilities for charging equipment installation and maintenance, procedures for energy cost reimbursement and documentation requirements, allocation of infrastructure costs between the County and employee (if any), equipment return protocols upon separation or reassignment, and insurance and liability considerations. Clear policy communication will help manage employee expectations, ensure equitable treatment across departments, and establish the administrative framework necessary for successful program implementation and scaling as the County's EV fleet expands.

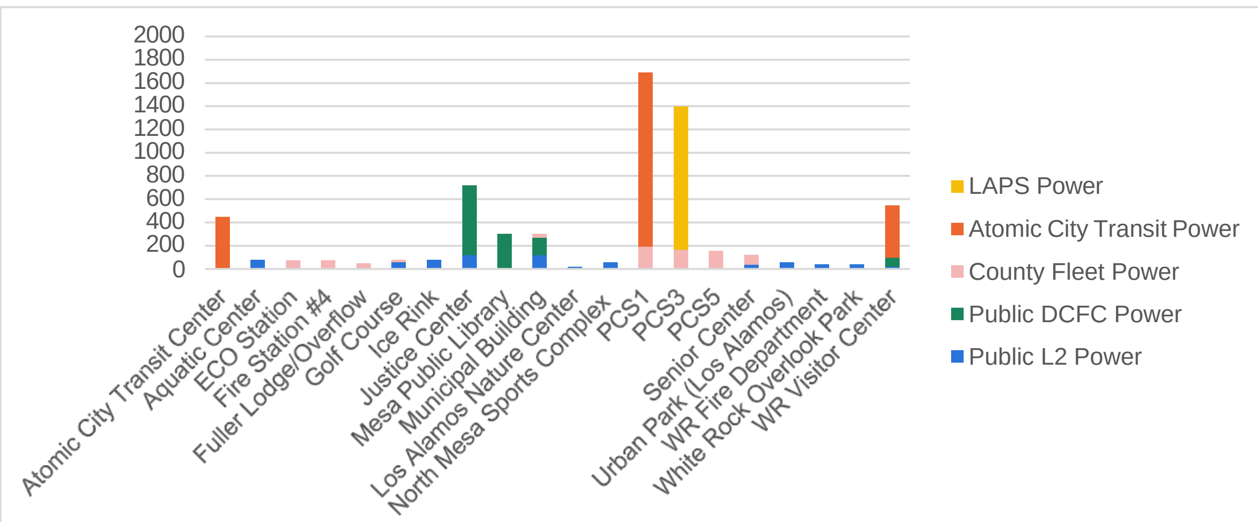
4.3 Utility Coordination

The Los Alamos County 30-Year Electrification Forecast projects substantial load growth driven by the rapid adoption of EVs, building electrification, and distributed energy technologies. The analysis, prepared by Burns & McDonnell 1898 & Co. as part of a separate report, establishes three scenarios of low, medium, and high adoption spanning residential, commercial, and fleet electrification through 2055.

The forecast supports the County's CAP target of carbon neutrality by 2050 and serves as a foundation for the 30-Year Distribution System Master Plan. The analysis examined how growing electrification will affect energy use and grid demand in Los Alamos County. It looked at expected increases in power consumption, strain on the electrical system, and future investment needs to support the transition. The scenarios were shaped by interstate policies like Advanced Clean Cars II, Advanced Clean Trucks, and the Heavy-Duty Omnibus standards, all of which aim to phase out gasoline and diesel vehicle sales by the mid-2030s.

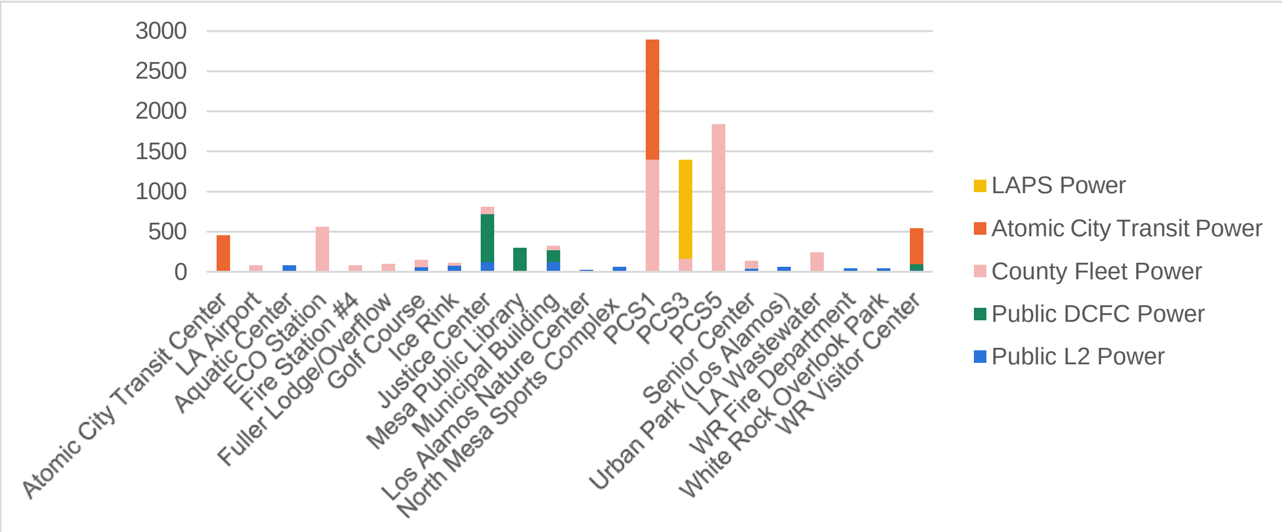
The amount of power demand from County operations from each implementation scenario are identified in the figures below. These projections include the total connected load from Atomic City Transit, which operates out of PCS 1 as it was calculated in Zero Emission Transition Plan (Appendix A), LAPS which operates out of PSC 4, and the public charging located at these facilities.

Figure 4-8: EV Policy total projected connected load (kW) by facility and type (facilities without charging anticipated not included)



The connected load from the EV Policy Scenario differs substantially from the CAP Policy Scenario as it pertains to the total connected load as shown in Figure 4-9.

Figure 4-9: CAP Policy total projected connected load (kW) by facility and type (facilities without charging anticipated not included)



The figures above (Figure 4-8 and Figure 4-9) show where the electrification of County fleet will add to the increase in demand. Under both transition scenarios, PCS1 includes the total connected load required from Atomic City Transit for depot charging. Atomic City Transit also has on-route charging located at the Transit Center and White Rock Visitor Center. These represent significant power demands due to the high, 450 kw capacity of these transit specific chargers.

In terms of infrastructure implications, the shift toward electric vehicles will steadily increase electricity demand and influence how the Los Alamos Department of Public Utilities plans future grid capacity. As more medium- and heavy-duty electric vehicles are added, power needs will become concentrated around County facilities and charging hubs. Public charging infrastructure is also expected to expand significantly: by 2040, the County may need between 65 and 217 Level 2 chargers and 6 to 8 fast chargers, growing to about 135-432 Level 2 and 12–36 fast chargers by 2055, depending on how quickly EV adoption occurs (see accompanying Los Alamos Community-Wide EV Charging Plan.)

4.3.1 Communication Infrastructure Enhancements

The transition to EVs requires upgrades to the County's communication infrastructure to support efficient charging, optimize fleet performance, and enable data-driven decision-making. Effective utility coordination for charging infrastructure extends beyond infrastructure upgrades, it requires advanced communication systems that allow fleets, chargers, and utilities to share real-time information.

Two key technology pillars in this transition are smart charging systems and fleet tracking software (telematics). Together, these tools allow for real-time coordination between vehicles, chargers, and fleet management systems while ensuring secure and reliable data transmission across departments.

4.3.1.1 Smart Charging

Smart charging refers to the integration of software, artificial intelligence, and control systems to determine when and how much charging occurs for each vehicle. Rather than charging all vehicles simultaneously, smart charging platforms strategically manage energy distribution based on factors such as time of day, number of connected EVs, state of charge (SOC), and scheduled dispatch times. This approach optimizes energy use while avoiding excessive demand charges and time-of-use utility rates.

Key benefits of smart charging include:

- Optimized dispatch readiness: Prioritizing vehicles based on route needs (e.g., charging vehicles scheduled for earlier departure first).
- Reduced utility costs: Minimizing charging during peak-rate periods to lower demand charges and overall electricity expenses.
- Grid-friendly operations: Coordinating vehicle charging to smooth facility power demand and align with utility programs.

To achieve these benefits, chargers must be capable of remote management, and the software must effectively aggregate and control them. Selecting chargers that support the Open Charge Point Protocol (OCPP) is a best practice to ensure interoperability across platforms and vendors.

The County can choose between native charging software (offered by most manufacturers) or third-party fleet charging platforms such as Synop, AMPLY Power, Siemens, and BetterFleet (formerly Evenergi). While native software often integrates seamlessly with chargers, third-party platforms often provide more robust fleet-wide insights, including real-time SOC, charging efficiency, and performance data for vehicles on route. These platforms typically involve per-vehicle subscription fees (often exceeding $100 per vehicle per month) but deliver significant operational and cost-saving advantages. Charging software helps reduce electricity costs by optimizing charging schedules to avoid peak demand charges and take advantage of lower off-peak rates. Operationally, it improves fleet reliability by coordinating charging to ensure vehicle availability, prevents overloading infrastructure, and supports better energy management across the system.

4.3.1.2 Fleet Tracking Software and Telematics

As fleets transition to EVs, fleet tracking software becomes essential for monitoring vehicle and charger performance, managing maintenance, and optimizing operations. These platforms provide real-time data on SOC, charging sessions, energy consumption, mileage, and route performance, allowing operators to make informed decisions regarding scheduling, dispatch, and maintenance planning.

Key performance indicators (KPIs) that telematics can track include:

- EV vs. non-EV miles traveled
- Energy consumption and fuel economy per mile
- EV vs. non-EV fuel/energy costs (per kWh vs. per gallon)
- Fleet availability and mean distance between failures
- Maintenance costs per mile by vehicle type

By leveraging this data, the County can compare EV performance across different routes and environmental conditions, support predictive maintenance, and calculate total cost of ownership.

Examples of leading telematics solutions include Geotab, Synop, Fleet Complete, and RouteSmart, all of which support advanced analytics for electric fleets. When selecting a telematics provider, the County should prioritize platforms adhering to ISO/IEC 27001:2013 information security standards to ensure that sensitive fleet and operational data are encrypted, securely stored, and compliant with municipal cybersecurity requirements.

4.3.1.3 Platform Integration and Scalability

To increase the value of these technologies, smart charging systems and telematics platforms must be integrated into a unified data management ecosystem. This will allow the County to monitor charging infrastructure performance, track fleet energy use, and align operational decisions with utility data.

All EV equipment should be connected to existing municipal data networks using secure, encrypted VPNs and integrated with current data collection architecture. Over time, these systems can be expanded to incorporate advanced features such as vehicle-to-grid (V2G) communications, enabling the fleet to interact dynamically with the electric grid, further optimizing energy use and cost management.

4.4 Safety Considerations

Safety is a paramount concern in the operation and maintenance of any municipal fleet, especially as new technologies introduce different risks and requirements. The transition to EVs necessitates comprehensive planning to protect personnel, facilities, and equipment. This involves conducting thorough risk assessments, developing emergency preparedness procedures, coordinating with emergency services, and implementing robust training and safety protocols.

4.4.1 Risk Assessment and Planning

Conducting a risk assessment is recommended to determine the specific equipment, protocols, and resources required to ensure the safe operation and maintenance of EVs within the County’s fleet. This assessment should account for the unique characteristics of electric drivetrains, high-voltage systems, and battery chemistries, and it will serve as the foundation for the development of detailed safety and preparedness measures. Key outcomes of this process include:

- Emergency preparedness procedures tailored to EV-specific risks, such as lithium-ion battery fires, thermal runaway events, and high-voltage electrical hazards. These procedures should integrate both preventative strategies and response protocols to minimize risk to personnel and property.
- Employee training programs for both maintenance staff and operations personnel, emphasizing safe handling practices, proper use of personal protective equipment (PPE), and protocols for responding to EV malfunctions or emergency situations.
- Engagement plans for emergency service providers, including local fire departments and other emergency responders. Early coordination will help align response procedures and possibly identify opportunities for joint training.

Regular reviews of these plans are necessary as EV technology evolves, and new vehicle models are introduced into the fleet. Regular reassessments can help the County stay aligned with industry best practices, regulatory requirements, and lessons learned from early adopters of fleet electrification.

4.4.2 Fire Protection

Lithium-ion batteries present unique fire risks due to the potential for thermal runaway. Formal codes specific to EVs and charging infrastructure are still being developed, so agencies should coordinate with local fire authorities for guidance. NFPA 855 can serve as a reference for energy storage systems, but its requirements may exceed what is necessary for outdoor EV charging areas.

Practical measures to enhance safety include:

- Coordination with the local Authorities Having Jurisdiction (AHJs), including the fire marshal and building officials, to determine additional fire protection needs.
- Installing emergency shut-off (shunt) switches to quickly disconnect power to chargers during an incident.
- Using physical barriers (bollards) to protect high-voltage equipment.
- For enclosed parking structures, consider designated “burn-out” zones for vehicles experiencing thermal events.

Additionally, fire isolator systems (e.g., EV fire blankets, aerosol suppression units) are supplemental tools and should be used to complement existing safety measures. Coordination with local fire authorities is essential to ensure compliance with evolving standards and site-specific needs. Detailed considerations for fire isolator use during thermal runaway are presented in Table 4-6 and shown in Figure 4-10.

Table 4-6: Key considerations for fire isolator use during thermal runaway

Topic	Key Considerations
Fire Risks in EV charging Areas	Most EV charging stations are outdoors, reducing fire spread risk due to open-air heat dissipation. However, parking garages, especially underground, present greater dangers because: • Limited access to firefighting equipment makes suppression more difficult. • Closely parked vehicles increase fire spread potential. • Structural integrity concerns arise from prolonged heat exposure in enclosed environments. In these locations, traditional fire suppression systems such as sprinklers are still the primary method of controlling fires, but fire isolators serve as an essential supplement to enhance protection.
How Fire Isolators Improve Safety	Fire isolators, including fire blankets and aerosol-based suppression systems, provide an additional layer of fire containment by: • Containing flames and smoke at the source to reduce the risk of fire spreading to other vehicles and structural elements. • Minimizing collateral damage to surrounding infrastructure and assets. • Enhancing firefighter response by slowing fire progression, giving responders more time to arrive and act effectively. Best practices suggest placing fire isolator kits near every 8-10 EV charging station to ensure rapid deployment in case of an emergency.

Components of a Fire Isolator System

A comprehensive fire isolator setup includes:

- EV Fire Blanket (9x6 meters) – designed to cover large vehicles, reusable up to six times, withstands temperatures up to 2,950°F.
- Aerosol Units – Deployed under the fire blanket, directly targeting the battery to reduce fire intensity.
- Fire Isolator Trolley – Allows for easy transportation of fire suppression equipment within the parking facility.
- Fire Isolator Standing Cabinet – A dedicated storage unit for quick access to fire blankets and aerosol suppression tools (See Figure 4-10).

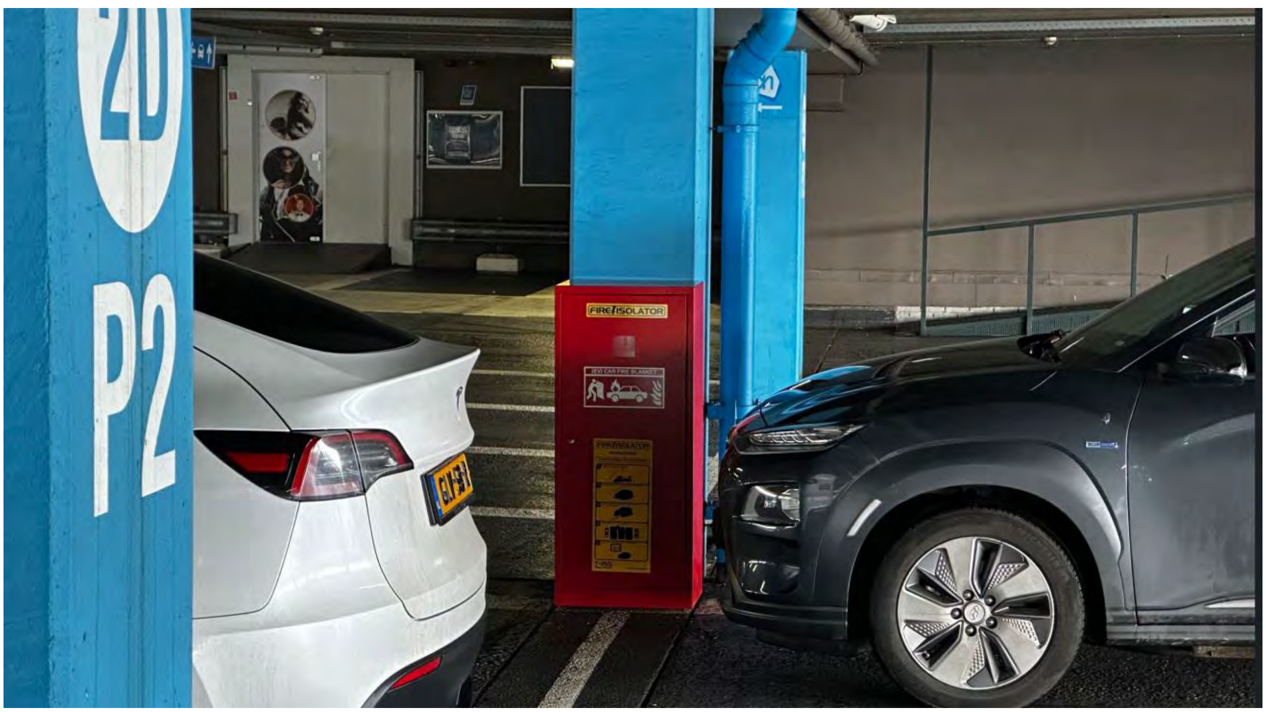
These fire suppression solutions have already been adopted by various parking garage operators worldwide, providing a proven means of reducing EV fire risks.

Implementation Considerations

While fire isolators provide valuable supplemental protection, they should be integrated alongside existing fire suppression systems, such as sprinklers and fire alarms, to increase safety in EV charging environments. In particular:

- Facilities with EV chargers in enclosed parking structures should include fire isolator stations nearby.
- Staff training is essential to ensure proper deployment.
- Clear signage and accessibility enhance emergency response efficiency.

Figure 4-10: Fire isolator cabinet



4.4.3 Electrical

Ensuring electrical safety is critical when transitioning to EVs, as the high voltage charging infrastructure introduces significant risks that are substantially different from those associated with conventional fleets. Without proper safeguards, these risks can result in serious injury, equipment damage, or service disruptions. To mitigate these hazards, a comprehensive electrical safety framework should be established that incorporates the following measures:

- Proper insulation and grounding of all high-voltage equipment, ensuring that stray currents cannot create shock hazards or damage connected systems.
- Clear signage and restricted-access barriers around high-voltage areas to limit exposure to authorized and trained personnel only. Visual warnings and lockout/tagout procedures should be standardized across all facilities.
- Routine maintenance and inspections of charging infrastructure, cables, connectors, and protective devices to detect and resolve issues.
- Strict adherence to safe power-down protocol, including disconnecting 12V batteries, removing high-voltage service disconnects and fuses, verifying zero voltage with CAT III/IV-rated multimeters, and observing OEM-specific discharge waiting periods (often up to 10 minutes).
- Emergency Shunt Switches.
- Bollards to protect equipment and users.

Beyond these core measures, training and continuous reinforcement of electrical safety practices should be prioritized for maintenance staff, operators, and emergency responders. Establishing clear standard operating procedures, reinforced through recurring safety audits and drills, will further ensure that EV operations remain safe as infrastructure scales and new vehicle technologies are introduced.

4.4.4 Personal Protective Equipment Best Practices

These recommendations reflect widely adopted best practices for personnel working with EVs and high-voltage systems. Staff involved in routine charging or high-voltage maintenance face elevated risks, including potential arc-flash events and battery-related hazards, which require enhanced PPE beyond standard automotive workplace requirements. Essential PPE includes:

- High voltage insulated gloves and tools rated to appropriate voltage levels, with gloves tested regularly for integrity to prevent electrical shock.
- Arc-flash and flame-retardant clothing designed to withstand heat and minimize burn injuries in the event of electrical discharge or battery thermal events.
- Face shields and electrical safety hooks to protect against flying debris, molten metal, and to provide safe distancing during emergency interventions.
- Foot protection designed for high-voltage environments.

In addition to providing PPE, establishing clear protocols for inspection, maintenance, and replacement of protective equipment is essential, as managed or outdated PPE can compromise worker safety. As EV adoption expands and technology evolves, PPE requirements should be reviewed and updated in alignment with OEM guidance and applicable safety regulations. Regular drills, audits, and refresher courses will help embed these practices into daily operations, creating a culture of safety around high-voltage work.

4.4.5 Ventilation

Although EVs do not emit exhaust, batteries may release hazardous gases, particularly during charging or thermal events. These recommendations reflect current best practices for areas where eVs are serviced or maintained, especially indoor maintenance facilities. For enclosed spaces, facilities should incorporate:

- Robust ventilation systems to maintain a continuous flow of fresh air.
- Gas detection systems to provide early warnings of hazardous gas accumulation.
- Regular inspections of ventilation equipment to ensure ongoing performance.

These measures help safeguard both personnel and infrastructure by reducing exposure risks and ensuring compliance with evolving safety standards. While these features are not included in the financial analysis provided in this report, they should be considered during design and planning alongside safety training and other protective measures.

4.4.6 Coordination with Emergency Responders

EV-specific incidents, such as high-voltage fires or collisions, require specialized emergency response. Establishing collaborative protocols with local emergency services is essential. Key considerations include:

- Developing incident response protocols for collisions, fires, and high-voltage malfunctions.
- Sharing critical resources, such as fleet maps, charger layouts, vehicle schematics, and safety data sheets, to streamline response logistics.
- Conduct mock emergency drills to improve preparedness and refine response strategies.

By embedding these measures into emergency preparedness planning, agencies can not only minimize safety risks but also foster confidence among employees, emergency responders, and the public in safe integration of EV technology.

5 Training and Foundational Skills

Transitioning to an EV fleet introduces new technologies, safety protocols, and operational requirements that must be supported through comprehensive workforce training. All relevant personnel, including operators, maintenance staff, emergency responders, and management, must be equipped with the knowledge and tools necessary to safely and efficiently operate and maintain the new fleet. This section outlines the training framework, key strategies, and resources to support this transition.

5.1 Training Framework and Approach

A multi-pronged training strategy should be implemented to ensure effective workforce development and long-term institutional knowledge. The following methods form the foundation of a strong training framework:

Table 5-1: Potential training methods

Plan	Description
Train-the-Trainer	Small numbers of staff are trained and subsequently train colleagues. This maintains institutional knowledge while reducing the need for external training.
Vehicle Manufacturer Training	OEM training provides critical, equipment-specific operations and maintenance information. Prior to implementing EV technology, staff work with the OEMs to ensure all employees complete necessary training.
Retraining & Refresher Training	Entry level, intermediate, and advanced continuous learning opportunities are offered to all relevant staff.
EV Training from Other Municipalities	The County and its departments leverage the experience of cities/counties who were early EV adopters and collaborate to share lessons learned during their EV transition.
Local Partnerships and Collaborations	The County can partner with local organizations, utilities, and industry groups to host workshops and training sessions that strengthen understanding of EV operations, charging infrastructure, and safety practices.
Professional Associations	Associations such as the EV Alliance[7] offer opportunities for sharing and lessons learned across government agencies. Members collaborate in many areas such as: sharing existing targets for EV deployment; working to establish a shared vision and target for EV leadership jurisdictions; creating and sharing action plans to achieve EV adoption targets; sharing data and best practices to inform target setting and planning; and encouraging and supporting additional jurisdictions to set ambitious EV targets.

Before the initial EV deployment, all staff should undergo a general orientation to familiarize them with new technology, safety protocols, and organizational expectations. This orientation supports a unified understanding of EV operations across departments.

[7] https://EValliance.org/members/

5.2 Operator Training

Operating EVs requires specialized training due to high-voltage systems, regenerative braking, and energy management requirements. The following recommendations reflect current best practices to improve vehicle range and use regenerative braking efficiently.

5.2.1 Operator Training and Skill Development

The handling of electric power systems, regenerative braking, and energy-efficient driving techniques include some unique features of operating EVs. Operators will need to develop proficiency in energy management, maximizing vehicle range through efficient driving practices, managing state-of-charge throughout shifts, and understanding how acceleration and deceleration impact battery life. Familiarity with charging protocols will be essential, including the operation of charging infrastructure, managing charging schedules, and understanding fast-changing requirements. Operators must also be aware of protocols for safely connecting and disconnecting high voltage charging systems for emergency shutoff procedures to disable a vehicle safely in the event of an incident.

Additionally, basic diagnostic awareness will be crucial, as it enables operators to recognize and respond to diagnostic alerts, allowing for proactive issue reporting that helps minimize vehicle downtime.

5.2.2 Adjustments to Operational Schedules

Electric vehicles often have different operational ranges and charging needs compared to conventional vehicles, impacting how daily schedules and routes are managed. Operations personnel will need to adapt in areas including:

- Route Planning and Range Management: Since EVs are limited by battery range, route planning will increasingly depend on factors like distance, elevation, and availability of charging stations. Operational teams will need to coordinate route assignments based on real-time charge levels and charging station accessibility.
- Charging Time Allocation: Charging times, especially during peak demand periods, will require scheduling adjustments to ensure that the vehicles are ready for deployment without delaying operations. Strategic midday, or opportunity, charging intervals may also need to be integrated into shift planning.
- Reduce Idle Times: Unlike combustion vehicles, EVs don't require idling to keep engines warm, which necessitates adjustments in fleet dispatch and staging areas. New policies will emphasize energy conservation by reducing unnecessary power draw when vehicles are stationary.

Adapting operations to these factors will require not only new scheduling and routing practices but also stronger reliance on data-driven decision-making. Telematics systems and communication technologies (see Section 4.3.1) can provide real-time visibility into vehicle status, battery charge, and route conditions, enabling dispatchers to make timely adjustments and optimize fleet performance.

5.2.3 Impact on Operational Staffing Needs

EV adoption may influence the allocation of operational staff. For instance, fewer support staff may be needed for fueling logistics, while additional staff may be required for managing charging operations, scheduling, and performance monitoring. These roles may be combined with other dispatch responsibilities or developed as specialized positions.

Since EVs provide continuous data on energy usage, charge levels, and vehicle health, operations staff may require new data analysis skills to interpret this information and make data-driven decisions. Real-time monitoring can help prevent battery degradation and increase vehicle utilization.

Operations personnel will need specialized training on handling EV-specific emergencies, such as battery fires, which require safety protocols. Operations teams will need to develop a health and safety framework, ensuring that operators are equipped with necessary protective equipment and are trained to respond to potential hazards. Protocols should educate operators on high-voltage risks and offer safe handling guidelines. As new EV models are introduced, operational protocols and best practices may shift, and the County's operations would benefit from regular training and protocol updates, collaboration with manufacturers, and utilizing newer training programs.

5.3 Maintenance Training

As the County transitions to an EV fleet, ensuring a robust and well-trained maintenance team will be crucial. With EVs, the maintenance landscape shifts significantly through the upkeep of electric-specific components. Maintenance staff must be skilled in both foundational electrical tasks and complex system management, adapting to the unique demands of electric propulsion, energy storage systems, and charging infrastructure.

5.3.1 Safety Protocols and Foundational Skills

Safety is paramount when working with high-voltage systems and large lithium-ion batteries. Mechanics should be trained in handling high-voltage components, batteries, and chargers, as well as understanding specific safety protocols to mitigate risk during inspections and repairs. Essential skills include:

- Reading and interpreting wiring diagrams.
- Safely handling and testing high-voltage batteries.
- Troubleshooting and repairing basic circuit faults.
- Demonstrating proficiency in the use of digital multi-meters.
- Repairing wiring and terminals to prevent faults.

It will be critical for mechanics to operate under defined procedures to ensure safe practices and avoid damage to batteries and components during maintenance. Procedures can include properly de-energizing batteries, potential hazards associated with batteries, and emergency preparedness in the event of thermal runaway and the release of flammable or toxic gases.

Creating a safe work environment for high-voltage EV maintenance begins with the implementation of safety barriers and warning signage. Work areas should also be enclosed using high-visibility tape, barricades, or designated high-voltage work zones to prevent unauthorized access and accidental exposure to electrical hazards. Additionally, warning signs must be placed at all entry points, clearly indicating potential dangers such as high voltage, restricted access, and required protective equipment. These measures serve as constant visual reminders for technicians and help maintain a controlled and hazard-free workspace.

Compliance with occupational safety standards is another essential aspect of high-voltage EV maintenance. Facilities must adhere to regulatory requirements, and OEM-specific safety protocols to ensure proper handling of EV systems. To maintain a high level of safety, organizations should conduct regular safety audits, risk assessments, and continuous training for personnel to keep them updated on evolving best practices and compliance measures. Furthermore, despite safety precautions, emergency preparedness is critical, as high-voltage accidents can be severe. Isolating the power source using emergency shutdown procedures and providing first aid for electrical injuries are essential. To see further safety considerations for high-voltage systems, including proper power-down procedures, voltage verification, and mandatory discharge times, refer to below.

Table 5-2: Safety protocols for EV maintenance

Procedure	Steps and Key Considerations
Safe Power Down and Isolation of High-Voltage Systems[8]	Ensuring a safe working environment when servicing EVs begins with proper high-voltage isolation procedures. Each manufacturer may have specific protocols, but the general steps include: • Disconnect the 12V Battery: This prevents accidental activation of the high-voltage system. • Locate and Remove the High-Voltage Service Disconnect: Each EV has a designated service disconnect that must be removed following OEM guidelines. • Remove High-Voltage Fuses: To ensure the circuits carrying high voltage are completely disconnected. • Isolate the High-Voltage Battery: This may require specialized tools and physical disconnection of key connections as outlined in the manufacturer's service manual.
Verification of Zero Voltage	Before beginning any maintenance on high-voltage components technicians must confirm that the system is fully de-energized: • May use a CAT III or CAT IV-rated digital multimeter designed for high-voltage measurement. • Measure across battery terminals and high-voltage cables to ensure no residual charge remains. • Confirm zero potential across all high-voltage points to prevent electrical shock risks.

[8] https://stedmansgarage.co.uk/electric-vehicles/high-voltage-ev-safety/

Procedure	Steps and Key Considerations
Mandatory Waiting Periods for System Discharge	Even after power is disconnected, high-voltage components can retain electricity due to capacitors and energy storage elements. To ensure full discharge: • A waiting period of up to 10 minutes is typically required after disconnecting power, though OEM recommendations may vary. • Follow manufacturer-specific guidelines for discharge times, as some EV models may require longer periods.

5.3.2 Advanced System Proficiency

The next layer of training focuses on multiplexing skills, which streamline vehicle electrical systems and replace extensive hard wiring. This skill set includes reading ladder logic diagrams, troubleshooting with LED indicators, and understanding input and output electrical symbols, which are critical for efficient fault resolution.

In addition, maintenance staff will require specialized skills in electronics, as nearly all systems in EVs are controlled by advanced electronic devices. Training in electronic maintenance includes:

- Inspecting and testing capacitors, diodes, and other modules.
- Differentiating between analog and digital signals.
- Understanding data communication protocols.
- Proficiency in using oscilloscopes and graphing multimeters.
- Troubleshooting gateway modules and understanding (Direct Current) DC and AC systems.

Equipping personnel with these capabilities will also necessitate access to specialized diagnostic and testing equipment, ensuring that staff can accurately identify faults and perform safe, effective repairs on complex EV systems.

5.3.3 Energy Storage and Propulsion Systems

The Energy Storage Systems (ESS) requires ongoing monitoring, diagnostics, and preventive care to ensure the longevity and performance of EV batteries. Maintenance staff will be trained in:

- ESS management hardware and software, focusing on maintaining optimal battery health.
- Safe practices for handling, storing, and disposing of high-voltage batteries.

Troubleshooting and servicing electric propulsion systems and other balance-of-plant elements are critical for reliable vehicle operation. Amid the shift to EVs, ensuring a robust and well-trained maintenance team will be crucial. With EVs, the maintenance landscape shifts significantly, placing greater emphasis on high-voltage safety protocols, advanced diagnostics, and the upkeep of electric-specific components. Maintenance staff must be skilled in both foundational electrical tasks and complex system management, adapting to the unique demands of electric propulsion, ESS, and charging infrastructure.

5.3.4 Diagnostic Systems and Preventative Maintenance

EVs come equipped with sophisticated onboard diagnostic systems that alert maintenance teams to performance issues, ensuring quick identification and repair of faults. Technicians will need to be trained to use onboard diagnostic systems effectively, interpreting alerts to prevent potential downtime. They will also need to implement preventative maintenance protocols for both buses and smaller fleet vehicles, focusing on high-wear components like brakes and HVAC systems, which experience reduced wear but still require consistent monitoring and servicing.

Early data suggests that EVs may require less reactive maintenance than combustion vehicles due to having fewer moving parts; however, long-term evidence specific to large-scale heavy-duty fleet deployment in North America remains limited.

In terms of preventative maintenance, EV propulsion systems are inherently more efficient than ICE engines and involve approximately 30% fewer mechanical parts. Key considerations include:

- Fluids – EVs eliminate the need for oil changes, transmission fluid replacements, and exhaust system maintenance due to their simplified drivetrains.
- Braking – Regenerative braking reduces wear on brake pads, though early transit data shows maintenance costs remain concentrated in the cab, body, and accessory systems. It is recommended that OEMs provide detailed preventative maintenance schedules, skills, and parts lists for EV compounds.
- Batteries – Battery systems introduce new requirements, such as monitoring thermal regulation and state of health, which demand periodic servicing.
- Tires – Increased vehicle weight and instant torque can accelerate tire wear, adding costs compared to ICE fleets.

Telematics further supports preventative maintenance by providing continuous monitoring of battery health, high-voltage system performance, motor temperatures, and component stress. Alongside regular diagnostic scans, inspections, preemptive replacement of high-wear parts, and calibration of electrical and mechanical systems, telematics allow maintenance to shift from time- or mileage-based schedules toward precision targeting of emerging issues.

In practice, battery health monitoring could replace traditional oil checks, thermal system diagnostics could substitute for coolant changes, and system performance tracking could stand in for many mechanical inspections, marking a significant evolution in maintenance philosophy.

5.3.5 Charging Infrastructure Maintenance

Maintenance of charging infrastructure will also be essential to fleet operations. Technicians will be responsible for diagnosing and repairing charging equipment to maintain reliable operations, and preventative care for chargers, with a focus on components prone to wear from high-frequency usage, as well as managing updates to smart charger software to ensure compatibility and performance.

As operations transition to EVs, decisions regarding the maintenance of charging infrastructure are equally critical as those related to vehicle servicing. Both in-house and outsourced approaches to managing charging infrastructure present distinct trade-offs that impact cost, reliability, and operational control.

5.3.5.1 In-House Maintenance

Maintaining charging infrastructure internally provides the highest degree of operational control. Technicians can address issues quickly, incorporate preventative maintenance into regular service schedules, and build organizational expertise that will be valuable as infrastructure expands. This approach also reduces dependency on third-party contractors and aligns with a preventative maintenance model, minimizing downtime through routine inspections, diagnostics, and component replacements.

However, it requires upfront investment in staff training, electrical safety certifications, and potentially specialized diagnostic tools. Agencies may also need to plan for dedicated space and resources to safely support this work.

5.3.5.2 Outsourced Maintenance

Outsourcing charging infrastructure maintenance can reduce internal workforce and training requirements, making it attractive for agencies with limited technical capacity or smaller deployments. Specialized service providers may also offer advanced diagnostic tools, direct OEM support, and warranties that simplify maintenance planning.

The downside, however, is reliance on external contracts, which can introduce higher long-term costs and slower response times if issues arise during critical operational periods. Outsourcing also limits the opportunity for agencies to build internal expertise, potentially creating knowledge gaps as infrastructure scales.

5.3.5.3 Key Considerations

Most fleet operators find a hybrid approach to be the most effective: handling routine inspections and basic preventative tasks in-house while relying on OEMs or specialty providers for complex or warranty-covered repairs. This balances responsiveness and institutional learning benefits of in-house maintenance with the technical expertise and risk management offered by external service providers.

5.3.6 Ongoing Training and Certification

Given the evolving nature of EV technology, ongoing training will be critical to keep maintenance staff up to date on the latest practices and equipment. The County's maintenance team should undergo regular training sessions covering critical topics, including high-voltage systems, safety protocols, and advanced diagnostics, as well as periodic refresher courses and certification renewals to stay current.

Once vehicles are out of general warranty, the County should document inspection and repair protocols, supplementing OEM manuals with real-world insights gained from fleet operations. Maintenance intervals will be aligned with OEM recommendations, but staff should monitor and adapt routines as necessary, refining them based on observed EV performance characteristics.

5.4 Manufacturer Training Programs

OEM-specific training programs provide critical equipment-based instruction. Examples of existing EV manufacturer training programs are summarized below.

1. **General Motors**[9]: General Motors (GM) offers the Automotive Service Educational Program (ASEP) which is designed to train participants in diagnostic and repair techniques on current and future GM vehicles. It is an accredited apprenticeship program, that partners with colleges and technical schools across the US. Training takes about 2 years as an Associate of Applied Science, aincludes:
    a. Engine repair
    b. Heating and air conditioning
    c. Manual drive train and axles
    d. Suspension and steering
    e. Automatic transmission/transaxles
    f. Brakes
    g. Electrical systems
    h. Engine performance

2. **Ford Motor Company**[10]: Ford Motor Company (Ford) offers the Automotive Student Service Educational Training (ASSET) program which includes a curriculum specifically for EVs. The program is a collaboration between Ford, Ford and Lincoln dealers along with community colleges and technical schools. The training is in-person and hands-on with the goal of providing Ford customers with technicians highly trained in Ford service technologies and diagnostic and repair methods. The Ford EV curriculum includes courses on:
    a. High voltage systems safety
    b. Hybrid vehicle components and operation
    c. Battery electric vehicle components and operation
    d. High voltage battery service
    e. Hybrid and electric vehicle operation and diagnosis

3. **Tesla**: Tesla offers two training programs, including the Tesla START[11] and the Tesla Independent Repair Training Program.[12] Tesla START provides training to develop technical expertise and earn certifications through in-class theory, hands-on labs, and self-paced learning. It is a four-year program where participants receive all levels of provincially accredited technical

[9] https://www.gm.ca/en/home/careers/asep.html
[10] https://media.ford.com/content/fordmedia/fna/us/en/news/2022/06/06/ford-technician-training-programs-new-locations.html
[11] https://www.tesla.com/en_ca/careers/tesla-start
[12] https://service.tesla.com/docs/Public/training/

training and on-the-job training needed to take the Red Seal Examination.[13] Tesla START partners with colleges across the West including: Rio Hondo College (Los Angeles, CA), Evergreen Valley College (San Jose, CA), Texas State Technical College (Waco & Rosenburg, TX), and Lincoln Tech in CO.

The Tesla Independent Repair Training Program is geared towards technicians and repair shops interested in servicing Tesla vehicles. Training modules include:

a. Tesla introduction: basic repairs and maintenance
b. High voltage and electrical systems
c. Infotainment and driver assist systems
d. Body controls, thermal, and chassis systems
e. Closures and glazing
f. High voltage, electrical system, and Noise, Vibration, and Harshness diagnosis

The County will need to strategically decide how to pair maintenance staff with OEM training as their EV fleet grows.

5.5 Emergency Responder Training

As mentioned in Section 4.4.6, proactive coordination with emergency services is critical. Firefighters, paramedics, and other first responders should be trained to manage EV-related incidents safely. Training should include:

- High-voltage Awareness: Identifying and managing EV battery risks.
- Battery Fire Protocols: Handling thermal runaway events using fire isolators, water, or approved extinguishing agents.
- Deactivation Procedures: Safely powering down vehicles to prevent unintended discharge.
- Mock Incident Response: Simulated scenarios to practice EV collision and fire response.

Los Alamos County should provide responders with up-to-date maps, schematics, and safety data sheets and host recurring training sessions to refresh and update response protocols.

[13] Automotive service technicians require a Red Seal License in Canada.

6 Financial and Budget Analysis

The financial evaluation of the County's EV transition consisted of the modeling of three cases through a 2050 horizon:

1. ICE-only Case: the 'business-as-usual' scenario and assumes the continued use of the current County fleet. At the time of retirement, ICE vehicles will be replaced with another ICE vehicle.
2. EV Policy: maintains the County's current EV procurement practices of transitioning two (2) vehicles to EVs each year.
3. Climate Action Plan (CAP) Goal: aligns with the County's goal of achieving 80% carbon neutral operations by 2050. Through the 25-year timeline, 86% of the County's eligible fleet vehicles are transitioned to EV.

The ICE-only case and EV Cases are used for illustrative purposes to determine the comparative financial impacts of a transition to an EV fleet compared to business-as-usual. This in turn can provide insight into budget and funding requirements for capital and operating costs.

The financial modeling process is comprised of several steps. First, Stantec worked with the County to collect all relevant financial data including vehicle purchase prices, vehicle mileage, vehicle maintenance costs, and fuel costs. The data, coupled with industry research, was used to determine the model inputs. After the model inputs were complete, costs were projected year by year through 2050 using inflation rates and energy price trends[14] where applicable. The financial modeling is expressed in the year of expenditure.

It is important to understand the inherent limitations of financial modeling due to assumptions about costs, operations, asset life cycles, and other factors that are difficult to predict. Additionally, it is important to note that the categories modeled are focused on the impacts of a change in propulsion type. They do not account for service delivery costs (such as operator salaries) as these costs would be largely comparable in all scenarios.

6.1 Financial Model Inputs

The financial model consists of several inputs that can largely be divided into fleet and cost information. The fleet inputs include vehicle useful life, vehicle mileage, and fuel efficiency. Cost inputs includes vehicle purchase costs, vehicle maintenance, fuel, and charging infrastructure. All inputs and assumptions are described in more detail below.

[14] Energy price projections sourced from U.S. Energy Information Administration (EIA), Annual Energy Outlook https://www.eia.gov/outlooks

6.1.1 Fleet Inputs

To support financial modeling, a set of commonly used fleet vehicles was identified based on body type and duty classification. This selection reflects the overall fleet composition and enables consistent application of financial inputs across vehicle types. Seven vehicles were chosen to serve as representative models for the analysis, summarized in Table 6-1.

Table 6-1: Representative Vehicle groups and most common fleet vehicle

Vehicle Duty	Class	Representative ICE Vehicle	Representative EV
Light-duty Vehicle 1 (LD1)	2E, 2F, 2G	Ford F-150	Ford F-150 Lightning
Light-duty Vehicle 2 (LD2)	1D, 2E	Ford Explorer	Ford Mustang Mach-E
Medium-duty Vehicle 1 (MD1)	2H, 3	Ford F350	Zeus Z-19
Medium-duty Vehicle 2 (MD2)	2H	Ford F-250	Unavailable
Heavy-duty Vehicle 1 (HD1)	6,7	Kenworth T270/T3 Series	Kenworth K270E
Heavy-duty Vehicle 2 (HD2)	8	Peterbilt 520	Peterbilt 520 EV
Heavy-duty Vehicle 3 (HD3)	8	International SA537	Kenworth T880E

In addition, Table 6-2 shows a breakdown of LAC's fleet vehicle duty classifications. Using information collected though the National Highway Traffic Safety Administration[15], each vehicle's VIN (vehicle identification number) was decoded to provide weight and body specifications. Depending on the configuration of a vehicle, the make and model may be included in multiple duty categories.

Table 6-2: LAC Fleet vehicle duty classification

Vehicle Duty	LAC Fleet Vehicle	Total Vehicle Count
Light-duty Vehicle 1 (LD1)	• CHEVROLET / Silverado • DODGE PICKUP / 1500 • FORD / F-150 • FORD / Ranger • NISSAN / Frontier	61
Light-duty Vehicle 2 (LD2)	• CHEVROLET / Bolt EV • CHEVROLET / Malibu • CHEVROLET / Tahoe • CHEVROLET / Traverse • CHEVROLET / Uplander • DODGE / Durango • DODGE / Grand Caravan	78

[15] https://www.nhtsa.gov/vin-decoder

Vehicle Duty	LAC Fleet Vehicle	Total Vehicle Count
	• ELDORADO AMERIV / Grand Caravan • FORD / Crown Victoria • FORD / Escape • FORD / Expedition • FORD / Explorer • FORD / Mustang Mach-E • FORD / Taurus • FORD CARGO VAN / Transit • FORD C-MAX / C-Max • JEEP / Grand Cherokee • JEEP / Renegade • TOYOTA / Camry	
Medium-duty Vehicle 1 (MD1)	• CHEVROLET / Silverado • CHEVROLET / Silverado HD • FORD / E-350 • FORD / E-450 • FORD / F-350 • FORD / F-450 • FORD / F-550 • FORD S/D / F-550 • ISUZU / NQR/NRR • ISUZU / NRR	41
Medium-duty Vehicle 2 (MD2)	• CHEVROLET / Express • DODGE CREW CAB / 2500 • FORD / E-350 • FORD / F-250 • FORD / F-350 • FORD / Transit • RAM / 2500	33
Heavy-duty Vehicle 1 (HD1)	• FREIGHTLINER / FL70 • FREIGHTLINER / MT 55 Chassis • GMC / C7 • INTERNATIONAL / MA025 • INTERNATIONAL / SA537 • KENWORTH / T3 Series • KENWORTH / T4 Series • KENWORTH T270 / T3 Series • KENWORTH T370 / T3 Series	10
Heavy-duty Vehicle 2 (HD2)	• AUTOCAR / ACX Xpeditor • KENWORTH / L770 • KENWORTH T270 / T3 Series • KENWORTH T800 / T8 Series • PETERBILT / 520 • PETERBUILT 520 / 520	10
Heavy-duty Vehicle 3 (HD3)	• ALTEC AM60 / SR525 • FREIGHTLINER / FL112 • INTERNAT SFA / SR525 • INTERNATIONAL / F-2574	17

Vehicle Duty	LAC Fleet Vehicle	Total Vehicle Count
	• INTERNATIONAL / SA537 • INTERNATIONAL / SA567 • INTERNATIONAL / SF567 • KENWORTH / T880 • KENWORTH DERICK / T8 Series • KENWORTH T470 / T4 Series • VACTOR / SA637 • VACTOR / T4 Series	

6.1.1.1 Vehicle Mileage

Annual average vehicle mileage was estimated using fleet data provided by the County. Prior to analysis, the data was cleaned to remove any outliers that appeared unreasonably high or low. For each representative vehicle duty group, the average mileage within that group was used to approximate expected yearly travel distances. EVs were assumed to have the same annual mileage as their fossil fuel equivalents. A summary of these estimates is provided in Table 6-3.

Table 6-3: Annual vehicle mileage by vehicle type

Vehicle	Annual Mileage
Light-duty Vehicle 1 (LD1)	7,572
Light-duty Vehicle 2 (LD2)	5,803
Medium-duty Vehicle 1 (MD1)	5,684
Medium-duty Vehicle 2 (MD2)	6,429
Heavy-duty Vehicle 1 (HD1)	4,797
Heavy-duty Vehicle 2 (HD2)	6,738
Heavy-duty Vehicle 3 (HD3)	2,545

6.1.1.2 Fuel Efficiency

Fuel efficiency for fossil fuel vehicles was calculated using fleet mileage and fueling data provided by the County. Efficiencies were averaged across representative vehicle categories, resulting in conservative values. Prior to analysis, fossil fuel data was reviewed and cleaned to remove values that appeared unreasonably high or low.

EV efficiencies were estimated based on expected performance of comparable vehicle models. For each duty group, a representative vehicle efficiency was modeled based on manufacturer provided ranges. When a vehicle category wasn't represented in the market, or sufficient data was lacking on assumed added battery demand from onboard equipment, EV efficiencies were calculated based on class[16] or previous real-world modeling. The resulting values are presented in Table 6-4.

Table 6-4: Fuel efficiency by vehicle type

Vehicle	Fossil Fuel Efficiency (mi/gal)	EV Efficiency (mi/kWh)
Light-duty Vehicle 1 (LD1)	14.47	2.00
Light-duty Vehicle 2 (LD2)	16.58	2.00
Medium-duty Vehicle 1 (MD1)	10.02	1.11
Medium-duty Vehicle 2 (MD2)	10.06	0.67
Heavy-duty Vehicle 1 (HD1)	5.82	0.67
Heavy-duty Vehicle 2 (HD2)	4.40	0.40
Heavy-duty Vehicle 3 (HD3)	3.74	0.40

6.1.2 Cost Inputs

Cost inputs for the financial analysis were developed using data provided by the County. This included vehicle purchase prices, fueling and charging costs, maintenance, and other operational expenses. These inputs were applied to the selected representative vehicles to support consistent and comparative evaluation across duty groups and fuel types.

6.1.2.1 Vehicle Purchase

Vehicle purchase costs were developed using a combination of data provided by the County and market research. First the dataset was reviewed for accuracy, and entries with clear errors were removed.

Fossil fuel vehicle purchase prices were calculated using County fleet data and adjusted to reflect current market conditions. Only vehicles purchased in 2015 or later were included in the analysis. For vehicles acquired between 2015 and 2020, an average 2% yearly increase was applied to account for inflation and market shifts. Then prices were averaged within each vehicle type group to establish baseline purchase costs for the financial model.

EV purchase prices were estimated by applying a cost ratio to the adjusted fossil fuel vehicle prices. This ratio was calculated by comparing LAC's price of a representative fossil fuel vehicle with a comparable EV within each vehicle type group.

[16] https://docs.nrel.gov/docs/fy23osti/84631.pdf

- Light Duty: The Ford F-150 costs $45,364, and the EV equivalent Ford F-150 Lightning costs $66,530. This results in a cost factor of 1.47.
- Medium Duty: The Super Duty F-250 costs $78,000, while the EV equivalent to Bollinger B4 costs $158,758. This results in a cost factor of 2.04.
- Heavy Duty: The Peterbilt 520 costs $454,000, while the EV equivalent Peterbilt 520 EV costs $1,000,000. This results in a cost factor of 2.20.

That factor was then applied to the adjusted fossil fuel vehicle price to estimate the EV purchase price for each representative vehicle group.

After establishing the vehicle purchase prices, a 2%[17] annual inflation rate was then applied from 2025 onward within the financial model. The capital costs for each vehicle type are summarized in Table 6-5.

Table 6-5: Vehicle purchase costs

Vehicle	ICE Purchase Cost	EV Purchase Cost	Cost Factor	Notes
Light-duty Vehicle 1 (LD1)	$38,813	$56,923	1.47	Historical purchase price from 2015 onward and adjusted for inflation
Light-duty Vehicle 2 (LD2)	$41,210	$60,438	1.47	Historical purchase price from 2015 onward and adjusted for inflation
Medium-duty Vehicle 1 (MD1)	$67,876	$138,153	2.04	Historical purchase price from 2015 onward and adjusted for inflation
Medium-duty Vehicle 2 (MD2)	$38,610	$78,585	2.04	Historical purchase price from 2015 onward and adjusted for inflation
Heavy-duty Vehicle 1 (HD1)	$148,646	$327,414	2.20	Historical purchase price from 2015 onward and adjusted for inflation
Heavy-duty Vehicle 2 (HD2)	$277,718	$1,000,000	2.20	Historical purchase price from 2015 onward and adjusted for inflation
Heavy-duty Vehicle 3 (HD3)	$261,722	$576,480	2.20	Average of all class 8 vehicles

A sensitivity analysis was included to assess the impact on the total cost of ownership if EV prices decrease due to lower battery costs. Using utility-scale battery cost projections from NREL (renamed to the National Laboratory of the Rockies - NLR)[18] as a proxy for vehicle battery price trend, three alternative outlooks were assessed. The high (-5% by 2050), medium (-45% by 2050), and low (-70%) trend scenarios

[17] Inflation assumption of 2% reflects the Federal Reserve's long-run target and historical averages. https://www.federalreserve.gov/economy-at-a-glance-inflation-pce.htm
[18] NREL Cost Projections for Utility-Scale Battery Storage: 2025 Update https://docs.nrel.gov/docs/fy25osti/93281.pdf

by NLR were applied to the purchase prices (Table 6-5, above) in the year of purchase instead of using an static cost factor.

When using the cost factor strategy and no price reduction trends, the County is expected to spend $19.17 million more on vehicle procurement than when just buying ICE vehicles. The implications of decreased vehicle prices had significant impact on the fleet acquisition costs, mainly for the CAP Policy Scenario. When applying the low trend there were savings of $3.54 million over 25-year period when compared to the ICE baseline. The medium trend showed a total increase of $5.46 million, and the high trend showed an increase in fleet acquisition costs of $17.94 million over the ICE-only Scenario.

6.1.2.2 Vehicle Maintenance

Maintenance cost inputs were developed using annual service data provided by the County. Annual maintenance costs were calculated at the representative vehicle group level, using the total maintenance cost divided by vehicle age, averaged at the representative vehicle group level and divided by annual miles. This cost per mile was used as baseline values for fossil fuel data inputs. For EVs, a 10% reduction was applied, to reflect lower maintenance needs due to fewer moving parts[19].

Maintenance costs per mile represent a meaningful measure of value gained through operating EVs. To additionally estimated this value, a sensitivity analysis using an optimistic 25% reduction in maintenance costs[20] was included and discussed below.

Once the cost per mile was established, a 2% annual inflation rate was applied year over year within the financial model. Final values are expressed in dollars per mile, shown in Table 6-6.

Table 6-6: Vehicle maintenance costs

Vehicle	ICE Maintenance ($/mile)	EV Maintenance 90% ($/mile)	EV Maintenance 75% ($/mile)
Light-duty Vehicle 1 (LD1)	$0.24	$0.22	$0.18
Light-duty Vehicle 2 (LD2)	$0.27	$0.24	$0.20
Medium-duty Vehicle 1 (MD1)	$0.51	$0.46	$0.39
Medium-duty Vehicle 2 (MD2)	$0.34	$0.30	$0.25
Heavy-duty Vehicle 1 (HD1)	$0.66	$0.60	$0.50
Heavy-duty Vehicle 2 (HD2)	$3.32	$2.99	$2.49
Heavy-duty Vehicle 3 (HD3)	$2.85	$2.56	$2.13

The EV Maintenance 75% (a 25% reduction in maintenance costs) was included to project a more optimistic projection of the savings the County could realize through operating EVs. In the EV Policy

[19] Basis for cost reduction and conservative approach https://www.actransit.org/sites/default/files/2023-01/0430-22%20Report-ZEBTA%20v4_FNL_012423.pdf

[20] Department of Energy identifies higher cost savings https://afdc.energy.gov/vehicles/electric-fleets

Scenario, this optimistic projection realizes a ~2% reduction in maintenance costs over the 25-year period. While estimated at $433K, due to the relatively small percentage of fleet transitioned under the EV Policy, this is only a 1% improvement in total maintenance costs over the conservative EV Maintenance 90% calculation.

Under the more aggressive CAP Policy Scenario with 86% of vehicles transitioned to EV by 2050, an ~8% reduction in maintenance costs is realized. If the County were to see as much as a 40% reduction in cost per mile, these savings could increase to a 13% reduction in maintenance costs. This represents a much more significant saving of $2.13 to $3.8 million over the 25-year period.

6.1.2.3 Fuel

Fossil fuel costs were determined using data provided by the County and are expressed in dollars per gallon. The Los Alamos Department of Public Utilities (DPU)) average on-peak rate was used for the electricity cost based on an electricity bill provided by the County, expressed in dollars per kWh. All fuel types were also forecasted using the US Energy Information Agency trends for the respective energy types.[21]

After the base fuel costs were determined, an inflation rate of 2% was applied. The fuel cost inputs are summarized in Table 6-7.

Table 6-7: Fuel costs

Fuel Type	Cost	Units
Diesel	$2.64	$/gal
Gasoline	$2.49	$/gal
Electricity	$0.11	$/kWh

6.1.2.4 Facility Infrastructure and Charging Equipment

Estimates for the facility infrastructure and charging equipment were developed based on a combination of sources including recent Los Alamos County project cost breakdown for the installation and equipment cost of Level 2 chargers at the Municipal Building (July 2025). Such estimates were also compared and adjusted based on historical costs from similar project installation that Stantec has conducted. The facility modifications to accommodate charging infrastructure will be phased in overtime in accordance with the vehicle procurement timeline described in Section 3.2-Implementation Strategies and following the equipment and timeline specifications as described in Section 4.2-Infrastructure Implementation Plan. Following the structure of the recent project cost and based on Stantec's experience installing over 800

[21] https://www.eia.gov/outlooks

charger plugs across the US, the infrastructure and charging equipment cost was broken down following the categories and assumptions described in Table 6-8.

Table 6-8: Facility modifications and charging equipment cost assumptions

Cost Category	Cost Type	Included Items	Unit Type	Estimate
Site Preparation, demolition, and construction	Fixed	Site prep/demolition, new concrete and asphalt, landscape, barricades, painting, labor, site clean-up, bonds 3%, mobilization 4%, taxes 7.0625%	Total per site (applied when more than 3 plugs are installed at once)	$290,000
Charger Installation	Per unit	Labor to just install chargers, cost of electrical conduct and related electrical work, charger bases and bollards.	$/plug	$12,000
L2 Charger Equipment Procurement	Per unit	Based on current quote for L2 from Charge Point but assumes a 25% price reduction after standardizing procurement and securing one compatible charge management system.	$/plug	$10,000
DCFC Equipment Procurement	Per unit	Assumes the cost of centralized/ rectifiers units that can be connected to between 4 and up to 8 plugs. Power between 75kW and 150kW per plug.	$/plug	$60,000
DPU grid connection upgrade and transformer	Fixed	Power utility related expenses to upgrade connection, cost of transformer and switchgears.	Total per site (applied when more than 50kVA of capacity is needed at once)	$35,000
Contingency	Fixed	Applied as an added percentage to the total site cost estimation.	Total per site	20%

Following this cost assumption breakdown, it was possible to generate an infrastructure related capital investment per site for each year but for simplicity, the aggregated cost estimates per site for each phase are summarized in tables for the EV Policy Scenario and for the CAP Policy Scenarios, Table 6-9 and Table 6-10 respectively. Additional details about the exact charger count and year of implementation are presented in Section 4.2-Infrastructure Implementation Plan.

Table 6-9: Facility infrastructure and charging equipment costs by year for EV Policy Scenario

Facility	2026- 2035	2036 - 2043	2044 - 2050
Municipal Building	$-	$49,613	$49,757
Justice Center	$-	$-	$-
Mesa Public Library	$-	$-	$-
PCS1	$440,059	$135,178	$74,419
PCS3	$390,446	$85,565	$24,806
PCS5	$525,623	$74,419	$-
LA Senior Center	$464,865	$24,806	$24,806

Facility	2026- 2035	2036 - 2043	2044 - 2050
ECO Station	$128,099	$-	$-
Fuller Lodge	$464,865	$-	$-
Fire Station #4	$-	$-	$-
Golf Course	$24,806	$-	$-
LA Wastewater	$-	$-	$-
Ice Rink	$-	$-	$-
LA Airport	$-	$-	$-

The CAP Policy infrastructure costs are summarized by phase below.

Table 6-10: Facility infrastructure and charging equipment costs by year for CAP Policy Scenario

Facility	2026- 2035	2036 - 2043	2044 - 2050
Municipal Building	$-	$74,419	$-
Justice Center	$-	$96,806	$-
Mesa Public Library	$-	$-	$-
PCS1	$539,284	$416,678	$1,101,197
PCS3	$-	$152,905	$110,371
PCS5	$712,929	$1,106,849	$1,112,343
LA Senior Center	$489,671	$49,613	$-
ECO Station	$24,806	$427,824	$195,936
Fuller Lodge	$514,478	$24,806	$-
Fire Station #4	$-	$85,565	$-
Golf Course	$24,806	$-	$85,565
LA Wastewater	$24,806	$85,565	$171,130
Ice Rink	$49,613	$-	$-
LA Airport	$-	$-	$85,565

6.2 Comparison and Outcomes

The cost comparison between the ICE-only Case, the EV Policy Case, and the CAP Policy Case is presented in Table 6-11, incorporating both capital and operating expenses. Over the 25-year horizon, the ICE-only Case has a total cumulative cost of $82.6 million, the EV Policy Case has a total cumulative cost of $88.3 million, and the CAP Policy Case has a total cumulative cost of $110 million. The EV Policy and CAP Policy Cases are 7% and 33% more expensive than the ICE-only Case, respectively. However, CAP Policy Scenario maintenance and fuel costs are $3 million lower than the ICE-only Scenario, and EV Policy Scenario maintenance and fuel costs are $750,000 lower than the ICE-only Scenario over the 25-year timeline. This reflects the lower cost of electricity compared to gasoline and diesel, as well as reduced routine maintenance requirements of EVs compared to conventional vehicles.

The EV Policy Scenario reflects the County's current procurement approach of adding two EVs per year, meaning these costs and benefits would occur under the existing trajectory. In contrast, the CAP Policy Scenario represents a more ambitious strategy aligned with the County's climate goals, requiring accelerated fleet electrification and associated infrastructure investments. While this approach is more rigorous and entails higher upfront costs, assuming savings in maintenance and fuel can offset part of the increased purchase price and infrastructure needs. Overall, an additional $27.3 million would be required to achieve the CAP targets, as opposed to following current procurement policy.

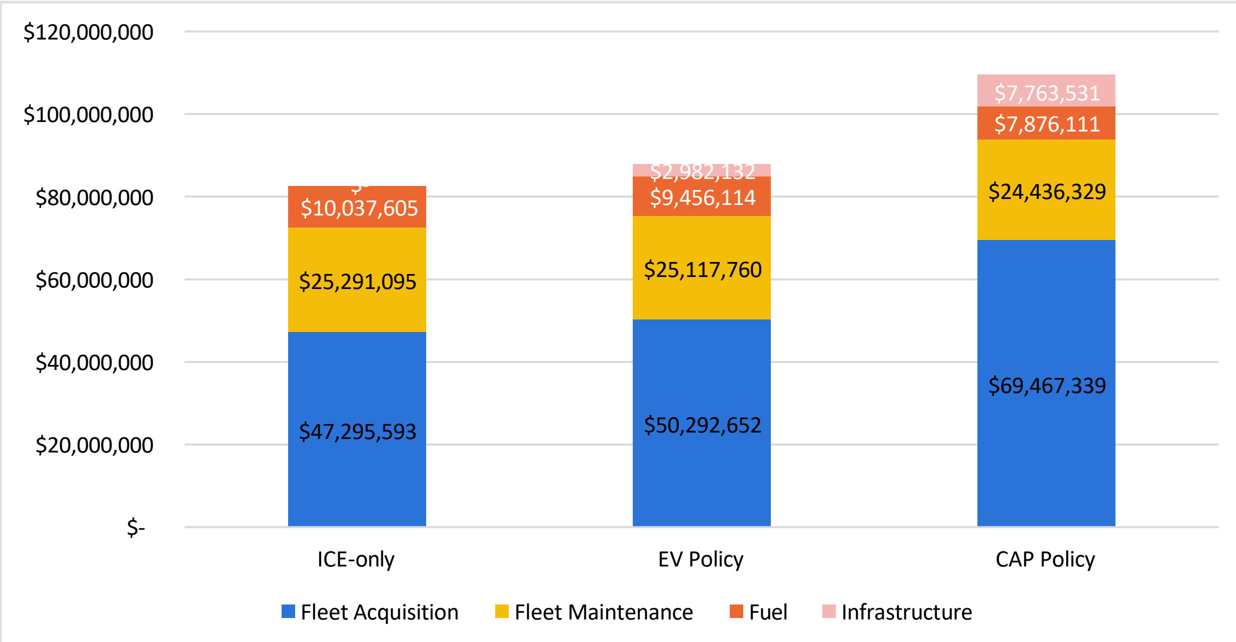
The financial assessment does not consider any grants or other alternative funding mechanisms. Therefore, there may be additional opportunities to offset the difference in the cost between the ICE-only Case and the EV cases.

Table 6-11: ICE-only Scenario, EV Policy Scenario, and EV CAP Scenario comparison

Vehicle	ICE-only Scenario	EV Policy Scenario	CAP Policy Scenario	EV Policy vs CAP Policy Cost Difference
Fleet Acquisition	$47,295,593	$50,292,652	$69,467,339	$19,174,687
Fleet Maintenance	$25,291,095	$25,117,760	$24,436,329	$(681,432)
Fuel/Electricity	$10,037,605	$9,456,114	$7,876,111	$(1,580,003)
Infrastructure	$-	$3,446,997	$8,206,009	$4,759,012
Total	$82,624,293	$88,313,523	$109,985,788	$21,672,264

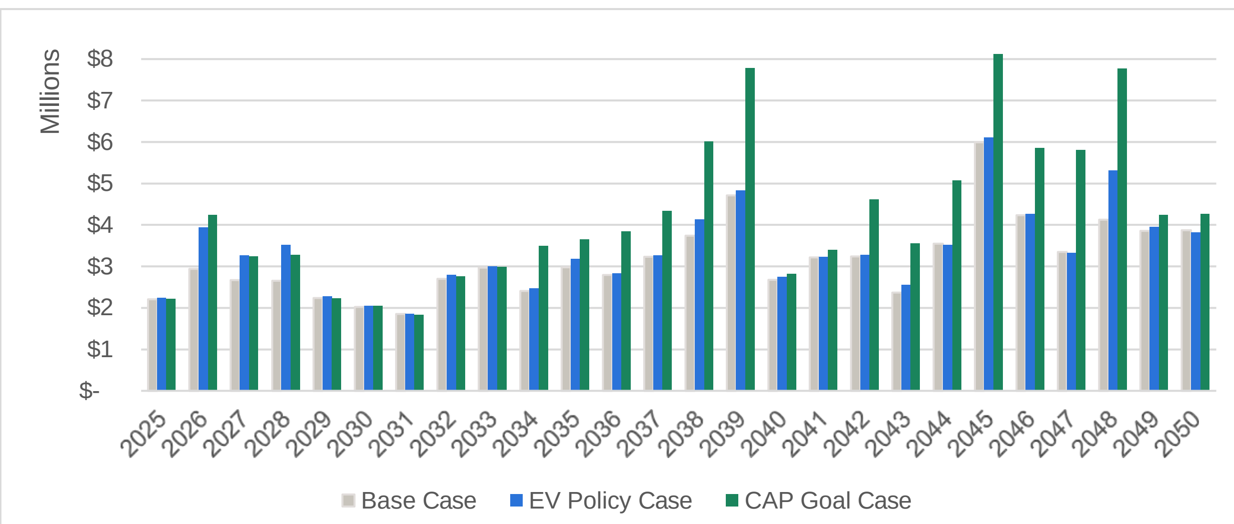
Figure 6-1 shows a breakdown of costs between the ICE-only Scenario and EV Scenarios. The procurement of EVs is $3 - $22 million more than the ICE-only Scenario due to the higher purchase price of EVs compared to fossil fuel vehicles. Additionally, the conversion and upgrades to the facility for charging infrastructure represents an added cost of $3.5 - $8.2 million. Lastly, the use of electricity represents an economic benefit of $580,000 - $2.1 million over the life of the project when compared to the current use of fossil fuels. These savings are a direct reflection of the improved efficiency that EVs have with respect to legacy technologies, with the added benefit of eliminating tailpipe emissions.

Figure 6-1: Cost breakdown of ICE-only Scenario and EV Scenarios



Finally, Figure 6-2 (below) shows the year-to-year comparison between the ICE-only, the EV Policy, and the CAP Policy Scenario. The higher costs for the EV Scenario occur during the years that facility modifications are conducted and when a higher number or more expensive vehicles are purchased.

Figure 6-2: Annual cost comparison 2025 - 2050



Annual costs under each transition scenario are driven by the number of vehicles scheduled for replacement each year. Both the EV Policy and CAP Policy Scenarios show higher total annual costs compared to the ICE-only baseline due to higher EV purchase prices and charging infrastructure costs. The

CAP Policy Scenario exhibits the greatest variation in annual costs due to larger fluctuations in the number of EVs purchased each year.

The most significant cost increases are expected during high purchase years. The County may be able to mitigate these cost “peaks” by shifting some purchases to adjacent years, creating a more consistent annual expenditure pattern. This approach:

- Reduces “sticker shock” years with exceptionally high costs.
- Aligns with the County’s current fleet management and procurement practices.
- Maintains the overall transition timeline while improving budget predictability.

Leveraging Grant Funding: Years with high EV procurement and preceding infrastructure deployment present opportunities for large-scale grant applications. To increase grant success, the County should:

- Plan vehicle procurement and infrastructure projects 12-18 months in advance.
- Pursue grants for vehicles, infrastructure, or combined projects depending on funding source requirements.
- Complete facility master planning (recommended in Section 4.2.1.1) to ensure project readiness.

By coordinating procurement timing with grant cycles and infrastructure readiness, the County can significantly reduce net capital costs while maintaining progress towards its 2050 electrification goals.

7 Greenhouse Gas Emissions Analysis

One of the chief reasons for transitioning to EVs is to reduce pollution by removing the harmful byproducts of fossil fuel combustion from traditional combustion engines. While EVs eliminate all tailpipe emissions, there may still be upstream carbon emissions associated with the production of energy sources that power EVs. This section provides a “well-to-wheel” emissions analysis to assess the overall impact of the EV transition on reducing harmful emissions locally in Los Alamos County.

The approach to model GHG production from the County’s fleet considered 7 vehicle categories of 2 light-duty, 2 medium-duty, and 3 heavy-duty vehicles. This approach utilizes averages from each category to approximate what the County could expect to see. As shown in the equation below, the average annual miles per vehicle category was divided by the average vehicle modeled efficiency to provide total annual kWh per vehicle. Carbon intensity based on Los Alamos Department of Public Utilities (DPU) grid was applied to calculate the total converted metric tons[22] of CO_2e produced by each vehicle. Based on the Transition Schedule previously outlined, the count of each vehicle category and technology distribution (EV vs ICE) provided an annual metric ton of CO_2e emitted by the County’s fleet.

$$\frac{aaaaaaaaaaaa\ \ mmmmaammmm}{vvmmhmmiiaamm} \div \frac{mmmmaammmm}{kkkkh} = \frac{kkkkh}{vvmmhmmiiaamm}\ xx\ \frac{ggCCCC_2mm}{kkkkh} = \frac{ggCCCC_2mm}{vvmmhmmiiaamm}\ xx\ vvmmhmmiiaamm\ \ iiccaaaacc\ \ xx\ \frac{1}{10^6} = aaaaaaaaaaaa\ \ ccccaa\ \ CCCC_2mm$$

The annual electricity supply mix for Los Alamos County was established using the DPU FY2025 Q1-Q4 energy supply reports.[23] Reported MWh from each resource were summed to determine total consumption and the proportional share of carbon-emitting (Econ Purchases, Laramie River Station) and non-emitting resources (Mercuria, WAPA, Abiquiu, and EL Vado).

The carbon intensity for the Econ Purchases category was assigned using the U.S EPA eGRID 2022 emission factor for the WECC Southwest (AZNM) subregion.[24] The reported rate of 779.4 lb CO_2e/MWh was converted to 0.352 metric tons CO_2e/MWh and applied to all Econ Purchase MWh, as this supply is not tied to a specific single generation source. The carbon intensity for the Laramie River Station was calculated using 2024 emissions and generation data from the U.S. EPA Clean Air Markets Program Data and applied based on the County’s annual share of MWh from this facility.[25]

Emission intensity was adjusted to reflect the planned addition of Foxtail Flats solar project in 2027. Based on projected annual solar generation, it was assumed that this energy will displace an equivalent share of

[22] All GHG calculations are presented in metric tons of CO_2 equivalent (CO_2e), which is calculated using the short-term 20-year global warming potential of CO_2, methane, black carbon, and particulate matter.
[23] Q1 - https://indd.adobe.com/view/59cafca5-7418-49f4-bbad-6c96cff117e8
Q2 - https://indd.adobe.com/view/f6707156-8858-428f-a6c8-0c5108eba31b
Q3 - https://indd.adobe.com/view/139b8d4f-d3b7-407b-b74b-274084d39e41
Q4 - https://indd.adobe.com/view/f621f01d-6a2e-473f-9997-bb34eb01f7f0
[24] https://www.epa.gov/system/files/documents/2024-01/egrid2022_summary_tables.pdf
[25] https://campd.epa.gov/data/custom-data-download

Econ Purchases, resulting in an estimated 50% reduction in carbon-emitting supply from that category. The resulting grid mix yields an adjusted emissions intensity of approximately 227.8 gCO_2e/kWh for scenario modeling. Additionally, to reflect the DPU's stated goal of achieving a fully carbon-neutral electricity supply by 2040, a second scenario using a green-electricity emissions factor of 90 gCO_2/kWh was incorporated to represent long-term decarbonization. Below, the equations used to calculate energy production from carbon-emitting resources and to account for the Foxtail Flats displacement effect are presented.

Econ Purchases and Laramie River Station energy production per year:

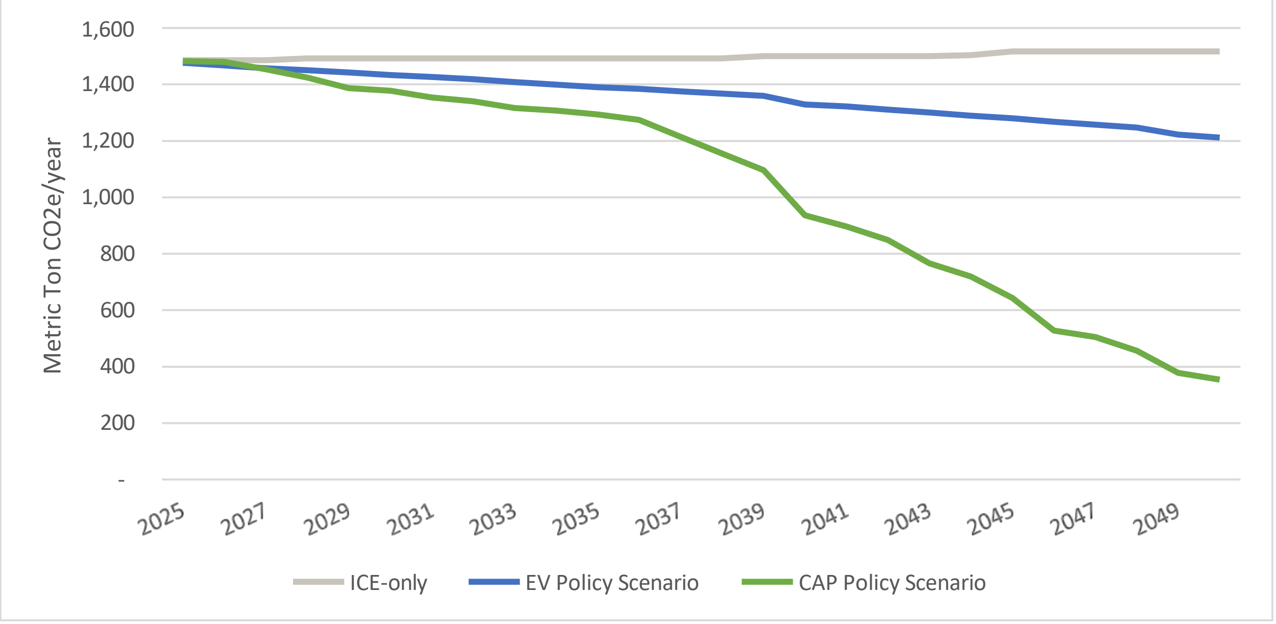
$$(MMkkhQQ1 + MMkkhQQ2 + MMkkhQQ3 + MMkkhQQ4)$$

Foxtail Flats[26] energy production per year:

$$(MMkkhQQ1 + MMkkhQQ2 + MMkkhQQ3 + MMkkhQQ4) \times 0.50$$

Due to the gradual transition to EVs, emissions are reduced as more ICE vehicles are phased out as shown in the figure below.

Figure 7-1: Annual fleet CO_2e emissions (metric tons), 2025 - 2050



[26] https://www.losalamosnm.us/Initiatives/Foxtail-Flats-Solar-Power-and-Battery-Storage

Based on the ZEVDecide modeling methodology, the County's current fleet is estimated to emit an average of 1,499 metric tons of CO_2e in a year, inclusive of upstream emissions from the production and burning of fossil fuels.[27]

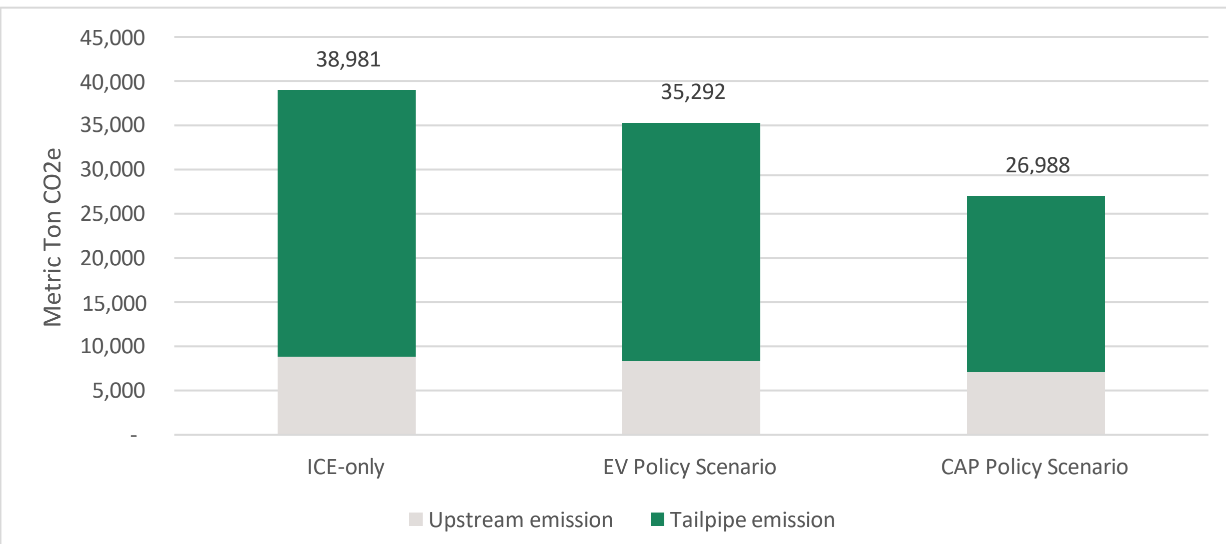
Through the analysis period (2025-2050), it was found that the future EV fleet will emit an approximate average of 1,357 metric tons of CO_2e annually, while the CAP Policy fleet emits 1,038 metric tons of CO_2e annually.

Table 7-1: Total average annual CO_2e emissions (metric tons)

Average Annual Emission (metric ton CO_2e)	ICE-only	EV Policy	CAP Policy
Upstream Emission	340	323	273
Tailpipe Emission	1,159	1,035	765
Total	1,499	1,357	1,038

As shown in the figure below, transitioning to EVs will reduce the County's cumulative emissions from fleet operations by 3,689 metric tons of CO_2e for the EV Policy Scenario, and by 11,993 metric tons of CO_2e for the CAP Policy Scenario. Of that total amount, 3,237 metric tons for the EV Policy and 10,243 metric tons for the CAP Policy Scenario will be tailpipe emissions, directly improving the air quality in the communities served by the Los Alamos County.

Figure 7-2: Cumulative CO_2e emissions (metric tons) 2025 - 2050



[27] Upstream emissions are GHG emissions related to the production of the fuel used to power vehicles, such as emissions from the production of electricity used to power vehicles. Importantly, this does not include the emission from the production of vehicles. (https://www.epa.gov/greenvehicles/light-duty-vehicle-emissions)

Stantec used the annual emissions that will be displaced by the EV fleet, along with the EPA GHG equivalent calculator[28], to visualize equivalent benefits. As presented, implementing an EV fleet, whether EV Policy or CAP Policy, will eliminate emissions equivalent to removing 415,101 – 1, 349, 499 gallons of gasoline per year, recycling 1,304 – 4,238 tons of waste per year, reducing the need to plant 60,998 – 198,305 seedlings to capture carbon, or eliminating the energy use of 495 – 1,611 households in a year.

Figure 7-3: Equivalent GHG benefits of implementing an EV fleet (EV Policy)

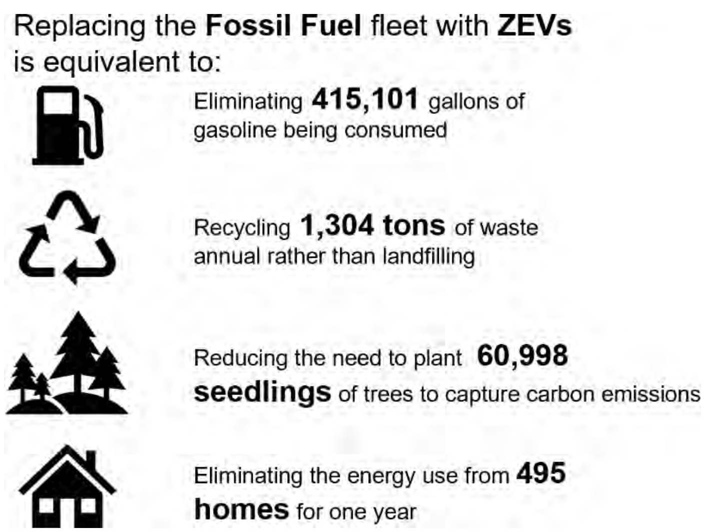
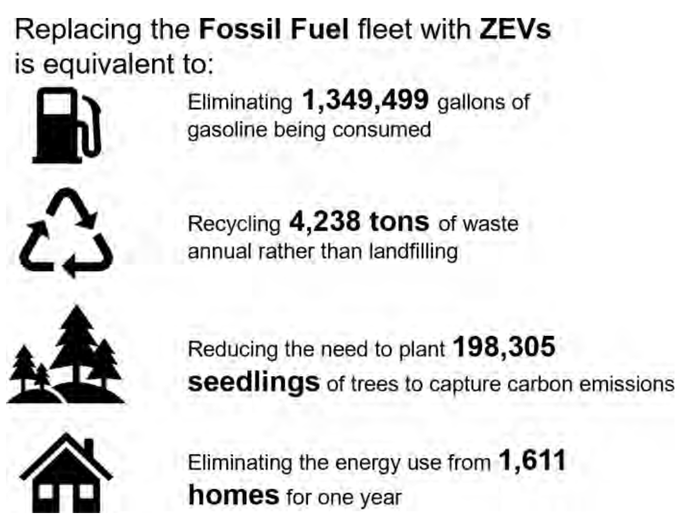


Figure 7-4: Equivalent GHG benefits of implementing an EV fleet (CAP Policy)



[28] https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator

Appendix A Summary of the Atomic City Transit ZE Transition Plan

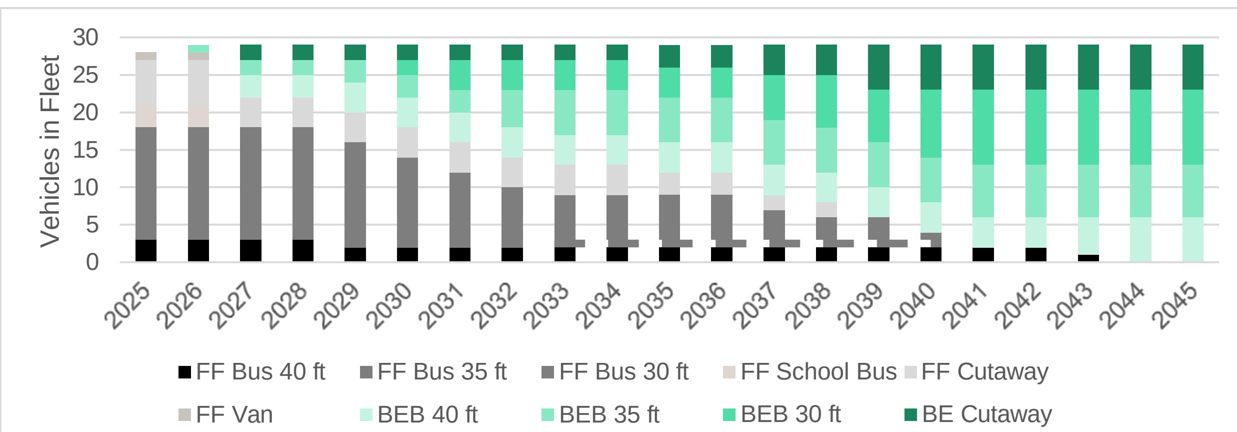
ACT developed a Zero-Emission Fleet Transition Plan to fulfill the requirements of the Federal Transit Administration's (FTA) Low or No Emission Grant Program (49 U.S.C. 5339(c)(3)(D)). The plan outlines ACT's strategy to transition to a 100% battery electric vehicle (BEV) fleet by 2045 and supports ACT's FY2025/2026 Low-No funding application. The plan is organized around six elements required by the FTA, summarized in the subsequent sections.

A.1 Fleet Assessment

ACT conducted vehicle performance modeling using operational data to evaluate ZEV technologies. While hydrogen fuel cell vehicles demonstrated strong performance, BEVs were selected due to regional fuel supply limitations, infrastructure costs, and vehicle availability.

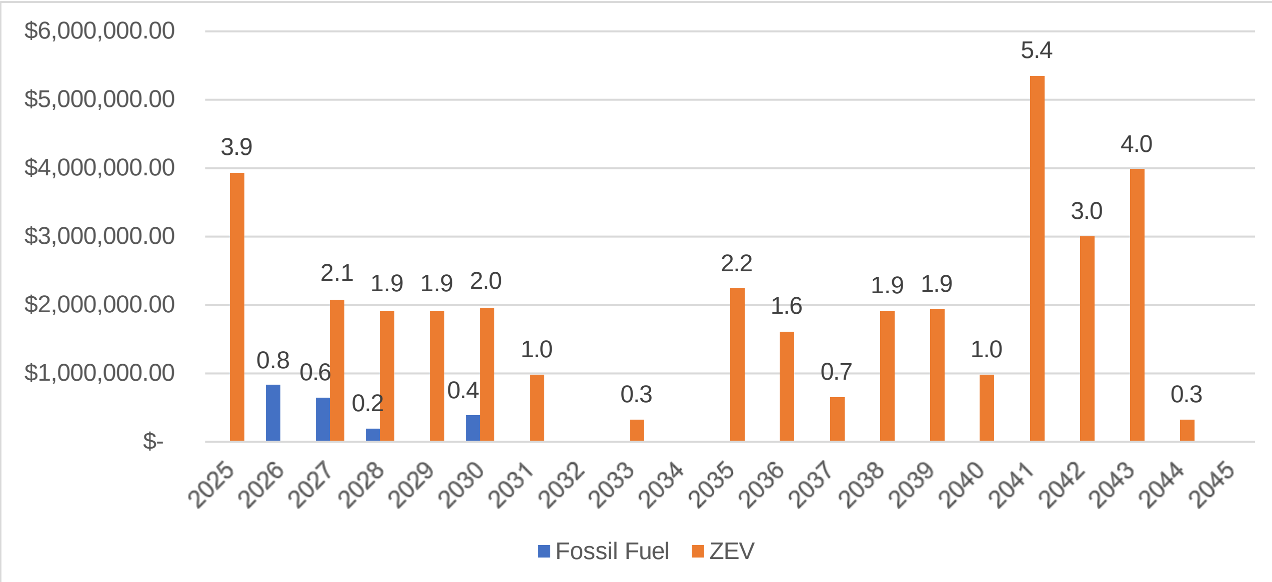
The transition plan includes operational adjustments such as increasing the fixed-route fleet by one vehicle and installing on-route charging infrastructure. Projected vehicle capital costs through 2045 total approximately $35.1 million, based on ACT's procurement history and industry benchmarks. ACT's fleet composition and estimated annual vehicle procurement costs are shown in Figure 7-5 and Figure 7-6 respectively.

Figure 7-5: Fleet composition (fixed route and demand response)[29]



[29] FF represents the ACT's existing fossil fueled vehicles.

Figure 7-6: Annual vehicle procurement cost



A.2 Funding Needs Assessment

ACT anticipates a total cost of $40.9 million for full fleet transition, including:

- $35.1 million for vehicle procurement
- $5.5 million for infrastructure and facility upgrades

While traditional formula funding may support portions of the transition, ACT expects to pursue additional funding sources to address the gap. The agency has previously received Low-No and state match funding and continues to explore federal, state, and local opportunities.

A.3 Policy Assessment

ACT's transition aligns with federal climate and equity goals, including the Bipartisan Infrastructure Law and Executive Order 14008. At the state level, the plan supports New Mexico's goal of reducing greenhouse gas emissions by 45% from 2005 levels by 2030 and achieving net-zero emissions by 2050. ACT's efforts also align with Los Alamos County's sustainability goals, including a 50% emissions reduction by 2030 and net-zero by 2045.

Relevant state and local policies include:

- New Mexico EV Program and Infrastructure Deployment Plan
- New Mexico Climate Action Plan
- Clean Transportation Fuel Standard

- State fleet ZEV acquisition mandates
- Los Alamos Climate Action Plan and Strategic Leadership Plan
- Regional Electric Vehicle (REV) West collaboration

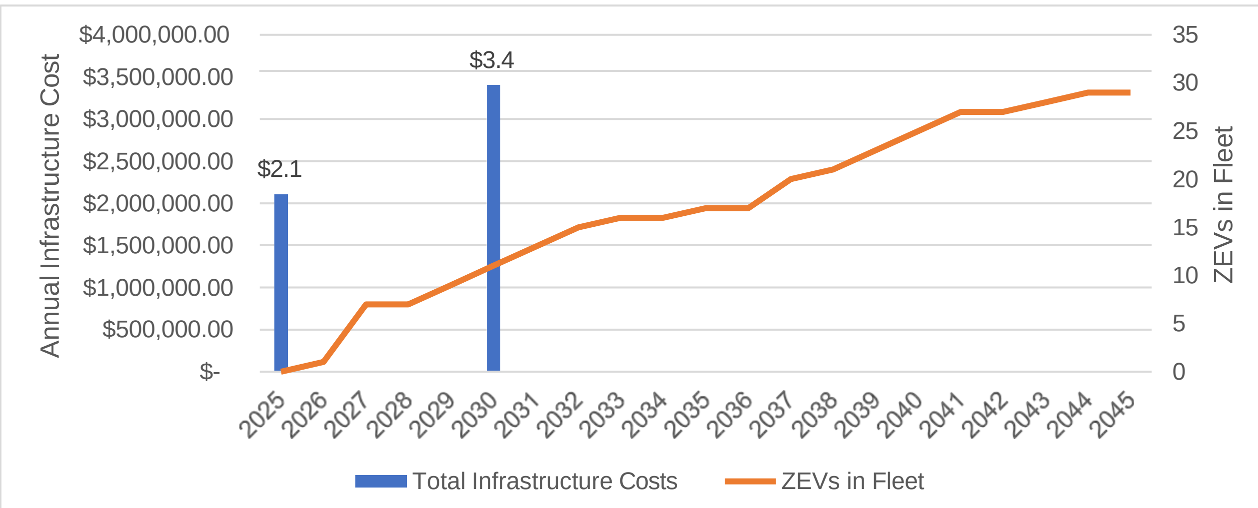
A.4 Facilities Assessment

ACT currently operates out of a shared facility equipped for diesel and gasoline vehicles. Infrastructure upgrades are planned to support 29 BEVs, including:

- Depot charging: 10 fast chargers (150 kW) for a total of 20 charging handles, and 6 Level 2 chargers.
- On-route charging: 3 DC fast chargers (450 kW) transit specific pantograph chargers to enable on-route charging through specialized rails affixed to the top of buses.

Estimated infrastructure costs total $5.5 million, covering planning, power upgrades, equipment installation, and design engineering costs for the depot as well as on-route charging locations (Figure 7-7).

Figure 7-7: Depot and on-route charging infrastructure costs



A.5 Partnership Assessment

ACT is coordinating closely with the Los Alamos Department of Public Utilities (DPU) to plan grid-side and facility-side electrical upgrades. DPU has confirmed available capacity and will provide a letter of support. ACT also collaborated with the New Mexico Department of Transportation (NMDOT), which funded the fleet assessment and provided strategic guidance throughout the planning process.

A.6 Workforce Analysis

ACT has identified significant workforce development needs to support the transition. Key strategies include:

- OEM-led training for operators, maintenance staff, and first responders
- Apprenticeship programs and train-the-trainer models
- Use of specialized diagnostic tools and safety equipment
- Partnerships with local colleges and regional transit agencies
- Participation in national training programs and professional associations

ACT is requesting $292,840 in Low-No funding to support workforce development, including training, equipment, and PPE. Workforce development activities are aligned with the fleet transition timeline, with ongoing training planned through 2045.

A.7 Summary and Recommendations

The fleet performance modeling confirms that a full transition to BEVs is feasible and beneficial for ACT. The plan recommends periodic updates every 4–5 years to reflect evolving priorities, technology developments, and funding opportunities. While battery electric vehicles are the recommended technology, ACT will continue monitoring regional hydrogen developments and vehicle availability for future consideration.

Appendix B Existing Conditions & Market Scan

Los Alamos County Fleet Conversion Plan
Existing Conditions & Market Scan

Existing conditions report for Los Alamos County Fleet Conversion Plan.

Prepared for:

Los Alamos County

Prepared by:

Stantec Consulting Services Inc.

Project/File:

1720001020

Revision Schedule

Revision	Description	Author	Date	Quality Check	Date	Independent Review	Date
V1	First Draft	Ian Lowell	8/20/2025	Analy Castillo	8/15/25	Jonathan Garrett	8/15/25
V2	Final	Ian Lowell	2/06/2025	Analy Castillo	2/09/26	Jonathan Garrett	2/10/26

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Executive Summary

To align with state and local climate goals (specify what they are), the County is initiating efforts to transition its fleet to zero-emission vehicles (ZEVs). This report marks the first step in crafting a roadmap to guide that transformation. Primarily a market scan detailing market trends and available ZEVs, this report also includes an overview of the County's facilities, infrastructure, and vehicles. This report is informed by analysis of the County's fleet to help introduce electrification to the County, creating a detailed plan for successful fleet transition.

At the state level, several key policies are driving the transition to cleaner transportation. Executive orders (state which Executive Orders) issued in 2019 and 2023 set ambitious greenhouse gas (GHG) reduction targets, including a mandate for state-owned fleets to be zero-emission by 2035. Additional regulations, such as the New Mexico Alternative Fuel Acquisition Act and Energy and Fuel Costs Savings Contracts, further incentivize fleet conversions. Despite legal uncertainties surrounding federal and state emission authority, New Mexico continues to promote electric vehicle adoption through incentives and public-private partnerships. Los Alamos County's Climate Action Plan (CAP) builds on these efforts with specific goals to promote EV infrastructure, expand community education, and convert the County fleet to EVs, with a target to "consider aligning with NM state target to achieve a zero-emission vehicle fleet by 2035." Despite that, the County will continue to replace vehicles on their traditional schedule and not prematurely replace to meet a 2035 goal.

A comprehensive review of available ZEV technologies reveals a growing market for both battery-electric vehicles (BEVs) and hydrogen fuel cell electric vehicles (FCEVs) across all vehicle classes. For light-duty vehicles, numerous BEV models, including sedans, SUVs, pickup trucks, and cargo vans, are commercially available and align well with the County's current uses. Medium- and heavy-duty segments also show increasing availability, though some vehicle categories may still require hybrid or near-zero emission interim solutions due to availability and upfitting (what is upfitting) constraints. FCEVs are an emerging but promising technology, particularly for those applications requiring long range and fast refueling. While hydrogen fueling infrastructure in the region remains limited, early efforts by Los Alamos National Laboratory (LANL) and regional partners suggest increasing availability over the next several years, should the region see more investment.

The County fleet currently consists of approximately 250 vehicles housed across 21 facilities, with a majority belonging to the Public Works and Utilities departments. Light-duty vehicles are the most common, though there is also a significant presence of heavy-duty trucks and specialty vehicles. While many vehicles remain within their useful life by mileage, several are past their expected replacement year, highlighting an opportunity for phased ZEV replacement. Fleet operations in White Rock are also included in the planning, though no vehicles are currently housed at those facilities. Alternatively, Atomic City Transit is part of the County fleet but a conversion study for transit operations is being conducted separately. Atomic City Transit vehicles will not be considered in the County fleet planning but power requirements will be included for locations with shared operations.

In summary, Los Alamos County is well-positioned to pursue a phased and strategic transition to a zero-emission fleet. By leveraging supportive policies, aligning with its CAP, and evaluating both BEV and FCEV technologies across its vehicle classes, the County can reduce emissions, improve operational efficiency, and lead by example in the statewide decarbonization effort.

Acronyms / Abbreviations

Acronym / Abbreviation	Full Name
ADA	Americans with Disabilities Act
BEV	Battery Electric vehicle
CAP	Climate Action Plan
CNG	Compressed Natural Gas
CTE	Centre for Transportation and the Environment
cu m	Cubic Meter
DER	Distributive Energy Resources
EV	Electric Vehicle
FCEV	Fuel Cell Electric Vehicle
GHG	Green House Gas
GVWR	Gross Vehicle Weight Rating
hr	Hour
ICE	Internal Combustion Engine
kg	Kilogram
KM	Kilometer
kWh	Kilowatt hour
LANL	Los Alamos National Laboratory
lbs	Pounds
NZEV	Near-Zero Emission Vehicle
OEM	Original Equipment Manufacturer
PHEV	Plug-in Hybrid Electric Vehicle
SUV	Sport Utility Vehicle
USD	United States Dollar
V2G	Vehicle-to-grid
ZEV	Zero Emission Vehicle

Glossary

Term	Definition
Cutaway	A cutaway vehicle is a commercial chassis where the cab and front-end are fully built by the manufacturer, but the rear portion of the vehicle is left open or unfurnished so that a third party can install a specialized body.
Battery Degradation	Battery degradation is the gradual loss of a battery's ability to hold and deliver charge over time due to chemical and structural changes within its cells.
Bidirectional Charging	The ability for electricity to flow from the charger into the vehicle and from the vehicle back to the grid or building.
CAFE Standards	Corporate Average Fuel Economy standards established by the U.S. DOT to improve vehicle fuel efficiency.
Compressed Hydrogen	Hydrogen stored at a high pressure for use in FCEVs.
Cryogenic Hydrogen	Hydrogen stored as a liquid in very low temperatures.
Distributed Energy Resource (DER)	A small-scale electricity supply or storage technology (e.g., V2G buses) connected to the grid.
Electrolysis	A method of producing hydrogen by splitting water using electricity, often from renewable sources.
Fuel Cell	A device that generates electricity through an electrochemical reaction between hydrogen and oxygen.
Gross Vehicle Weight Rating (GVWR)	The maximum weight a vehicle can safely carry, including passengers and cargo.
Heavy-duty	Heavy-duty vehicles are large commercial vehicles designed for freight, refuse collection, construction, and other industrial operations.
Hydrogen Refueling Station	A facility where hydrogen vehicles are fueled.
Kilowatt-hour (kWh)	A unit of energy used to measure battery capacity.
Kilowatt (kW)	A unit of power used to measure motor output or charger speed.
Light-duty	Light-duty vehicles include typical passenger vehicles and small commercial vehicles designed for personal or light commercial use.
Medium-duty	Medium-duty vehicles are typically commercial trucks and vans used for goods delivery, transit, or vocational services.
Regenerative Braking	A process where energy from braking is recovered and stored in the battery.
State of Charge (SOC)	State of Charge (SOC) refers to the current level of energy stored in a battery as a percentage of its total usable capacity. It is a key indicator of how much charge remains before a battery is depleted or needs recharging.
State of Health (SOH)	State of Health (SOH) is a measure of a battery's overall condition and performance relative to when it was new. It is expressed as a percentage (%), where: 100% SOH = battery is performing at its original, as-new capacity.
Vehicle-to-Grid (V2G)	Vehicle-to-Grid (V2G) is a technology that allows electrical vehicles, particularly battery electric vehicles, to send electricity back to the power grid. V2G enables bidirectional charging, meaning the vehicle can both charge from and discharge to the grid, potentially helping to balance demand, provide backup power, and support renewable energy integration.

1 Regulatory Context

Policies and regulations supporting the transition to ZEV fleets are increasing as efforts to decarbonize the transportation sector expand. Through Executive Orders, regulation, and joint contracts the State of New Mexico is advancing this effort through multiple avenues. While some mechanisms compel State-owned fleets to transition, Los Alamos County may want to align with some or all of them or pursue their own policies.

First, Executive Order (2023-138) requires state-agency-owned fleets to be zero-emission by 2035. This Executive Order does not apply directly to County vehicles, but the County may adopt this aspirational goals. Battery-electric, plug-in hybrid electric, and fuel-cell electric vehicles have eligible powertrains that are likely to meet this procurement requirement. Law enforcement vehicles, firefighting trucks, and some other heavy-duty vehicles are exempted from this objective.

The New Mexico Alternative Fuel Acquisition Act (1992 NMSA 1978, Sections 13-B-1 through Section 13-1B-7, last amended in 2018) was enacted to align with the federal Energy Policy Act (EPAct). The Act requires state agencies, departments, and educational institutions to acquire a minimum of 75% alternative fuel vehicles (AFVs), plug-in electric vehicles (PHEVs), or gas-electric hybrids for new light-duty vehicles under 8,500 pounds. These vehicles must also meet or exceed U.S. DOT Corporate Average Fuel Economy (CAFE) standards, which require manufactures to increase fuel efficiency by 2% per year for passenger cars and 0-2% per year for light trucks from model years 2027 to 2031. Furthermore, these vehicles must:

- Have a hybrid powertrain
- Be capable of operating on alternative fuel
- Be plug-in electric vehicles

The New Mexico's Clean Car Rule (also known as Advanced Clean Cars II or ACC II) requires vehicle manufacturers to deliver an increasing percentage of new, on-road ZEVs (like electric and plug-in hybrid cars and light trucks) to the state, starting with Model Year 2027, with the goal of over 80% ZEVs by Model Year 2032. Certified law enforcement pursuit vehicles and emergency vehicles are exempt from both this Act and the New Mexico Alternative Fuel Acquisition Act.

Lastly, Energy and Fuel Cost Savings Contracts are a mechanism by which government fleets may finance alternative fuel vehicles or related infrastructure through guaranteed utility savings contracts where vehicle operational and fuel cost savings pay for the capital investment.

As New Mexico's vehicle emissions standards were modeled on California's and adopted by the state, New Mexico has been impacted by the recent federal EPA waiver cancellation that allowed California and other states to set emissions standards stricter than the EPAs. This waiver cancellation has prompted New Mexico and several other states to form the Affordable Clean Cars Coalition which aims to preserve state's authority to set their own emissions reduction targets. A court will now decide whether emissions standards will be set at the state or federal level. However, New Mexico has stated they will continue to support the private adoption of electric vehicles and infrastructure through tax credits and incentives. This signal makes it likely that public fleet transition will continue to be encouraged as well. While this does not create a direct regulatory requirement for Los Alamos County, the policy direction suggests that, even without a mandate, public fleet transition will continue to be encouraged through incentives and supportive programs.

Lastly, the County has already started the adoption of EVs through hybrid vehicle purchases and a policy of transitioning two vehicles a year to EV. This two-vehicle policy uses the County's standard annual procurement strategy determining which fleet vehicles need to be replaced and relies on staff to determine which two vehicles are best suited for transition. Using this policy as a baseline, the County Fleet Conversion Plan will assess the impacts of this and other strategies while better planning for larger and longer-term adoption of EVs into the County's fleet.

1.1 Los Alamos Climate Action Plan

Los Alamos County's Climate Action Plan (CAP), approved in November 2024, sets ambitious goals for reducing greenhouse gas emissions from transportation and enhancing community mobility.[1] It highlights strategies to build a sustainable and accessible transportation network by expanding EV infrastructure, promoting multimodal options, and improving cycling and pedestrian paths. Specific EV-related actions are designed with several key strategies

- T1.1: Promote EV adoption by educating the community on tax incentives and rebates for EV purchases, particularly for low-income populations, and working with local partners such as LANL and the school district to explore fleet conversions to EVs.
- T1.2: Develop an EV infrastructure plan to map EV infrastructure needs in collaboration with the Los Alamos Electric Utility, NMDOT, and other organizations, addressing barriers to EV readiness in public spaces, with particular focus on affordable housing access. This aligns with the County's existing incentives to reduce parking requirements if EV infrastructure or bike facilities are included.
- T1.3: Implement new building codes to incentivize EV readiness for new and redeveloped properties, encouraging EV chargers in multi-family housing, commercial areas, and community spaces, with particular focus on affordable housing access. This aligns with the County's existing incentives to reduce parking requirements if EV infrastructure or bike facilities are included.

[1] https://www.losalamosnm.us/files/sharedassets/public/v/2/departments/county-manager/documents/losalamoscap_20241104-reduced.pdf

- T1.4: Transition the County fleet to EVs by replacing end-of-life vehicles with EVs when feasible. Alternative strategies, such as right-sizing or hybrid vehicle purchases, will be pursued when full EV options are not available. The County is considering aligning its transition goal with New Mexico's target of a 100% zero-emission fleet by 2035.

1.2 ADA Parking Requirements

Los Alamos County is committed to ensuring that all programs, services, and activities – including the provision of EV charging stations – are accessible to individuals with disabilities, in accordance with the Americans with Disabilities Act (ADA) of 2010.[2] For public-facing EV chargers, ADA accessibility requirements apply and must be followed. For county fleet-only charging there are currently no strict ADA mandate – only recommended practices. As a matter of good practice and keeping in mind compliance may change, the County should ensure at least one accessible charging unit is available at the employee site for internal use.

To be considered accessible, EV charging stations must:

- Be located on an accessible route connecting to sidewalks, buildings, and other site elements[3],
- Have operable controls within the ADA-reach range (typically 15-48 inches from the floor to ground[4]),
- Provide adequate clear floor space for wheelchair users with stall dimensions, 11 ft wide by 20 ft deep[5],
- Include a "reasonable number" of accessible charging ports (best practice is 5% of total ports[6]),
- Offer proper signage that identifies accessible chargers without reserving them exclusively for drivers with disabilities[7],
- Ensure payment systems and user interfaces are usable by people with disabilities, ideally meeting Section 508 standards,
- Provide communication aids or alternative formats upon request[8], and

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[2] https://www.access-board.gov/ada/
[3] https://www.access-board.gov/tad/ev/#accessible-routes
[4] https://www.access-board.gov/tad/ev/#unobstructed-side-reach
[5] https://www.access-board.gov/tad/ev/#accessible-mobility-features-1
[6] https://www.access-board.gov/tad/ev/#number-of-accessible-chargers
[7] https://www.access-board.gov/tad/ev/#%E2%80%9Cuse-last%E2%80%9D-approach-to-ev-chargers-with-accessible-mobility-feat
[8] The EV charger market supports multilingual displaces and in some cases audio prompts. For example, the LG EV Charger supports audio in English, Spanish, and French. https://www.lg.com/us/ess/pdf/LG_SPEC-SHEET_EV_Series_112334_LR1.pdf

- Be installed in locations with adequate lighting and, if possible, weather protection such as canopies or overhangs.

If a person with a disability is unable to use an EV charger due to its design or location, they may request a reasonable modification through the County's ADA Access and Inclusion Solutions Process. The County may deny a request only if it would impose an undue burden or fundamentally alter the nature of the program or service.

The County's ADA policy does not mandate that EV charging stations be placed in ADA parking stalls. This approach aligns with federal best practices, which recommend that EV charger accessibility be achieved through independent design features, not by reserving EV spaces exclusively for ADA placard holders. The key requirement is that at least one or more chargers are accessible, regardless of their co-location with ADA stalls.

2 Technology Review

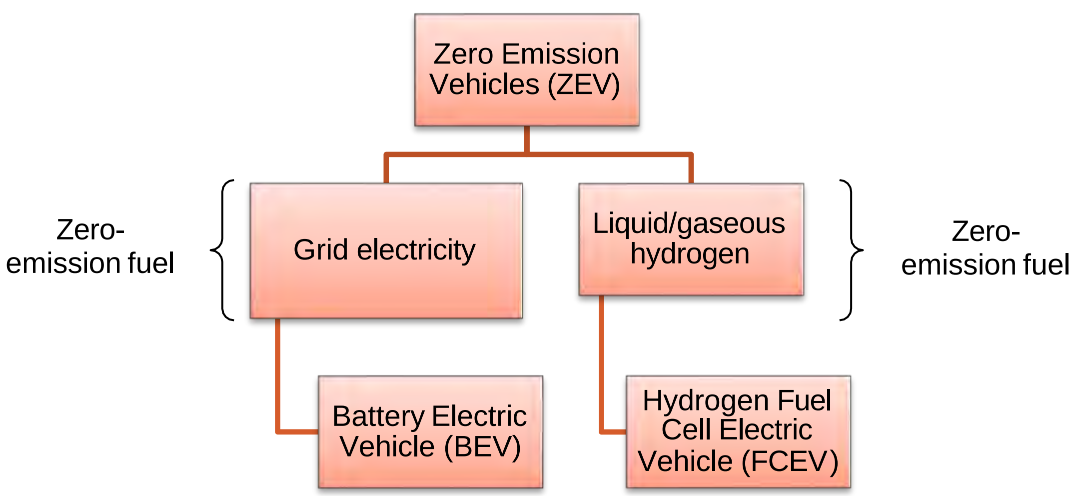
Before delving into the various ZEV technologies, it is also important to understand how traditional vehicles function, and how they differ from ZEVs.

Traditional vehicles with an internal combustion engine (ICE) generate power through burning fossil fuels, such as gasoline or diesel, to facilitate motion. Greenhouse gases (GHGs) and pollutants are emitted as exhaust gases from this combustion. Alternative fuel types, such as compressed natural gas (CNG) and biofuels, typically emit fewer air pollutants compared to gasoline or diesel.

Hybrid vehicles reduce exhaust emissions and offer improved fuel efficiency by leveraging an ICE with an electric motor. Hybrid vehicles transition between electric propulsion and conventional combustion dynamically based on driving conditions and power demand. Though emissions are lower, they do not achieve zero tailpipe emissions[9] and are therefore referred to as near zero-emission vehicles (NZEVs).

ZEVs produce zero tailpipe (or point-source) emissions and when powered by carbon free energy sources, such as solar, hydro-electric, or nuclear have no upstream GHG emissions. Divided into two categories, ZEVs include battery electric vehicles (BEVs) and hydrogen fuel cell electric vehicles (FCEVs). The relationship between these vehicles is summarized in Figure 2-1.

Figure 2-1: Types of Zero-Emission Vehicles



[9] Tailpipe emissions are the pollutants emitted directly from a vehicle's exhaust system.

Furthermore, BEVs rely solely on electricity stored in onboard batteries for propulsion and need to be charged through an electric power source. In contrast, FCEVs utilize onboard hydrogen fuel cells to generate electricity from a gaseous or liquid hydrogen fuel source. FCEVs refuel in a manner similar to refueling traditional ICE vehicles.

Each section reviews the current market as it pertains to Los Alamos' existing fleet. To simplify this review, vehicles are divided into three classes: light-, medium-, and heavy-duty vehicles. This classification used gross vehicle weight rating (GVWR) and is informed by the Federal Highway Administration (FHWA) Identification Guide[10] from the U.S. Department of Transportation (DOT).

Table 2-1: Vehicle classification by GVWR

Classification	GVWR Range	Vehicle Body Types	Common Vehicle within the Los Alamos Fleet
Light-Duty	0-8,500	Passenger cars	Ford F-150
		Pickup trucks	
		Cargo vans	
Medium-Duty	8,501-19,500	Box trucks	Ford F-350
		Step vans	
		Cutaways	
		Flatbed	
		Dump trucks	
Heavy-Duty	Over 19,500	Straight trucks	Peterbilt 520
		Vocational truck	
		Tractors	
		Refuse trucks	
		School bus	

It is important to note that transitioning to ZEVs is not always one-to-one as ZEVs are often heavier and may not be able to perform the required operations in the same way as the fossil fuel fleet.

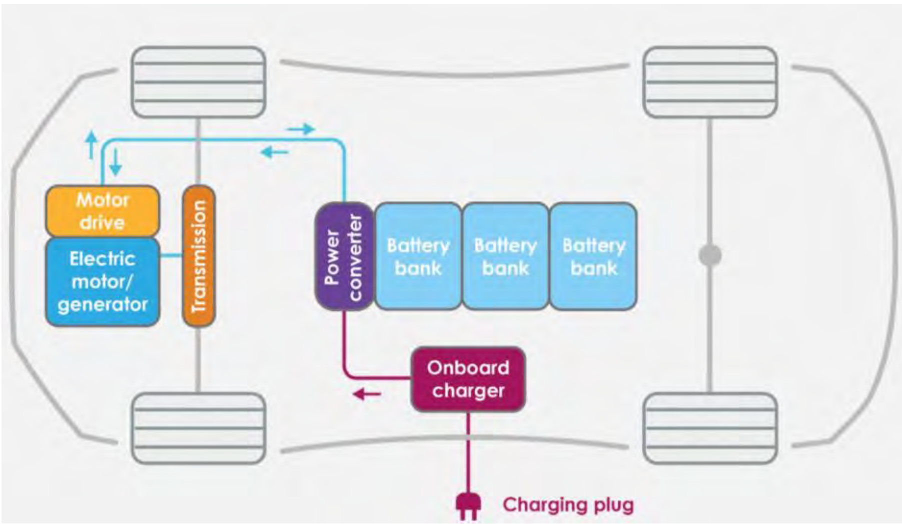
2.1 Battery Electric Vehicles

BEVs are driven by an electric motor and obtain energy from onboard batteries. Propulsion occurs from electricity stored in their battery, and fueling occurs by recharging their onboard battery packs or battery

[10] https://ops.fhwa.dot.gov/publications/fhwahop10014/long_f21.htm

banks from an external power source as shown in Figure 2-2. Additionally, regenerative braking captures kinetic energy during braking and converts it back into electrical energy to replenish the onboard battery.

Figure 2-2: Battery Electric Vehicle[11]



2.1.1 Charging Infrastructure

The EV charging space is evolving to feature not only different power capacities, but also connector configurations. While the market has started to coalesce around the North American Charging Standard (NACS), a variety of connector types are still prevalent including SAE J1772, CCS, CHAdeMo. First laying a foundational understanding of connectors/dispensers, the following section describes the different power ratings of charging equipment, noting dispenser configurations for that could increase efficiency when charging the County's EV fleet.

Current charging infrastructure is grouped into three categories: Level 1, Level 2, and direct current fast chargers (DCFC) or Level 3. The table below (Table 2-2) provides a breakdown of charging level and applicable connector types.

[11] https://ocw.tudelft.nl/course-readings/2-1-2-lecture-notes-parts-of-an-ev-recap/

Table 2-2: Connector configuration and capacity

	Level 1	Level 2	DC Fast Charging
Connector Type	J1772 connector 	J1772 connector 	CCS connector  CHAdeMO connector  NACS J3400 
Voltage	120 V AC	208 - 240 V AC	400 V - 1000 V DC
Typical Power Output	1 kW	7 kW - 19 kW	50 - 350 kW
Estimated PHEV Charge Time from Empty	5 - 6 hours	1 - 2 hours	N/A
Estimated BEV Charge Time from Empty	40 - 50 hours	4 - 10 hours	20 minutes - 1 hour
Estimated Electric Range per Hour of Charging	2 - 5 miles	10 - 20 miles	180 - 240 miles
Typical Locations	Home	Home, Workplace, and Public	Public

Level 2 chargers have emerged as a cornerstone of electric vehicle infrastructure due to their balance of charging speed and convenience. These chargers use a 208-volt AC power source in commercial applications (240V in residential applications), similar to what is used for large household appliances like dryers and ovens. This higher voltage allows Level 2 chargers to deliver power more efficiently compared to Level 1 chargers, which use a standard 120-volt outlet in commercial and residential applications.

Charging up to two vehicles at a time at a maximum of 19kW, Level 2 chargers can charge a light-duty BEV to 80% from empty in 4 – 10 hours. This translates to an extra 25-30 miles of range per hour of charging compared to Level 1 chargers.

Figure 2-3: Level 2 charging examples

Increasing the speed at which a charger transfers power to a vehicle's batter, DCFCs rapidly deliver direct current (DC) to a vehicle's battery, bypassing the slower onboard AC conversion. Most DCFCs use CCS or NACS plug standards but depending on the charger and vehicle, they can add 180-240 miles of range in 20-60 minutes.

Individual chargers are the conventional architecture for DCFC equipment with typical standalone units outputting up to 150-kW, each wired to two separate dispenser connectors. While each charger can support two vehicles, the 150-kW capacity is shared, meaning some systems charge one vehicle fully before switching, while others split the power to charge both simultaneously to reduce power demand. Depending on the equipment, the charging scheme can be defined at the charger level.

Individual chargers are a key element of fleet charging infrastructure and allow for flexibility in managing the charging needs of multiple vehicles in tight spaces. They can be tailored to meet the space and energy requirements of the fleet.

Key features of individual charging equipment:

- Charger to Connection Ratio: Each charger can support 2 vehicles
- Charger Power: Each charger can output up to 150kW

Centralized charging systems are designed to handle high power capacities and offer significant efficiency improvements for charging multiple vehicles simultaneously. In this configuration, a central enclosure houses a device called a rectifier that converts AC current from the power source to DC, allowing for faster charging of vehicles. This central unit distributes DC power through many dispensers located throughout the site, allowing for simultaneous charging of multiple vehicles and ensuring that the fleet is ready for operation with minimal downtime.

Figure 2-4: Kempower centralized charging units

The modular design of these centralized systems provides flexibility in how vehicles are charged. Charger modules are available in various power levels, such as 50kW, 75kW, and 100kW, which can be combined to tailor power delivery depending on the needs of the vehicles charging at a particular time. This means that if one vehicle achieves a sufficient charging level, some of that power can be redirected to more quickly charge a different vehicle that has a lower charge. Because the charging infrastructure is consolidated in a central location, the dispensers can be in small areas for optimal space efficiency.

Key features of Centralized Charging equipment:

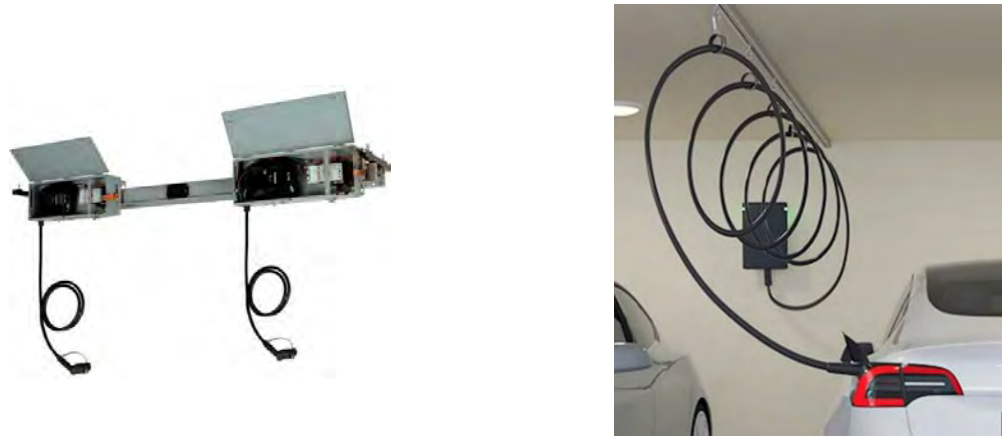
- Charger to Connection Ratio: Each charger can support up to 8 vehicles
- Charger Power: Each charger can output up to 240 kW

When designing charging infrastructure, the placement of dispensers plays a crucial role in optimizing space and power. Two common configurations are ground-mounted and ceiling-mounted dispensers.

Ground-mounted dispensers are the conventional charging design, where dispensers rise out of the ground at the location where the vehicle is charged. This design allows drivers easy access, as well as flexible deployment throughout the site, which can be helpful for accommodating vehicles of different sizes and types. However, ground mounted chargers also require careful planning because they can easily obstruct walkways or vehicle paths. In sites with space constraints, ground mounted dispensers can take up valuable real estate such as walking paths, drainage and landscaped areas.

Ceiling -mounted dispensers, however, are mounted overhead and alleviate the space constraints caused by ground mounted dispensers. Cables and dispensers are removed from potential conflicts with vehicles, reducing hazards and risks. Especially in sites with tight parking spaces and limited real estate, ceiling or gantry mounted dispensers can offer significant advantages. They are optimal for parking garages and indoor charging locations. However, ceiling mounted dispensers can also create accessibility concerns for some users, and they require specific conditions for installation.

Figure 2-5: Examples of cable management for overhead dispensers



In conclusion, while the naissance of the EV industry creates friction between legacy technology and evolving standards, there is no one-size-fits-all approach to deploying charging equipment. The County's fleet managers, procurement team, and facilities managers will need to coordinate on pairing the most appropriate vehicles with compatible charging infrastructure, sized for the utilization demand. Informed decision making will enable the County to deploy EVs, learning from each subsequent expansion of infrastructure.

2.1.2 Light Duty

Smaller vehicles in fleet operations can include midsized and compact sedans or sport-utility vehicles (SUVs), weighing under 8,500 lbs. and are classified as Class 1 and Class 2 vehicles. This vehicle segment has a variety of technologies and models available.[12]

The BEV sedan market is well-developed and includes a broad range of manufacturers producing a variety of models at different price points. Base on a review of the County's fleet, the light-duty vehicles included in this market analysis are those most applicable to the fleet.

[12] Vehicle class definitions https://hedgescompany.com/blog/2018/06/vehicles-in-operation-vio-faqs/

Table 2-3: Battery-electric light-duty sedans and SUVs

Five Passenger Sedan		
Battery size (kWh)	64 - 99	
Range (mi)	211-402	
GVWR	3,679 - 4,916	
Vehicle Weight (lbs)	947 - 4,890	
Available models	• Hyundai Kona[13] • Volkswagen ID.4[14] • Tesla Model 3[15] • Hyundai Ioniq 6[16]	
MSRP (USD)	$32,496 - $56,990	*Hyundai Ioniq 6 pictured
Five Passenger SUV		
Battery size (kWh)	77 - 91	
Range (mi)	222-353	
GVWR	5,556 - 6041	
Vehicle Weight (lbs)	4,600 - 4877	
Available models	• Hyundai Ioniq 5[17] • Kia EV6[18], Niro[19] • Nissan Ariya[20] • Ford Mustang Mach-E[21] • Tesla Model Y[22]	*Ford Mustang Mach-E pictured
MSRP (USD)	$33,447 - $57,473	

[13] https://www.hyundaicanada.com/en/showroom/2024/kona
[14] https://www.vw.ca/en/models/new-vehicles/2025-id4.html
[15] https://www.tesla.com/en_ca/model3
[16] https://www.hyundaicanada.com/en/showroom/2024/ioniq-6
[17] https://www.hyundaiusa.com/us/en/vehicles/ioniq-5/compare-specs
[18] https://www.kiamedia.com/us/en/models/ev6/2022/specifications
[19] https://www.kiamedia.com/us/en/models/niro-ev/2022/pricing
[20] https://www.nissan.ca/vehicles/electric-cars/ariya.html
[21] https://www.ford.com/cmslibs/content/dam/brand_ford/en_us/brand/suvs-crossovers/mache/3-2/pdf/seo-pdfs/Mustang-Mach-E-Tech-Specs.pdf, https://www.ford.ca/suvs/mach-e/?searchid=700000001048934&campaignid=71700000059716210&gclid=1b433d1d72dd169682765578faa77e2e&gclsrc=3p.ds&msclkid=1b433d1d72dd169682765578faa77e2e
[22] https://driving.ca/tesla/model-y/

In addition to passenger vehicles, the County fleet includes light-duty pickup trucks. There are a variety of battery-electric pickup trucks available, summarized in Table 2-3. While all models offer potential benefits for the County, the Ford F-150 XLT Lightning, available in both the standard and extended-range version, may present the most seamless transition as it aligns with the County's existing use of Ford pickup trucks within its fleet.

Table 2-4: Battery-Electric Light-Duty Pickup Trucks

Light-Duty Pickup Truck		
Battery size (kWh)	98 - 213	
Range (mi)	240-500	
GVWR	7700 – 12,500	
Vehicle Weight (lbs)	8,250 – 9,063	
Available models	• Ford F-150 XLT Lightning (Standard-range)[23] • Ford F-150 XLT Lightning (Extended-range) • Rivian R1T[24] • GMC Hummer[25] • Chevrolet Silverado EV[26] • GMC Sierra EV[27]	
MSRP (USD)	$59,992 - $107,000	*Ford F-150 Lightning pictured

[23] https://www.fromtheroad.ford.com/content/dam/fordmediasite/us/en/library/2022/specs/F-150_Lightning_Tech_Specs.pdf
[24] https://www.electricvehiclespecs.com/rivian-r1t-135-kwh-specifications/
[25] https://www.gmc.com/electric/hummer-ev/pickup-trucks-suvs
[26] https://www.chevrolet.ca/en/electric/silverado-ev
[27] https://www.gmccanada.ca/en/electric/sierra-ev

The County's fleet also includes cargo vans. While the battery electric van market has been developing outside of North America with vehicles like Nissan's e-NV200,[28] the availability of cargo and utility vans is growing but limited within the United States. Battery-electric cargo vans produced by Ford, Mercedes, Chevrolet and RAM offer a variety of lengths to help suit all needs.

Table 2-5: Battery Electric Vans

Minivan		
Battery Size (kWh)	91	 *Volkswagen ID Buzz pictured
Range (mi)	258	
GVWR	Not available	
Vehicle Weight (lbs)	5447	
Available models	• Volkswagen ID Buzz[29] • Kia PV5[30]	
MSRP (USD)	Not available	
Cargo Van		
Battery size (kWh)	68 - 120	 *Chevrolet BrightDrop 600 pictured
Range (mi)	108-126	
GVWR	9,500 - 11,000	
Vehicle Weight (lbs)	5966 - 10,360	
Available models	• Ford E-Transit Cargo Low/Medium/High Roof[31] • Mercedes-Benz eSprinter[32] • Chevrolet BrightDrop 400/600[33] • RAM ProMaster EV[34]	
MSRP (USD)	$48,689 - $74,181	

[28] https://www.electricvehiclespecs.com/nissan-e-nv200-24-kwh-specifications/
[29] https://www.vw.ca/en/models/new-vehicles/2025-idbuzz.html
[30] https://worldwide.kia.com/int/pv5
[31] https://www.fromtheroad.ford.com/us/en/home
[32] https://www.mercedes-benz-vans.ca/en/esprinter
[33] https://www.chevrolet.com/commercial/brightdrop
[34] https://www.ramtruck.ca/en/promasterev

2.1.3 Medium Duty

The tables below summarize the specifications for step vans, cutaways, flatbeds, dump trucks, and straight tucks with GVWRs within the medium-duty classification that could meet the needs of the County's fleet.

Table 2-6: Battery Electric Vans and Cutaways

Step Van		
Battery size (kWh)	140 - 280	 *XOS SV Stepvan pictured
Range (mi)	105-234	
GVWR	19,500 - 26,000	
Vehicle Weight (lbs)	Not available	
Available models	• XOS SV Stepvan[35] • Chevrolet BrightDrop 600[36] • Motiv EPIC Step Van[37] • W56 Electric Step Van[38] • W750 All-Electric Step Van[39]	
MSRP (USD)	Not available	
Cutaway/Shuttle Bus		
Battery size (kWh)	89 - 127	 *Ford 2024 E-Transit Cutaway pictured
Range (mi)	90-159	
GVWR	9500 – 14,500	
Vehicle Weight (lbs)	5072 – some data not available	
Available models	• Ford 2024 E-Transit Cutaway • Motiv Shuttle Bus[40] • Optimal EV S1[41]	
MSRP (USD)	Not available	

[35] https://www.xostrucks.com/stepvan/
[36] https://www.gmenvolve.com/fleet/electric-vehicles/brightdrop-zevo
[37] https://www.motivtrucks.com/vehicles/step-vans/
[38] https://workhorse.com/work-trucks/w56-electric-step-van/
[39] https://workhorse.com/work-trucks/w750-electric-step-van/
[40] https://www.motivtrucks.com/vehicles/shuttle-bus/
[41] https://www.optimal-ev.com/s1

Table 2-7: Battery Electric Flatbed Truck

Flatbed Truck		
Battery size (kWh)	72 - 150	
Range (mi)	130-180	
GVWR	11,500 – 12,000	
Vehicle Weight (lbs)	Not available	
Available models	• VMC 1200[42] • BYD ETH8[43]	
MSRP (USD)	Not available	*VMC 1200 pictured

Table 2-8: Battery Electric Dump Trucks

Dump Truck		
Battery size (kWh)	105 - 210	
Range (mi)	135	
GVWR	14,200 – 33,000	
Vehicle Weight (lbs)	Not available	
Available models	• eMV Electric Dump Truck[44]	
MSRP (USD)	Not available	*eMV Electric Dump Truck pictured

[42] https://vicinitymotorcorp.com/images/pdf/VMC1200SpecificationsFlyer.pdf
[43] https://bydtrucks.com/eth8.html
[44] https://www.international.com/products/trucks/series/electric-mv

Table 2-9: Battery Electric Straight Truck

Straight Truck (Medium Duty)	
Battery size (kWh)	60 - 310
Range (mi)	41 - 250
GVWR	15,500 – 26,000
Vehicle Weight (lbs)	Not available
Available models	• Freightliner eM2[45] • Mack MD electric[46] • Hino M5e, L6e[47] • Isuzu N-Series EV[48] • BYD 6F[49] • Bolliger B4[50] • Zeus Electric Chassis[51]
MSRP (USD)	Not available

*Mack MD electric pictured

45 https://www.freightliner.com/trucks/em2/
46 https://www.macktrucks.com/trucks/md-electric/
47 https://www.hino.com/assets/ehino_spec.pdf
48 https://www.isuzucv.com/en/app/site/pdf?file=2025NRR-EV_ProductBrochure_Final.pdf
49 https://ev.motorwatt.com/ev-database/database-electric-trucks/byd-6f-cab-chassis
50 https://bollingermotors.com/bollinger-b4-electric-truck/
51 https://zeuselectricchassis.com/

2.1.4 Heavy Duty

Heavy-duty trucks have seen a significant increase in battery-electric model availability since 2019. In addition to original equipment manufacturers (OEMs), several companies like SEA offer retrofits to convert a vehicle to a battery-electric equivalent. Available battery-electric heavy-duty vehicles are summarized in the following tables. It should be noted that Los Alamos' fleet includes service trucks with specialized upfits, and a zero-emission equivalent would require selecting a compatible ZEV chassis and working with a body builder to replicate the necessary configurations.

Table 2-10: Battery-Electric Heavy-Duty Straight Trucks and Tractors

Vocational Truck (Heavy Duty)		
Battery Size (kWh)	240	 *Battle Motors Electric Striker pictured
Range (mi)	124	
GVWR	54,000	
Vehicle Weight (lbs)	Not available	
Available Models	• Battle Motors Electric Striker[52] • Fuso Next Generation eCanter with Roll-off Tipper[53][54]	
MSRP (USD)	Not available	
Straight Truck (Heavy Duty)		
Battery size (kWh)	138 – 375	
Range (mi)	175 - 275	
GVWR	26,000 – 33,000	
Vehicle Weight (lbs)	Not available	
Available models	• Freightliner eM2[55] • Volvo VNR Electric 4x2 Straight[56] • Volvo VNR Electric 6x4 Straight	

[52] https://battlemotors.com/striker_bev.html
[53] https://www.daimlertruck.com/en/newsroom/pressrelease/robust-efficient-and-battery-electric-daimler-truck-subsidiary-fuso-presents-the-next-generation-ecanter-with-roll-off-tipper-for-the-construction-industry-at-bauma-2022-52079443
[54] https://www.mitsubishi-fuso.com/en/product/new-ecanter/
[55] https://www.freightliner.com/trucks/em2/specifications/#tab-1
[56] https://www.volvotrucks.us/trucks/vnr-electric/

	• SEA-DRIVE 180 (electric powertrain platform)[57]	*Volvo Electric 4x2 pictured
MSRP (USD)	Not available	

Table 2-11: Battery Electric Specialty Trucks

Bucket Truck		
Battery size (kWh)	250 - 240	 *Mack MD7 All Electric Bucket Truck pictured
Range (mi)	135	
GVWR	33,000	
Vehicle Weight (lbs)	Not available	
Available models	• International eMV All Electric Bucket Truck[58] • Mack MD7 All Electric Bucket Truck	
MSRP (USD)	Not available	

[57] https://www.exro.com/
[58] https://www.terex.com/utilities/en/products/terex-green-solutions/terex-ev

Table 2-12: Battery Electric Tractors

Tractor		
Battery size (kWh)	375 - 753	
Range (mi)	100 - 350	
GVWR	82,000 – 105,000	
Available models	• Freightliner eCascadia[59] • BYD 8TT[60] • Nikola TRE BEV • Kenworth T680E • Volvo VNR Electric 6x2 • Peterbilt Model 579EV[61]	
MSRP (USD)	Not available	*Volvo VNR Electric 6x2 pictured

In addition to service vehicles, the County's fleet includes a small number of school buses. It should be noted that the information presented is based on publicly available sources and may not capture all vehicles currently in development or available through direct manufacturer engagement.

Table 2-13: Battery Electric School Buses

School Buses (25 – 40-ft)		
Battery size (kWh)	155 - 315	
Range (mi)	120 - 255	
Available Models	• Blue Bird Vision Electric[62] • Lion LionC[63] • IC Bus Electric CE[64] • Thomas SAF-T-Liner C2 Jouley[65] • BYD Type C[66]	*Blue Bird Vision Electric pictured
MSRP (USD)	Not available	

[59] https://www.freightliner.com/trucks/ecascadia/
[60] https://ride.co/products/8tt/
[61] https://www.peterbilt.com/trucks/electric/579EV
[62] https://www.blue-bird.com/vision-electric-2/
[63] https://thelionelectric.com/lionc/
[64] https://www.icbus.com/electric
[65] https://thomasbuiltbuses.com/school-buses/saf-t-liner-c2-jouley/
[66] https://cptdb.ca/wiki/index.php/BYD_Auto_Type-C_school_bus

The deployment of battery electric school buses presents a significant opportunity for Vehicle-to-Grid (V2G) applications to support the electric grid. Integrating electric school bus deployment with V2G may contribute to a more competitive total cost of ownership by enabling buses to act as Distributed Energy Resources (DERs) that provide compensated grid support, such as discharging during peak demand periods and recharging off-peak. This kind of deployment depends on high-powered bidirectional charging with advanced communication systems and cooperation with the utility.

Finally, while buses used for public transportation are located at County facilities, a market scan oriented towards transit vehicles was provided in previous efforts directed at Atomic Transit. The electrification study for Atomic Transit was conducted independently but will be summarized and included as an appendix of the County's Fleet Electrification Study.

2.1.5 Waste Management

The County currently operates front and side loading refuse trucks as well as street sweepers as part of its fleet. The market for ZEV alternatives within the refuse space is steadily expanding with several large-scale deployments of these vehicles across the country. The table below outlines available and emerging ZEV options for refuse collection and street sweeping applications.

Table 2-14: Battery electric trucks for refuse collection

Refuse Truck (Side and Front Loader)		
Battery size (kWh)	396	
Range (mi)	128 – 193 (~1,100 bin pickups per charge)	
GCWR	66,000	
Vehicle Weight (lbs)	Not available	
Available models	• Peterbilt 520EV[67] • McNEILUS Volterra ZSL [68] • Heil Revamp [69] • Mack LR Electric[70] • BYD 8R[71]	
MSRP (USD)	Not available	*Peterbilt 520EV pictured

Table 2-15: Battery-Electric Street Sweepers

Street Sweeper			
Size	Medium	Large	
Battery size (kWh)	210	240 - 400	
Run time (hr)	8	8	
GVWR	n/a	n/a	
Hopper size (cu m)	4.3	3.4 - 5.6	
Available models	Global M3 EV[72]	Global M4 EV Electric Broom Bear[73]	

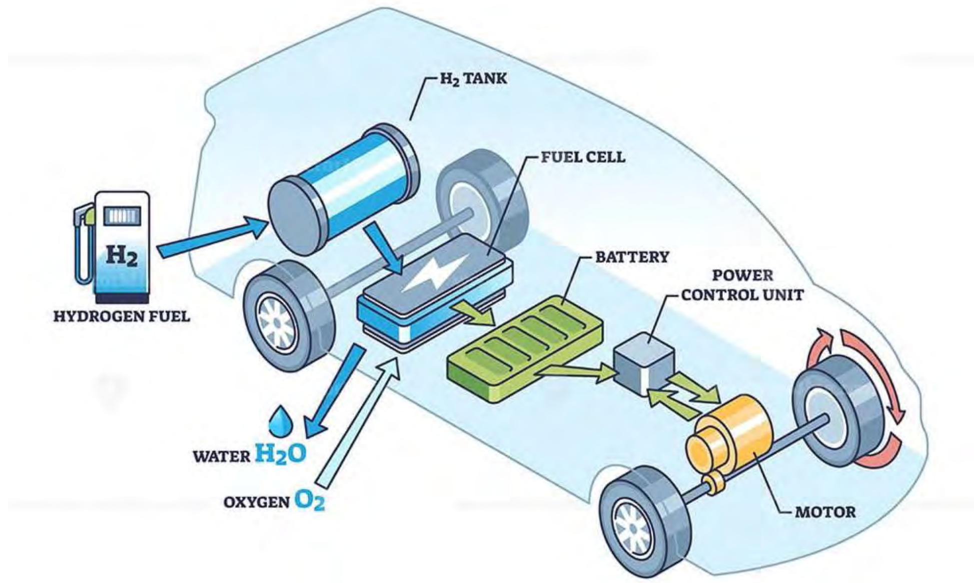
[67] https://www.peterbilt.com/trucks/zero-emission/520EV
[68] https://mcneilusgarbagetrucks.com/electric-garbage-trucks/volterra-zsl
[69] https://www.heil.com/bodies/revamp-electric-side-load-garbage-truck/
[70] https://www.macktrucks.com/trucks/lr-series/
[71] https://en.byd.com/byd-trucks/class-8-refuse-truck/
[72] https://globalsweeper.com/electric-street-sweepers#green-sweepers
[73] https://www.elginsweeper.com/products/all-electric/electric-broom-bear

MSRP (USD)	n/a	n/a	*Global M4 EV pictured

2.2 Hydrogen Fuel Cell Vehicles Viability

FCEVs are powered by an electric motor, similar to BEVs, but obtain energy from a fuel cell that generates electricity through a chemical reaction between hydrogen and oxygen. The only byproduct of this process is water vapor, making FCEVs zero-emission at the tailpipe. Fueling occurs by filling onboard hydrogen tanks at a hydrogen refueling station, as shown in Figure 2-3. Like BEVs, FCEVs also utilize regenerative braking to recover and store energy in a small onboard battery.

Figure 2-6: Hydrogen Fuel Cell Electric Vehicle



2.2.1 Fueling Considerations

Hydrogen fueling infrastructure in the Los Alamos area is currently limited, but strategic pilot programs and regional development efforts are laying the foundation for increased hydrogen availability in the near future. This section outlines existing and upcoming hydrogen fueling initiatives, supply logistics, and considerations for fueling hydrogen vehicles in the region.

2.2.1.1 Current Infrastructure

At present, there are no public hydrogen fueling stations in Los Alamos County. However, Los Alamos National Laboratory (LANL) has installed temporary hydrogen fueling stations on its campus to support a demonstration hydrogen fuel cell bus pilot.[74][75] The stations, located at Technical Area 03, provides fueling capacity for one hydrogen-powered shuttle bus and is being used to evaluate operational feasibility, fueling logistics, and performance in a high-altitude environment.[76] All hydrogen fuel is currently delivered to the site via truck, likely in a compressed gas form.

This pilot is intended as a short-term solution and a steppingstone toward a permanent hydrogen fueling facility at LANL or elsewhere in the region.[77] While not providing useable hydrogen for the County, this demonstration bus project aligns with Los Alamos County's broader decarbonization goals and provides valuable insight into how hydrogen could support transit and fleet operations in the area.

2.2.1.2 Regional Hydrogen Projects

Hydrogen production and fueling infrastructure are developing across northern New Mexico, with several initiatives poised to benefit the Los Alamos area:

- Kit Carson Electric Cooperative Hydrogen Microgrid (Questa, NM): About 70 miles from Los Alamos, this project is building a solar-powered green hydrogen microgrid with a 104 MW fuel cell plant for energy storage.[78] Hydrogen is produced on site using electrolysis and treated wastewater. While not designed for vehicle fueling, it establishes technical expertise and regional hydrogen generation capacity.

- Southwest Clean Freight Corridor (Statewide): Libertad Power, Diesel Direct, and Hyundai are collaborating to develop a regional hydrogen fueling corridor for heavy-duty vehicles spanning from California to West Texas, Hydrogen production plants and truck stop fueling stations are planned along I-40 and I-25, which could enable hydrogen delivery routes near Los Alamos in the coming years.[79]

- Although New Mexico's 2023 bid for a DOE-funded hydrogen hub was unsuccessful, the state continues to support hydrogen infrastructure through public-private partnerships. Companies like BayoTech are developing modular hydrogen production hubs in Alburquerque and other areas, which may serve northern New Mexico via delivered hydrogen.[80]

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[74] https://www.lanl.gov/science-engineering/science-programs/applied-energy-programs/fuel-cell
[75] https://ladailypost.com/nnsa-proposes-temporary-hydrogen-fueling-station/#:~:text=The%20purpose%20of%20the%20station,future%20need%20of%20alternative%20fuels
[76] https://www.lanl.gov/media/news/0505-northern-nm-hydrogen-power
[77] https://www.kob.com/archive/los-alamos-national-lab-works-on-hydrogen-powered-trucks/#:~:text=%22Heavy,vehicles%20on%20board%2C%E2%80%9D%20said%20Borup
[78] https://www.lanl.gov/media/news/0505-northern-nm-hydrogen-power
[79] https://www.thetruckersreport.com/news/new-mexico-envisions-hydrogen-powered-southwest-clean-freight-corridor/#:~:text=The%20corridor%20would%20stretch%20from,a%20Southwest%20Clean%20Freight%20Corridor
[80] https://www.bizjournals.com/albuquerque/news/2023/10/18/new-mexico-hydrogen-industry-federal-dollars-miss.html

2.2.1.3 Fueling and Delivery Logistics

With no hydrogen pipeline infrastructure or on-site production in Los Alamos, hydrogen is currently delivered via truck – either as compressed gas in tube trailers or as liquid hydrogen in cryogenic tankers, depending on volume needs. LANL's demonstration station uses this delivery model, any future permanent station would need to evaluate whether delivered fuel or on-site electrolysis is more cost-effective.[81]

For larger-scale deployment (e.g., a medium to large scale fleet), hydrogen generation via electrolysis may be viable if water and electricity availability are sufficient. Lessons learned from the Kit Carson project indicate that treated wastewater and renewable power can successfully support hydrogen production in northern New Mexico's environment.[82]

Station citing will require careful planning for hydrogen storage (compressed or liquid), setback distances, and safety systems. LANL's pilot station is temporary and designed to be relocated once permanent infrastructure is developed.

2.2.1.4 Outlook for Hydrogen Availability

Hydrogen availability in Los Alamos is currently limited to a single pilot fueling station for a demonstration vehicle. However, the region is seeing early momentum through:

- LANL's leadership in piloting hydrogen vehicle use;
- Regional production capacity via the Questa microgrid and BayoTech hubs;
- Planned freight fueling corridors through New Mexico.

While current access requires delivered hydrogen and fleet-scale coordination, future availability is likely to improve as infrastructure and supply chains mature. Collaboration with LANL and monitoring of regional developments will be key to ensuring hydrogen can be a viable zero-emission fuel in Los Alamos moving forward.

2.2.2 Hydrogen Vehicle Options

FCEV options are more limited compared to BEVs but are consistently expanding. The FCEV market is more developed for light-duty sedans and there are successful applications with heavy-duty vehicles.

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[81] https://info.ballard.com/hubfs/Premium%20Content/Hydrogen%20Fueling%20for%20Fuel%20Cell%20Bus%20Fleets/WP-Ballard-Hydrogen-Refueling-for-Fuel-Cell-Bus-Fleets.pdf
[82] https://afdc.energy.gov/states/nm#:~:text=Fuel%20Public%20Private%20Biodiesel%20,LPG%29%2059%202

Japanese manufacturers have a long history of hydrogen powered commercial vehicles and continue to promote this technology within US markets.

Table 2-16: Hydrogen Fuel Cell Light-Duty Sedans and SUVs

Fuel Cell Five Passenger Sedan		
Tank Size (kg)	5.6	 *Toyota Mirai pictured
Range (mi)	402	
GVWR	5345	
Vehicle Weight (lbs)	4255	
Available models	• Toyota Mirai[83]	
MSRP (USD)	$51,285	
Fuel Cell Five Passenger SUV		
Tank Size (kg)	4.3 – 6.5	 *Hyundai Nexo pictured
Range (mi)	360- 380	
GVWR	4,497 – 5,159	
Vehicle Weight (lbs)	4.134 – 4, 387	
Available models	• Hyundai Nexo[84] • Honda CR-V e:FCEV[85]	
MSRP (USD)	$58,490 - $72,500	

Hydrogen fuel cell options for light-duty pickup trucks are not available in the United States market. However, companies like Nikola, Hyundai, and Toyota are actively working towards offering hydrogen-powered options in the future.

2.2.2.1 Medium and Heavy-duty Fuel Cell Deployment

Hydrogen fuel cell vehicles are beginning to gain traction in the medium-duty sector, though deployments remain in the early stages. One of the most notable efforts is Ford's deployment of a fuel cell version of the F-550 Super Duty truck, piloted in collaboration with SoCalGas under the U.S. Department of

[83] https://www.toyota.ca/en/vehicles/mirai/overview/
[84] https://www.hyundaicanada.com/en/vehicles/2024-nexo
[85] https://automobiles.honda.com/cr-v-fcev

Energy's (DOEs) Supertruck 3 program.[86] Designed to meet the high demands or utility work – including long range, fast refueling, and 24/7 readiness – the F-550 Fuel Cell Electric Truck has begun entering service in 2025. A temporary hydrogen fueling station will support the deployment at SoCalGas's Bakerfield Facility, helping the utility evaluate performance under real-world conditions.

A second pilot with Ferguson Enterprises will test another F-550 fuel cell prototype over a six-month period, providing Ford with critical data on how hydrogen vehicles perform in medium-duty delivery fleets.[87] These early deployments reflect a growing interest in hydrogen technology as a solution for fleet segments where battery-electric vehicles face limitations – such as payload capacity, range, and power tool usage.[88] While hydrogen medium-duty vehicles are still emerging, pilots like these are helping manufacturers and operators assess viability, build fueling infrastructure, and lay the foundation for broader adoption.

In addition to utility and work truck pilots, hydrogen fuel cell technology is also being tested in medium-duty delivery vans, offering another pathway for decarbonizing commercial fleets. In 2023, SoCalGas and the Center for Transportation and the Environment (CTE) deployed the first of 15 hydrogen fuel cell electric delivery vans in Southern California, retrofitted from diesel models and equipped with onboard hydrogen storage and a fuel cell range extender.[89] These vans are operated by a leading courier service, with routes focused in disadvantaged communities in the Inland Empire, where emissions reductions can deliver significant local air quality benefits.[89] This initiative is backed by a broad coalition with support from agencies such as the DOE, California Energy Commission (CEC), and South Coast AQMD.[89]

2.2.2.2 Available Medium- and Heavy-Duty Models

Hydrogen fuel cell tractors are beginning to emerge in the market, with a few models now commercially available. These include options from Kenworth, Hyzon, Nikola, and Hyundai. Though these vehicles are tractors, they can be used and configured for other applications like those of a flatbed truck, dump truck, or other specialized heavy-duty vehicles, providing versatile solutions for various commercial needs. Hyzon and New Way recently had a demo for a fuel cell refuse truck, and it is expected that they will be available for purchase in the coming year.[90]

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86 https://www.socalgas.com/newsroom/stories/socalgas-to-test-drive-fords-prototype-f-550-super-duty-hydrogen-fuel-cell-electric-truck
87 https://fordauthority.com/2022/09/ford-f-550-fuel-cell-prototype-work-truck-joins-ferguson-fleet/
88 https://www.cleantrucking.com/hydrogen/article/15295981/ford-rolling-out-fuel-cell-f550-utility-truck
89 https://www.socalgas.com/newsroom/press-release/socalgas-joins-center-for-transportation-and-the-environment-to-reduce-emissions-with
90 https://www.recyclingproductnews.com/article/42139/north-americas-first-hydrogen-fuel-cell-powered-refuse-truck-begins-road-testsn

Table 2-17: Hydrogen Fuel Cell Heavy-Duty Vehicles

Fuel Cell Vocational Truck[91]*		
Tank Size (kg)	Not available	 *Elemental Trucks Vocational Truck pictured
Range (mi)	310	
GVWR	Not available	
Vehicle Weight (lbs)	Not available	
Available Models	• Elemental Trucks Vocational Truck[92]	
MSPRP (USD)	Not available	
Fuel Cell Tractor		
Tank Size (kg)	32 - 100	 *Hyzon HyHD8-200 pictured
Horsepower (continuous)	374 - 415	
Range (mi)	350 - 500	
GVWR	33,000 - 82,000	
Vehicle Weight (lbs)	Not available	
Available models	• Kenworth T680 FCEV[93] • Hyzon HyHD8-200[94] • Hyzon HyHD8-110[95] • Nikola TRE FCEV[96] • Hyundai XCIENT Fuel Cell[97] • QHM FCEV[98]	
MSRP (USD)	Not available	

91 *More data is available from manufacturer through request
92 https://elementaltrucks.com/
93 https://www.kenworth.com/trucks/t680-fcev/
94 https://www.hyzonfuelcell.com/vehicles/hyhd8-200kw
95 https://www.hyzonfuelcell.com/vehicles/class-8
96 https://www.nikolamotor.com/wp-content/uploads/2023/09/FCE022_FCEV_Brochure_Full_09.25.2023.pdf
97 https://ecv.hyundai.com/global/en/products/xcient-fuel-cell-truck-fcev
98 https://www.quantron.net/en/q-truck/q-heavy/qhm-fcev/

There are also hydrogen fuel cell electric options for street sweeping, such as the Green Machines 500 H2 Light and Plus versions. These hydrogen-powered sweepers offer zero-emission solutions with operational flexibility. The Green Machines 500 H2 features a cartridge system with a run time of approximately 3 hours and a fixed tank system providing up to 11 hours of continuous operation. These innovative sweepers utilize hydrogen fuel cells to generate electricity, ensuring efficient and eco-friendly street cleaning for urban environments.

Table 2-18: Hydrogen Fuel Cell Electric Street Sweepers

Fuel Cell Street Sweeper		
Tanke Size (kg)	4	
Run time (hr)	3 - 11	
GVWR	4965 (light) 5776 (plus)	
Hopper size (cu m)	1,269 m3	
Available models	• Green Machines 500 H2 Light/Plus[99]	
MSRP (USD)	Not available	*Green Machines 500 H2 pictured

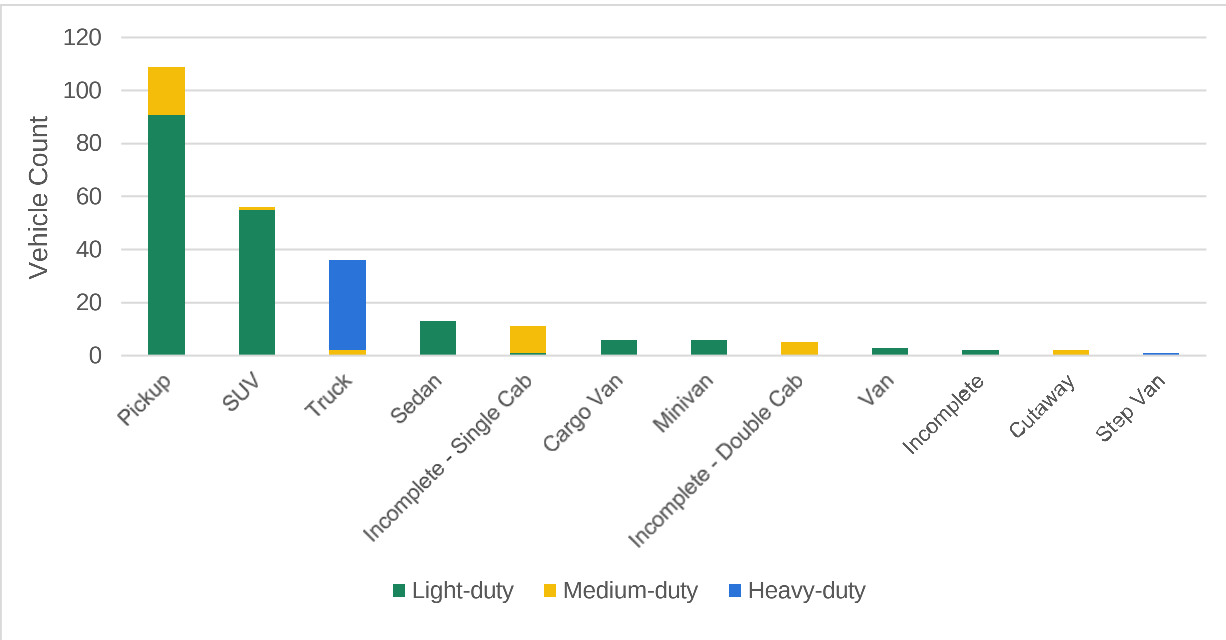
[99] https://greenmachines.com/500-h2/

3 Los Alamos County Fleet Overview

Los Alamos County operates a fleet of 250 vehicles, including many with specialized equipment and unique configurations. A summary analysis of the vehicles, users, and their utilization provides a baseline understanding of the fleet. To better understand and analyze the County's fleet and facility conditions and operational characteristics, Stantec developed a Power BI Dashboard that is able to process the data and present it in specific graphs and tables to better digest the information. Stantec has created specific information tabs with information for Los Alamos County to explore.

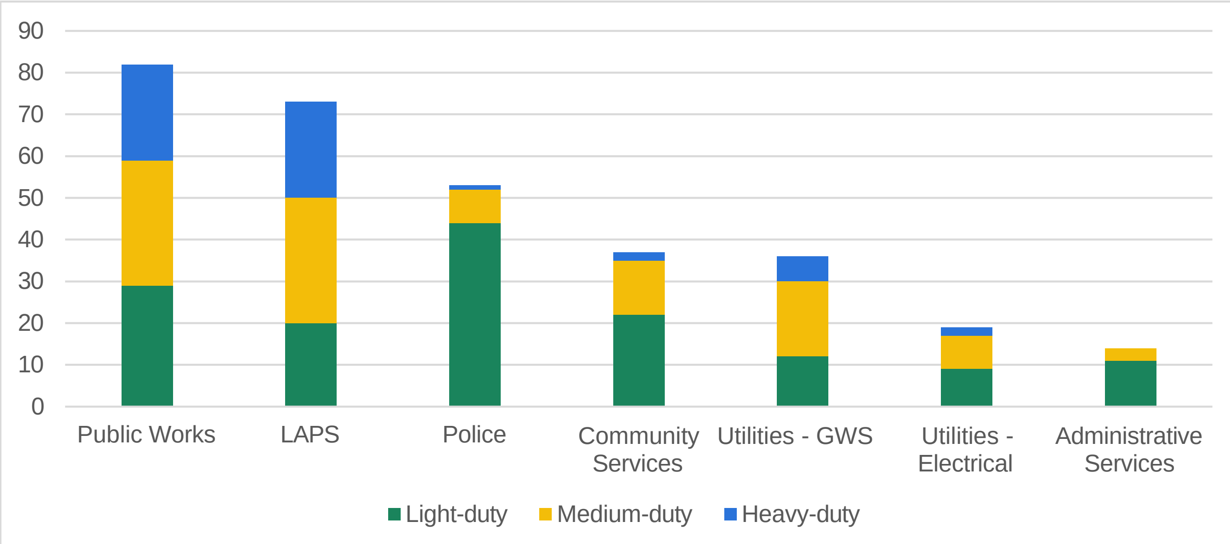
The sections below provide a brief overview of the fleet and facilities as the Dashboard is currently presenting such information. Los Alamos County will have full access to this information via a web-based platform for Power BI and will continue to have access to update and monitor the conditions of the fleet and the facilities even after the current project is completed.

Figure 3-1: Count of County fleet vehicles by body type and class



The County primarily operates pickups and SUVs with many heavy-duty trucks and some sedans among a variety of specialty vehicles. Of these vehicles, the most common vehicle type is light-duty. Fuel types used by the county include diesel and gasoline as well as some electric vehicles.

Figure 3-2: Distribution of vehicles by department group



Public Works and LAPS have the largest fleets (around 80 vehicles of diverse weight ratings) with most vehicles operating out of Pajarito Cliff Site (PCS). In addition to those fleets out of PCS, Police have around 55 vehicles operating out of the Justice Center with a significant portion being take home vehicles.

The chart above generalizes County departments into Department Groups by the services they provide. These Department Groups will help tailor recommendations on the direction these groups should take for electrification.

Broad recommendations will be informed by vehicle utilization and therefore will have nuance within Department Groups. For example, while Fire Response is expected to transition later (requiring significant improvements to technology) there may be opportunities for electrification of support vehicles. This nuance is often best served through phased implementation of fueling equipment with utility infrastructure sized for multiple phases.

Table 3-1. Department grouping

Department Group	Departments
Administrative Services	• Information Management, Procurement Warehouse, Fleet Motor Pool, and Human Resources
Community Services	• Community Services Department (Ice Rink, Library, Parks Open Space as well as Parks Maintenance, Senior Citizen services, and Recreation), Community Development, along with the County Assessor and Clerk
Fire Response	• Emergency Management, Fire Department and Deployment
Police	• Police Operations

Department Group	Departments
Public Works	• Public Works Departments (Engineering, Fleet Management, Transit, Facilities Maintenance, Custodial, Environmental Services, Traffic & Streets, and the Airport)
Utilities - Electrical	• Electrical focused departments (Distribution, Production, and Engineering) and Administration
Utilities - GWS	• Gas, Water, Sewer with water focused departments (Domestic Water, Meter Readers, Water Production), and general GWS.

Useful Life and Mileage

In general, the County's fleet is older with several vehicles well past their anticipated replacement year. The figures below were developed by using an interactive County ZEV Dashboard and show the distribution of age remaining across the fleet.

Figure 3-3: Remaining useful life of fleet vehicles

In addition to vehicle age, odometer readings are an important metric for which the County already measures the useful life of its vehicles. Shown below, the average odometer reading of each vehicle duty type is compared to the corresponding useful life meter reading. This indicates that on average, while there are older vehicles in the fleet, they are well within their useful life as measured by mileage.

Figure 3-4: Average last meter reading and estimated replacement meter by duty

4 County Facilities Overview

Operating out of 21 facilities across 17 properties in Los Alamos County, all vehicles are housed at facilities in or near the county of Los Alamos. The map found in Figure 4-1 shows the marker size relative to the count of vehicles at that facility. Of these facilities, PCS houses the most vehicles with several only having one or two.

Figure 4-1: Vehicle count at facilities within Los Alamos

In addition to the facilities located in Los Alamos, the County also operates out of five facilities in White Rock, NM. These facilities are included in the Fleet Conversion Plan but do not house any vehicles (what about Fire Station 3 and Library and Senior Center and Overlook Convenience Center).

Figure 4-2: County facilities located in White Rock

While the map above indicates the geographic distribution of facilities, the chart below (Figure 4-3) provides insight into the type of vehicles housed at each facility. For most facilities, light-duty vehicles are the most prevalent.

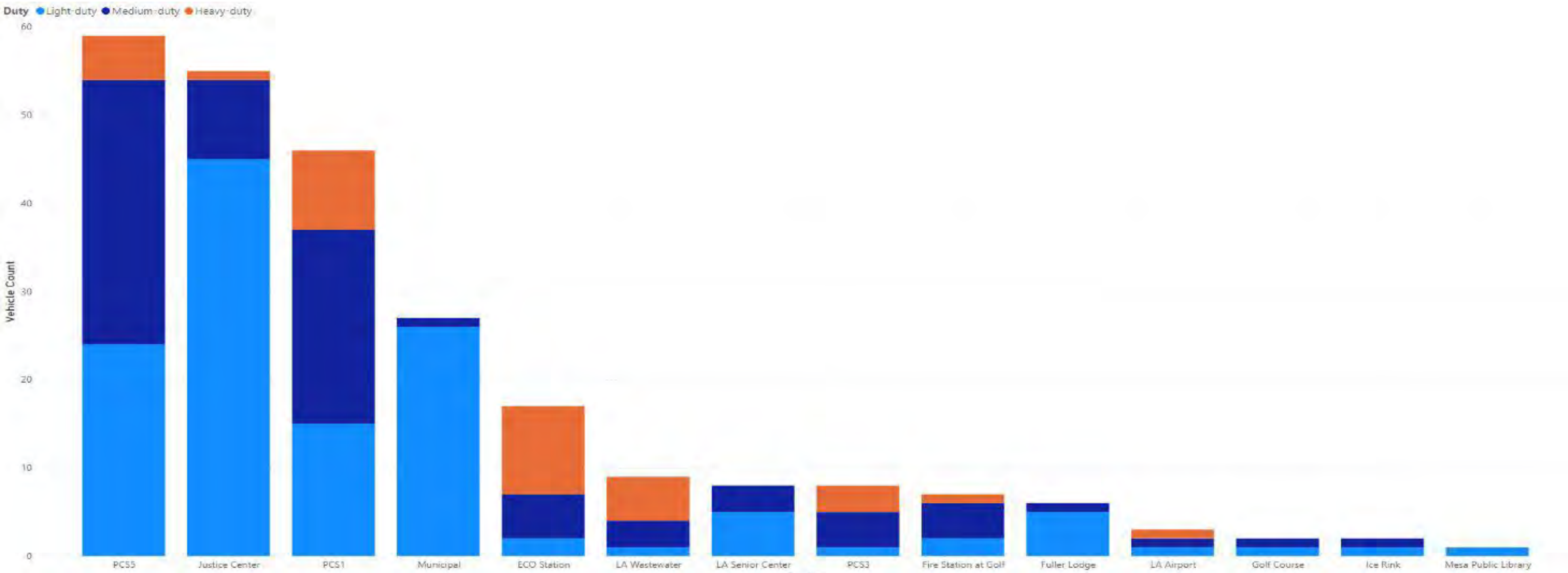
Table 2. Facilities included in Fleet Electrification plan

Facility Name	Address
Municipal Building	1000 Central Avenue, Los Alamos, NM 87544
Justice Center	2500 Trinity Drive, Los Alamos, NM 87544
Mesa Public Library	2400 Central Ave, Los Alamos, NM 87544
PCS 1	101 Camino Entrada, Los Alamos, NM 87544
PCS 2	101 Camino Entrada, Los Alamos, NM 87544
PCS 3	101 Camino Entrada, Los Alamos, NM 87544
PCS 4	101 Camino Entrada, Los Alamos, NM 87544
PCS 5	101 Camino Entrada, Los Alamos, NM 87544
Senior Center (Los Alamos)	101 Bathtub Row, Los Alamos, NM 87544
ECO Station	3701 E. Jemez Rd, Los Alamos, NM 87544
Fuller Lodge/Overflow	2132 Central Ave, Los Alamos, NM 87544
Fire Station #4 (Los Alamos)	4401 Diamond Dr, Los Alamos, NM 87544
Fire Department Training Center	132 DP Rd, Los Alamos, NM 87544
Golf Course	4290 Diamond Dr, Los Alamos, NM 87544
Wastewater Treatment Plan (Los Alamos)	3598 Pueblo Canyon Rd, Los Alamos, NM 87544
Ice Rink	4475 West Jemez Rd, Los Alamos, NM 87544
White Rock Senior Center	133 Longview Dr, White Rock, NM 87547
White Rock Library	10 Sherwood Blvd, White Rock, NM 87547
White Rock Visitor Center	115 State Road #4, White Rock, NM 87547

Facility Name	Address
White Rock Fire Station #3	129 State Road #4, White Rock, NM 87547
White Rock Wastewater Treatment Plant and Parks	580 Overlook Dr, White Rock, NM 87547
Airport (Los Alamos)	1040 Airport Rd, Los Alamos, NM 87544

Of the 22 County facilities included in this study, 14 have vehicles assigned to them (shown below in Figure 4-3). As part of the assessment of the County's fleet and facilities, Stantec completed 17 site visits to determine existing conditions, EV deployment potential, and issued preliminary recommendations. Summary of the site visit observations and recommendations for each site will be part of the final County Fleet Conversion Plan.

Figure 4-3: Vehicle count by facility and vehicle duty



4.1 Next Steps

Setting the stage for ZEV transition, this Market Scan report and the accompanying County ZEV Dashboard provide insight into key considerations for the County. Specifically, the dashboard will highlight which vehicle types and duty cycles are best suited for near-term electrification.

This tool provides a comprehensive and dynamic view of the fleet's composition and performance, relating factors such as duty cycle, production year, facility assignment, departmental use, and maintenance costs. Because the dashboard is live and updatable, it will continue to support data-driven decisions as fleet conditions and operational needs evolve. Some examples of insights driven by the model are listed below:

- Vehicles by duty type and facility: Compare how different types of vehicles (light-duty, heavy-duty) are distributed across County facilities to identify where replacement opportunities are most concentrated.
- Average vehicle age by department: Visualize which departments are operating the oldest vehicles, helping to prioritize replacements based on lifecycle and service reliability.
- Annual maintenance cost per vehicle: Assess how maintenance costs vary between vehicle types and how they relate to vehicle age.
- Mileage and utilization by facility: Identify under- or over-utilized vehicles across sites to optimize fleet size and reassign or retire low-use vehicles
- Replacement readiness by department: Combine factors such as age, mileage, maintenance costs, and duty type into a visualization showing EV transition readiness.

Through pairing conversations with the County and data analysis, Stantec will aim to provide actionable recommendations on EV vehicle phasing, fueling infrastructure, and change management for the County. Generally, a new utility meter with a new service would be recommended, but sub-metering could be a cost-effective solution for rapid implementation of the EV infrastructure needed.

Based on facility site visits, the appropriate utility connectivity is still uncertain but will be determined on a facility-by-facility basis. While the need for ADA accommodating EV charging was a concern, site visits indicate that public facing locations should have ample space, requiring minimal updates.

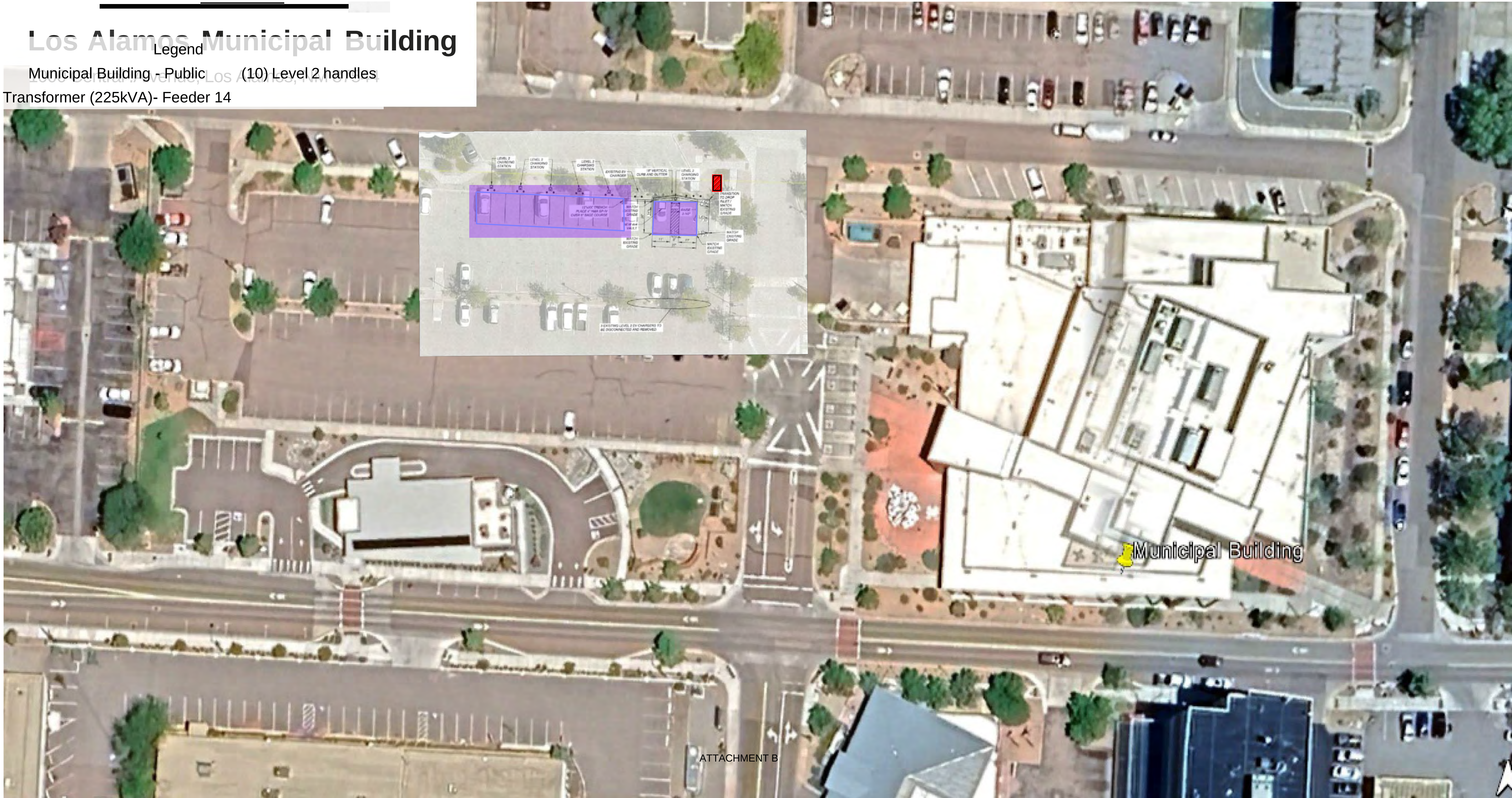
In conclusion, there are no significant obstructions to implementing EV infrastructure. Efforts thus far have set a foundation for infrastructure recommendations to be developed in subsequent tasks with the goal of helping chart an approach for County fleet transition that balances the needs of the Los Alamos community.

Appendix C County Facility Proposed Charging Siting

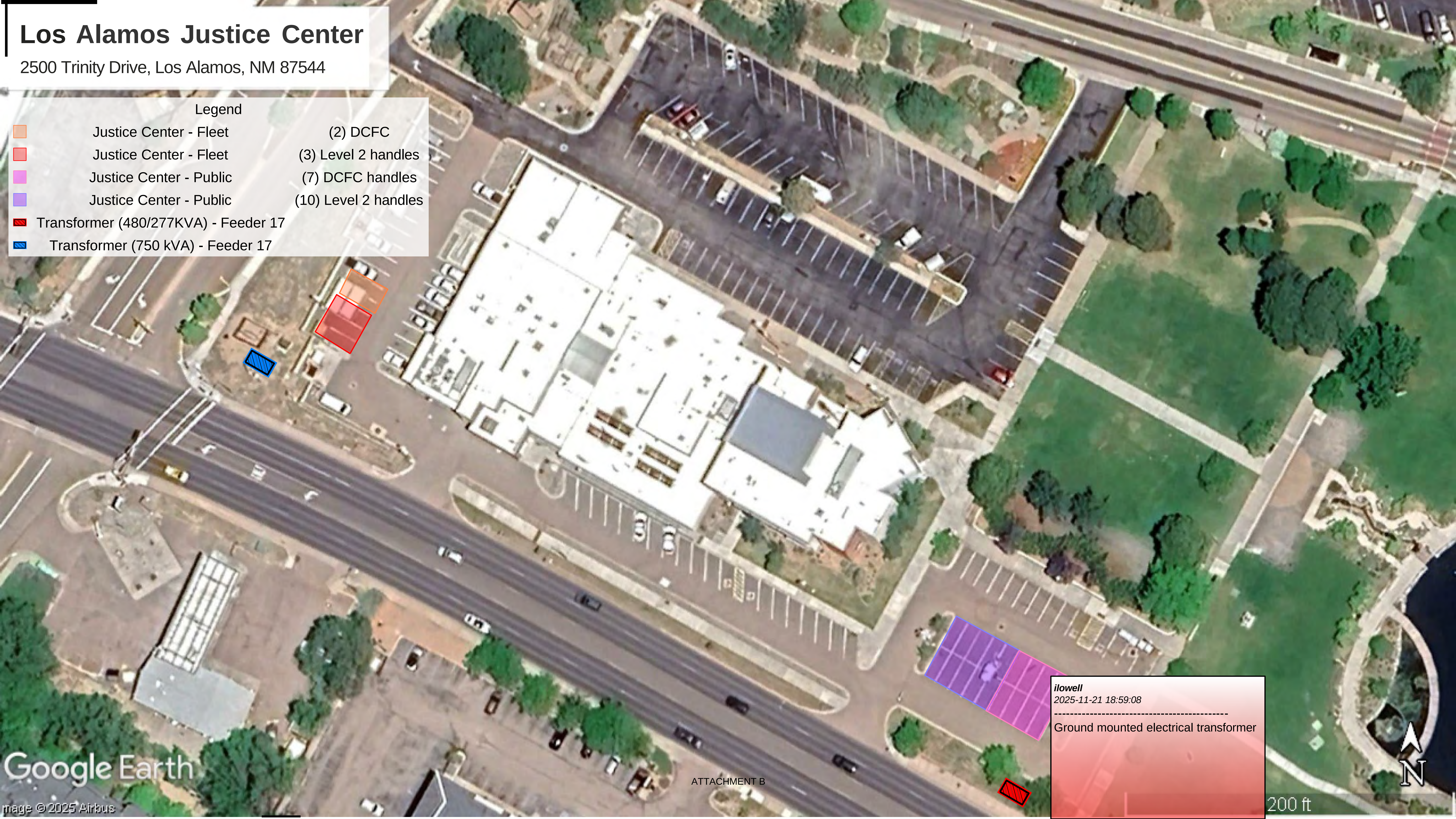
Los Alamos Municipal Building

Legend

- Municipal Building - Public (10) Level 2 handles
- Transformer (225kVA)- Feeder 14



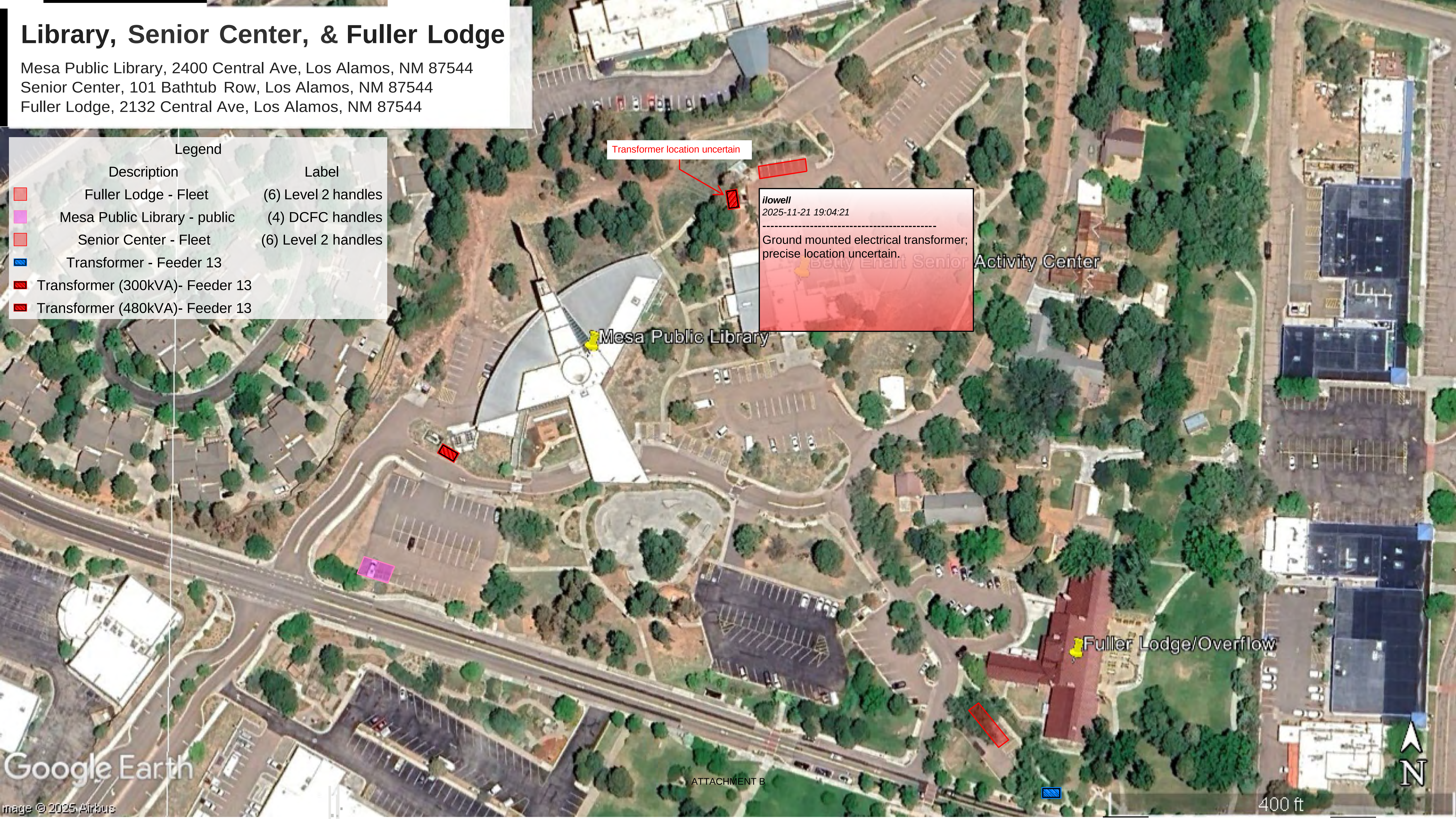
ATTACHMENT B


Los Alamos Justice Center
2500 Trinity Drive, Los Alamos, NM 87544
Legend
Justice Center - Fleet (2) DCFC
Justice Center - Fleet (3) Level 2 handles
Justice Center - Public (7) DCFC handles
Justice Center - Public (10) Level 2 handles
Transformer (480/277KVA) - Feeder 17
Transformer (750 kVA) - Feeder 17
ilowell
2025-11-21 18:59:08

Ground mounted electrical transformer
ATTACHMENT B
Google Earth
Image © 2025 Airbus
200 ft
N

Library, Senior Center, & Fuller Lodge

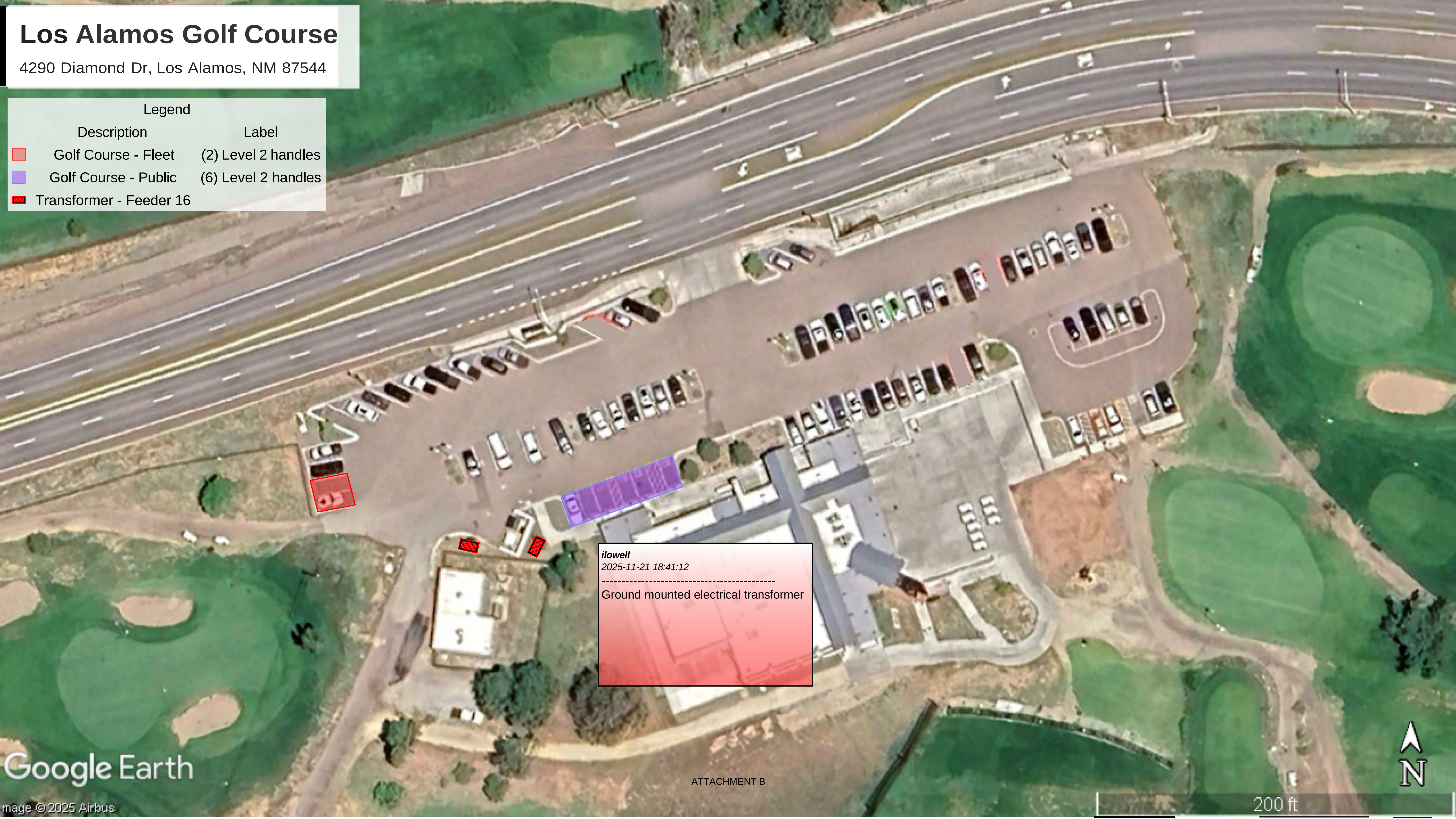
Mesa Public Library, 2400 Central Ave, Los Alamos, NM 87544
Senior Center, 101 Bathtub Row, Los Alamos, NM 87544
Fuller Lodge, 2132 Central Ave, Los Alamos, NM 87544



ATTACHMENT B


Sites (PCS)
101 Camino Entrada, Los Alamos, NM 87544
Atomic Transit
Legend
Description
Label
PCS 1 - Fleet (3) Level 2 handles
PCS 1 - Fleet (4) DCFC
PCS 1 - Fleet (6) Level 2 handles
PCS 3 - Fleet (6) Level 2 handles
PCS 5 - Fleet (3) Level 2 handles
PCS 5 - Fleet (8) DCFC
PCS 5 - Fleet (13) Level 2 handles
Transformer (300kVA)- Feeder 14
ilowell
2025-11-19 16:09:27
(6) Level 2
handle
ilowell
2026-02-24 20:01:06
-(4) DCFC
999.9 sf
PCS2
LAPS
PCS4
PCS5
PCS3
ilowell
2025-11-19 16:15:59
(13) Level 2
handles 3,615.4 sf
ATTACHMENT B


Los Alamos Eco Station
3701 E. Jemez Rd, Los Alamos, NM 87544
Legend
Description
Label
Eco Station - Fleet
(1) Level 2 handle
Transformer - Feeder 14
ilowell
2026-02-24 20:07:09
ilowell
2025-11-21 18:22:16
Ground mounted electrical transformer
Google Earth
Image © 2025 Airbus
ATTACHMENT B
300 ft
N



Los Alamos Golf Course
4290 Diamond Dr, Los Alamos, NM 87544
Legend
Description
Label
Golf Course - Fleet
(2) Level 2 handles
Golf Course - Public
(6) Level 2 handles
Transformer - Feeder 16
ilowell
2025-11-21 18:41:12
Ground mounted electrical transformer
ATTACHMENT B
Google Earth
mage © 2025 Airbus
200 ft
N


Los Alamos Water Treatment Plant
3598 Pueblo Canyon Rd, Los Alamos, NM 87544
Legend
Description
Label
WTP - Fleet
(1) DCFC - Phase 2
WTP - Fleet
(1) Level 2 handles - Phase 1
WTP - Fleet
(2) DCFC - Phase 3
ilowell
2025-11-19 17:01:51
(1) DCFC - Phase 2 135.9 sf
Google Earth
mage © 2025 Airbus
ATTACHMENT B
200 ft
N

Legend

Description	Label
Ice Rink - Fleet	(2) Level 2 handles
Ice Rink - Public	(8) Level 2 handles
Transformer - Feeder 13	

Los Alamos Ice Rink

4475 West Jemez Rd, Los Alamos, NM 87544

ATTACHMENT B

Stantec is a global leader in sustainable engineering, architecture, and environmental consulting. The diverse perspectives of our partners and interested parties drive us to think beyond what's previously been done on critical issues like climate change, digital transformation, and future-proofing our cities and infrastructure. We innovate at the intersection of community, creativity, and client relationships to advance communities everywhere, so that together we can redefine what's possible.

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