RIO METRO
REGIONAL TRANSIT DISTRICT

2023

# ZERO EMISSION TRANSITION PLAN

# Contents

# Agency Overview

The Rio Metro Regional Transit District ("Rio Metro" or "the RMRTD") is the primary regional transit provider for Bernalillo, Sandoval, and Valencia counties, offering transit service between communities and across county lines. In 2003, the New Mexico legislature passed the Regional Transit District Act, catalyzing the formation of multi-jurisdictional transit agencies like Rio Metro. Pushing this foundational legislation forward developed a framework for safe and efficient regional transit services with purposes including: reducing congestion, crashes and pollution caused by single occupant vehicles; extending the life of the state's roads by reducing traffic; providing transportation alternatives to residents, particularly transit-dependent groups such as seniors, youth, low-income, and mobility-impaired residents; providing residents with better access to education and higher paying jobs; and reducing oil dependence.

Rio Metro upholds its mission of providing safe, accessible, efficient, and innovative transportation services for the benefit of its diverse local communities and the regional economy. Rio Metro manages the New Mexican Rail Runner Express commuter rail and operates, manages and/or funds select bus services in its three-county area. These transit services combine to form an integrated network that extends over 100 miles and connects 4 counties, 14 incorporated communities, and 8 Native America Pueblos. Rio Metro's services also link to other transit agencies' that serve more distant transportation markets in Santa Fe, Taos, and Socorro.


Every day, tens of thousands of trips are taken between the towns, cities, Tribal areas, and counties in Rio Metro's service area, making transportation access a critical element of the region's quality of life. Due to the varied transportation needs of a geographically large and evolving region, a diverse portfolio of transit services is necessary to meet the demands of the service area. This will require Rio Metro to plan for and expand its regional transit network using innovative mobility options that enable customers to access key regional destinations, all while meeting sustainability initiatives established at the federal, state and local levels.

## Zero Emission Transition Plan

The Federal Transit Administration introduced a new requirement that any federal grant application for projects related to zero emission vehicles must include a Zero Emission Transition Plan. Therefore, the FTA requires a Zero Emission Transition Plan from each transit agency that applies to the FTA Low or No Emission Grant Program and the FTA Bus and Bus Facilities Grant Program for zero emission projects. The Zero Emission Transition Plan must include the following six elements:

1. **Policy & Legislative Impacts**: Consideration of policy and legislation impacting relevant technologies
2. **Fleet Transition Plan**: Demonstration of a long-term fleet management plan with a strategy for how the applicant intends to use the current request for resources and future acquisitions
3. **Facility & Infrastructure Plan**: Evaluation of existing and future facilities and their relationship to the technology transition
4. **Utility & Fuel Partnerships**: Description of the partnership of the applicant with the utility or alternative fuel provider
5. **Funding Plan**: Address the availability of current and future resources to meet costs for the transition and implementation
6. **Workforce Transition Plan**: Examination of the impact of the transition on the applicant's current workforce by identifying skill gaps, training needs, and retraining needs of the existing workers. This focuses on supporting the applicant's short-term and long-term needs to operate and maintain zero emission vehicles while avoiding displacement of the existing workforce.



## Fleet Transition Overview

Rio Metro's fleet transition includes both the revenue and non-revenue fleets and will follow one of two pathways forward, where the fleet will be comprised of only battery electric vehicles (BEVs) or it will be comprised of a mix of BEVs and hydrogen fuel cell electric vehicles (FCEVs). Regardless of pathway forward, the agency's non-revenue fleet will be entirely BEV by 2032, with the first BEV purchases occurring in 2025. The transition of Rio Metro's revenue fleet vehicles will begin in 2027 with a BEV Pilot Program based at the Sandoval County Transit Facility in Rio Rancho. The agency will gain valuable, real-world experience with BEVs before making a decision in 2029 to continue with BEVs or introduce FCEVs into the fleet at Valencia County Transit Facility in Los Lunas, depending on Pilot Program success, the cost of delivered hydrogen, and availability of hydrogen vehicles. In both pathways forward, all revenue vehicles based in Rio Rancho will be BEVs by 2031; the decision in 2029 will only impact revenue vehicles based in Los Lunas. Provided there are no delays with supply chain shortages or funding appropriation, Rio Metro's revenue fleet will be transitioned to 100% zero emission by 2036 regardless of the alternative fuel type selected for the revenue fleet in Los Lunas. The following graphic shows key milestones along the transition process.


Rio Metro's annual vehicle and charger purchases under both scenarios are detailed in the tables below, showing the estimated total annual capital cost for purchase and installation of infrastructure, including BEV chargers, utility infrastructure upgrades, and hydrogen fueling station infrastructure, shown in today's dollars. These tables are intended to illustrate how much funding will be required in each year necessary to facilitate a transition to zero emission to aid in planning for future grant applications and other funding mechanisms at local, state, and federal levels. The details behind this summary can be found below in the Fleet Transition Plan. Each key milestone in the figure above is indicated in bold in the tables below.

| | NMRX Yard | Sandoval County Transit Facility | Valencia County Transit Facility | | |
|---|---|---|---|---|---|
| **2023** | Begin conversations with PNM to plan for utility infrastructure upgrades that will take place in 2024 at NMRX Yard and Sandoval County Transit Facility as well as upgrades at Valencia County Transit Facility that will occur in 2025. Begin applying for and securing funding for up-front capital costs associated with these utility upgrades. | | | | |
| **2024**<br>**$3.09M** | $1.09M Utility Infrastructure Upgrades | $2.00M for Utility Infrastructure Upgrades | | | |
| **2025**<br>**$682k** | **Begin Non-Revenue Fleet Transition** | | | | |
| | $74.4k for 2 Non-Revenue BEVs<br>$20k for 2 Level 2 Chargers | $32.4k for 1 Non-Revenue BEV<br>$10k for 1 Level 2 Charger | $545k for Utility Infrastructure Upgrades | | |
| **2026**<br>**$203k** | $84.0k for 2 Non-Revenue BEVs<br>$20k for 2 Level 2 Chargers | $32.4k for 1 Non-Revenue BEV<br>$10k for 1 Level 2 Charger | $46.7k for 1 Non-Revenue BEV<br>$10k for 1 Level 2 Charger | | |
| **2027**<br>**$1.34M** | **Begin Revenue Fleet Transition with BEV Pilot Program at Sandoval County Transit Facility** | | | | |
| | $46.7k for 1 Non-Revenue BEV<br>$10.0k for 1 Level 2 Charger | $1.16M for 4 Revenue BEVs<br>$40k for 4 Level 2 Chargers | $64.8k for 2 Non-Revenue BEVs<br>$20k for 2 Level 2 Chargers | | |
| **2028**<br>**$52.0k** | Begin to strategize for capital funding to support large infrastructure upgrades in 2029 and a large number of revenue vehicles to be replaced in 2030 and 2031. | | | | |
| | $42.0k for 1 Non-Revenue BEV<br>$10k for 1 Level 2 Charger | | | | |
| **2029**<br>**$1.61M**<br>**or**<br>**$5.90M** | **Decision to Transition to BEV or FCEV at Valencia County Transit Facility** | | | | |
| | | | $32.0k for 1 Non-Revenue BEV<br>$10k for 1 Level 2 Charger | | |
| | | | $1.58M for Utility Infrastructure Upgrades | or | $5.86M for hydrogen fueling station infrastructure |
| **2030**<br>**$4.51M**<br>**or**<br>**$2.13M** | $88.7k for 2 Non-Revenue BEVs<br>$20k for 2 Level 2 Chargers | $760k for 1 Revenue BEV<br>$10k for 1 Level 2 Charger | $3.33M for 5 Revenue BEVs<br>$10k for 1 Level 2 Charger<br>$290k for 4 DCFCs | or | $1.25M for 5 Revenue FCEVs |



| | NMRX Yard | Sandoval County Transit Facility | Valencia County Transit Facility | | |
|---|---|---|---|---|---|
| **2031**<br>**$6.26M**<br>**or**<br>**$5.32M** | $216k for 3 Non-Revenue BEVs<br>$30k for 3 Level 2 Chargers | $3.84M for 7 Revenue BEVs<br>$20k for 2 Level 2 Chargers<br>$363k for 5 DCFCs | $217k for 3 Non-Revenue BEVs<br>$30k for 3 Level 2 Chargers | | |
| | | | $1.67M for 6 Revenue BEVs<br>$50k for 5 Level 2 Chargers<br>$72.5k for 1 DCFC | or | $ 851k for 6 Revenue FCEVs |
| **2032**<br>**$3.68M**<br>**or**<br>**$1.76M** | **Complete Non-Revenue Fleet Transition** | | | | |
| | | | $ 32.4k for 1 Non-Revenue BEV<br>$10k for 1 Level 2 Charger | | |
| **2033**<br>**$3.63M**<br>**or**<br>**$1.71M** | | | $2.90M for 10 Revenue BEVs<br>$725k for 10 DCFCs | or | $1.71M for 10 Revenue FCEVs |
| **2034**<br>**$1.56M**<br>**or**<br>**$513k** | | | $1.34M for 3 Revenue BEVs<br>$217.5k for 3 DCFCs | or | $513k for 3 Revenue FCEVs |
| **2035** | | | | | |
| **2036**<br>**$725k**<br>**or**<br>**$342k** | **Complete Revenue Fleet Transition** | | | | |
| | | | $580k for 2 Revenue BEVs<br>$145k for 2 DCFCs | or | $342k for 2 Revenue FCEVs |



# Policy & Legislation Impacts

In addition to FTA's direction, the following state policy and legislative actions support Rio Metro in its Zero Emission Transition Plan. As Rio Metro begins to transition its fleet with initial procurements of battery electric vehicles (BEVs), it is also important to note that local utility partners are working to reduce emissions from the electric grid. As the grid becomes cleaner, the electric vehicles powered by that grid become cleaner as well.

## New Mexico Policies and Commitments

### NMDOT New Mexico 2045 Plan

The New Mexico 2045 Plan is a performance-based long-range transportation plan which meets the requirements of the Fixing America's Surface Transportation (FAST) Act. The FAST Act requires performance-based planning and programming to facilitate transportation decision-making that supports the seven national transportation goals: safety, infrastructure condition, congestion reduction, system reliability, freight movement and economic vitality, environmental sustainability, and reduced project delivery delays. NMDOT integrated recent state initiatives and priorities into the development of the New Mexico 2045 Plan. These include Governor Lujan Grisham's Executive Order 2019-003 on Addressing Climate Change and Energy Waste Prevention, detailed in the paragraph below. In coming years, NMDOT will be developing a Climate Change Plan to further develop adaptation and resiliency strategies, as well as adopting solutions to reduce transportation emissions.

In response to increasing concerns about climate change and its potential impacts on the health, safety, and quality of life for residents of New Mexico, Governor Lujan Grisham issued Executive Order 2019-003 to explicitly combat climate change and prevent energy waste in July 2019. Supporting the aims of other statewide initiatives, the order requires all state agencies to evaluate the impacts of climate change on their programs and operations, as well as develop and integrate associated climate change mitigation and adaptation strategies into their practices as an agency.

To effectively address Governor Lujan Grisham's concerns stated in Executive Order 2019-003, and to ensure the New Mexico 2045 Plan guides future investment decisions appropriately, NMDOT performed a resiliency analysis during plan development. The resiliency analysis results show that all components of the New Mexico roadway system have vulnerability risks that may be exacerbated by the natural events associated with climate change (e.g., flooding). Understanding these risks will help NMDOT better allocate resources for mitigation projects.

### 2019 Energy Transition Act

The fast rate at which electricity is decarbonizing in New Mexico can be mainly attributed to the state's Energy Transition Act, which took effect in 2019 and requires that electric utilities attain a renewable energy standard of 50 percent by 2030 and 80 percent by 2040. The electricity sector is New Mexico's third-highest source of emissions, although electricity-sector carbon dioxide emissions declined 43.9% from 2005 levels in 2020. Despite this progress, a great deal of decarbonization is still required to reach mandated levels. With the electricity sector underlying emissions reductions in other sectors like transportation and the built environment, meeting this objective is instrumental to overall decarbonization efforts.



## New Mexico Climate Strategy 2021

The New Mexico Climate Change Task Force releases an annual Climate Strategy report, detailing the state's progress in implementing policies and practices to reduce greenhouse gas emissions and promote climate change adaptation strategies. The transportation sector is recognized as the second largest source of greenhouse gas (GHG) emissions in New Mexico, and the 2019 Climate Strategy identifies two recommendations to reduce these emissions: 1) setting targets for implementing "California clean car standards", and 2) reducing per capita vehicle miles travelled (VMT) to 15% below 2015 levels by 2027.

In 2021, the New Mexico Climate Change Task Force responded to the detailed results of a study from Colorado State University which analyzed New Mexico's greenhouse gas emissions, informing New Mexico on the best estimates to date of recent and projected emissions. In response, the New Mexico Climate Change Task Force proceeded to develop climate action plans aimed at reducing greenhouse gas emissions at least 45% below 2005 levels by 2030. The Climate Change Task Force's Climate Action Teams (CATs) advance previously identified climate-related actions and continue to evolve recommended actions for emissions reductions, adaptation, and resilience in proposed climate action plans. Within these action plans, the transportation sector is highlighted as a major area of focus, with electric vehicle adoption and electric vehicle charging infrastructure largely supporting emission reduction efforts.

The New Mexico Climate Strategy outlines the state's efforts in making the transition to electric vehicle usage easy and accessible for New Mexicans, one major way being through alternative fuel corridors. In collaboration with the Energy Conservation and Management Division of the Energy, Minerals and Natural Resources Department (EMNRD), NMDOT, Land of Enchantment Clean Cities, and the Public Service Company of New Mexico (PNM), the state applied to the federal government in February 2021 to designate four new routes as electric vehicle corridors. By obtaining these designations, New Mexico is now eligible to participate in future public-private partnerships and federal grant programs like the National Electric Vehicle Infrastructure (NEVI) Program. In April 2021, the Federal Highway Administration (FHWA) approved these routes, establishing 2,300 miles of electric vehicle corridors throughout the state, connecting electric vehicle drivers to Arizona, Colorado, and Texas. As New Mexico aims to become a cleaner and greener state, the increased use and normalization of electric vehicles will be crucial.

# Fleet Transition Plan

Transitioning to a zero emission fleet involves more than simply buying vehicles and a fueling system. The transition introduces new technology and processes into day-to-day operations. Successful fleet transition plans take a holistic approach to consider operational requirements, market conditions, available power, infrastructure demands, and costs. The in-depth analysis summarized below provides Rio Metro with data to guide important decisions involving capital programs and operations necessary to build key partnerships and support transition actions and phases.

## Zero Emission Vehicles & Fueling Options

As transit agencies look for zero emission technology to replace gasoline vehicles, there are two primary options: battery electric vehicles (BEVs) and hydrogen fuel cell electric vehicles (FCEVs). Currently, BEVs are the more popular replacement choice because they are readily available on the market today and use the electric grid as their fuel source, which is universally available and relatively "easy" to connect to and draw the required power. Based on today's technology, BEVs limited range compared to gasoline vehicles can mean that not all gasoline vehicles can be replaced one-to-one with a BEV. In some cases, additional vehicles or mid-day recharging would be necessary to maintain the same level of service.

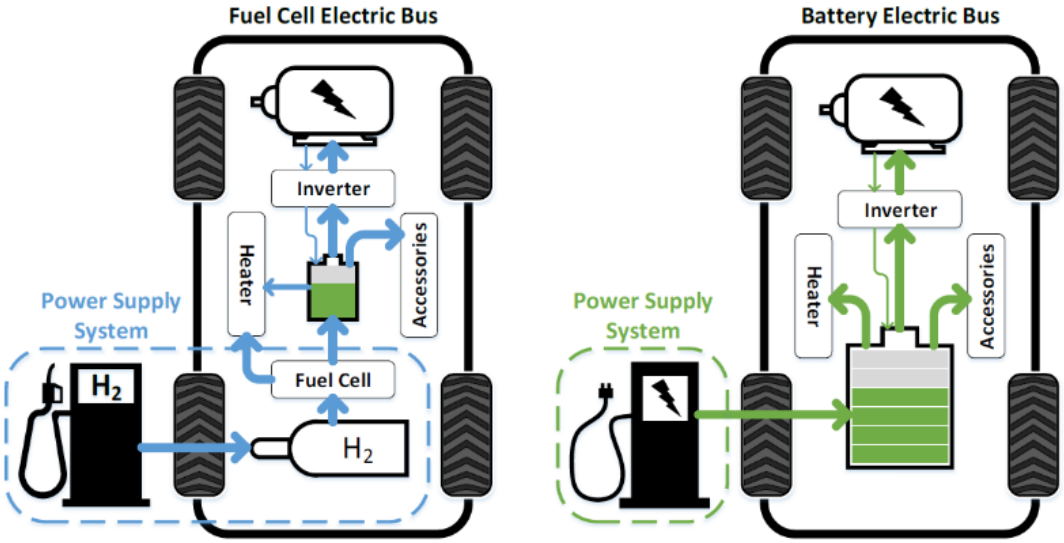



**Figure 1. BEV and FCEV Vehicle Technology Comparison**

Hydrogen FCEVs are the other primary option as a propulsion type for a zero emission transition. FCEVs utilize a similar drivetrain to BEVs but have a smaller battery that is recharged by an on-board fuel cell that generates electricity from hydrogen as the vehicle travels. The energy density of hydrogen is much greater than a battery, which allows for the range of these vehicles to match a conventional gasoline vehicle more closely. Therefore, the greatest benefit of FCEVs is that their range is comparable to gasoline vehicles. However, the challenge with deploying FCEVs is the lack of a current market for cutaway vehicles, and locating a source of hydrogen, which is not as readily available as electricity.

## Energy Modeling & Analysis

Understanding energy consumption is a key component of fleet transition planning as it informs the choice of vehicle technology, infrastructure requirements, finances, and fleet replacement strategies. Using monthly operating data, including vehicle average and maximum daily miles and hours, Rio Metro's current revenue and non-revenue fleet operations were analyzed using the battery and charging specifications of BEVs equivalent to the existing fleet shown in Table 1 were identified in a technology review of the current state of the industry. The total energy consumption of the BEV fleet was computed using both the average and most heavily used vehicles in Rio Metro's fleet, which allowed overall site energy and fleet size impacts to be more accurately predicted.

Eight hours were allotted for fully charging each vehicle, including 7 standard off hours and a 1-hour safety buffer. This period was reduced to 6 hours for vehicles that are available for on-call services. The buffer not only provides a grace period for connecting any given vehicle to their charger, but also considers the reduction in charge rate that occurs as a battery reaches full charge. To protect the life of the BEVs' batteries and avoid range anxiety, the analysis also assumed a minimum state of charge (SOC) of 20% and a maximum SOC of 90%, resulting in a usable battery capacity equal to 70% of the vehicle's nameplate battery capacity.

**Table 1. Rio Metro Existing Fleet Composition by Location**

| Valencia County Transit Facility | | Sandoval County Transit Facility | | NMRX Yard | |
|---|---|---|---|---|---|
| (23) | Cutaways | (12) | Cutaways | (4) | Cutaways (Contingency) |
| (3) | Minivans | (8) | Buses (Contractor) | (11) | Non-Revenue Vehicles |
| (8) | Non-Revenue Vehicles | (2) | Non-Revenue Vehicles | | |

**this fleet count does not include the (4) ABQ Ride buses acquired in Valencia County and Sandoval County.*

In addition to BEVs, revenue operations were also modeled to determine feasibility of FCEVs. Hydrogen vehicles equivalent in size and purpose to Rio Metro's fleet are not currently available, so a mathematical conversion from miles per gallon (MPG) of gasoline vehicles to miles per gasoline gallon equivalent (MPGGE) of hydrogen vehicles to estimate the amount of hydrogen required to fuel an FCEV revenue fleet. Though FCEVs suitable for Rio Metro's fleet do not currently exist, current technology and future market trends indicate that by 2030 fleet equivalents will likely be available. Rio Metro will pursue hydrogen if in 2030 the cost of delivered hydrogen is comparable to the cost of gasoline and the market offers hydrogen cutaways equivalent to the current gasoline fleet.

## Non-Revenue Vehicles

Rio Metro will cease purchasing gasoline non-revenue vehicles after 2024 with an initial purchase of 3 vehicles in 2025 and all future non-revenue vehicle procurements will be battery electric. The non-revenue fleet will be replaced at a 1-to-1 ratio with BEVs on the same timeline as the fleet replacement schedule shown in from Rio Metro's Budget and Capital Plan and Level 2 AC chargers will be installed in the same year as each vehicle purchase. Figure 2 and Figure 3 below show the number of BEVs purchased in each year by location and the overall non-revenue fleet composition by fuel type, respectively.



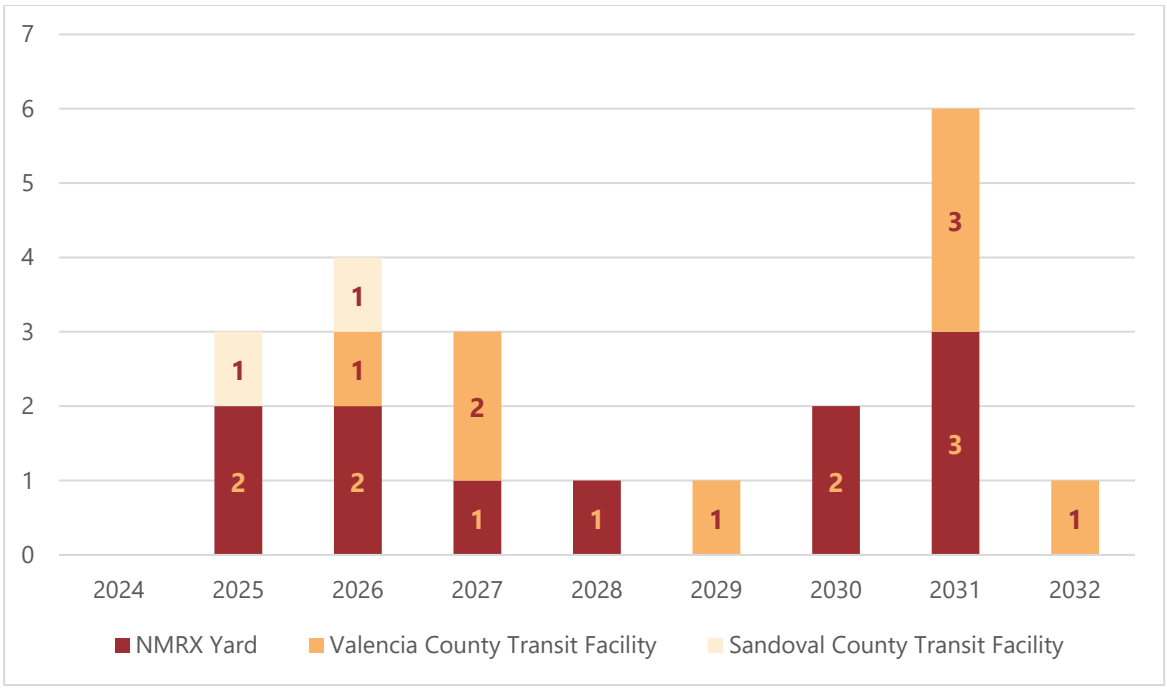



**Figure 2. Non-Revenue BEV Purchases by Year at Each Location**

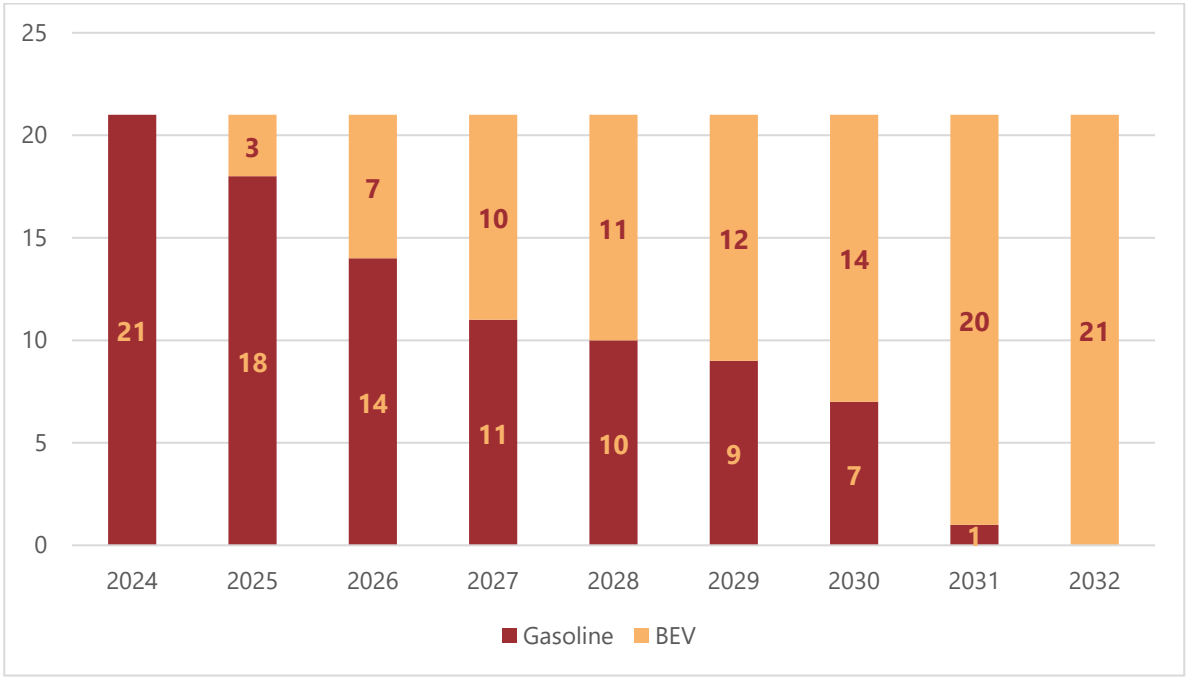



**Figure 3. Non-Revenue Fleet Composition by Year**

## Revenue Vehicles at Sandoval County Transit Facility

Rio Metro will begin the transition of their revenue fleet in 2027 with a Pilot Program of four BEVs at Sandoval County Transit Facility. Additional vehicles being purchased beginning in 2030 and continuing through 2031 as shown in Figure 4; an overall fleet composition is shown in Figure 5. Initial deployment of BEVs in Rio Rancho will be accompanied by utility upgrades necessary to support a fully

battery electric fleet at this facility as well as four Level 2 AC Chargers. In future years when more BEVs are deployed in Rio Rancho, additional Level 2 AC Chargers as well as DC Fast Chargers (DCFCs) will be installed in the same year a BEV replaces a gasoline vehicle as shown in Figure 12 below.

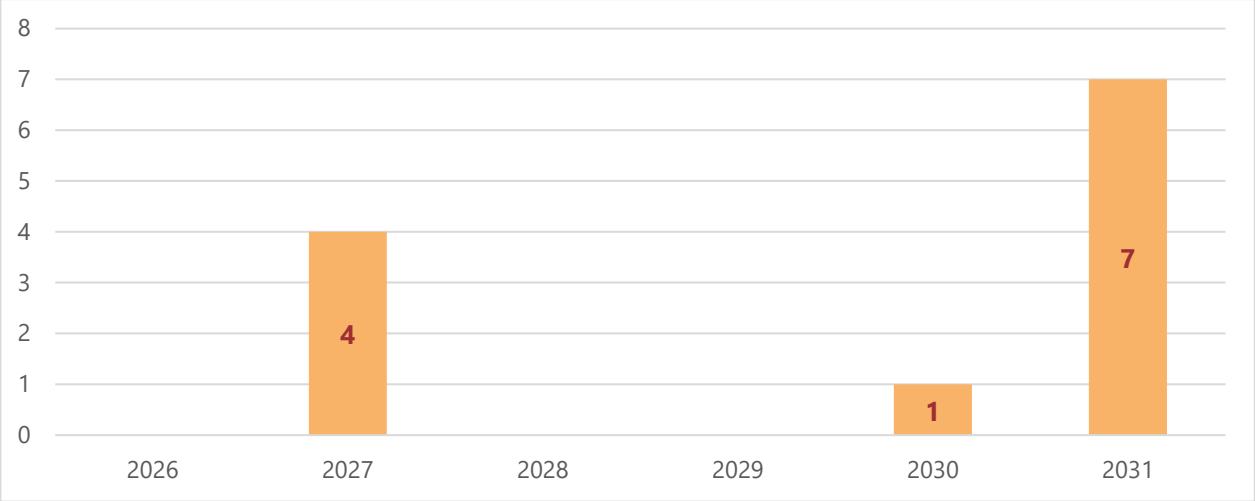



**Figure 4. Revenue Fleet BEV Purchases at Sandoval County Transit Facility**

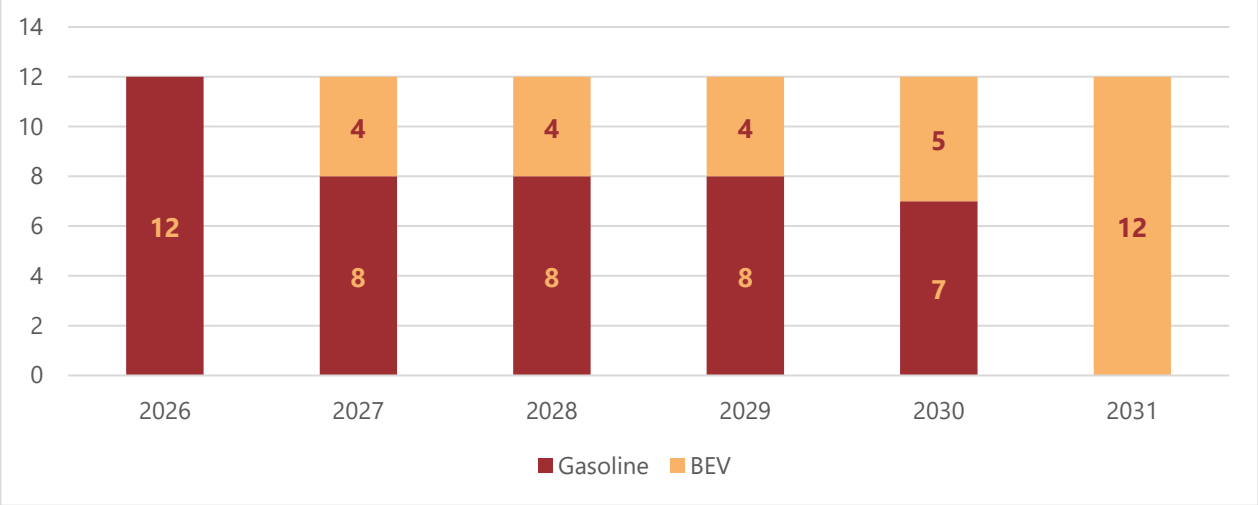



**Figure 5. Revenue Fleet Composition by Fuel Type at Sandoval County Transit Facility**

## Revenue Vehicles at Valencia County Transit Facility

Rio Metro will begin to transition revenue vehicles based at Valencia County Transit Facility in 2030 which will either be BEV or FCEVs, depending on the current vehicle technology capabilities at that time as well as the agency's decision based on successful performance the 2027 Pilot Program in Rio Rancho. Revenue operations at Valencia County Transit Facility were modeled to determine feasibility of both BEVs and FCEVs at this location.

### Battery Electric Revenue Fleet

Fleet modeling revealed that Rio Metro's revenue vehicles based at the Valencia County Transit Facility could not complete regular service without either mid-day recharging or an increased fleet size. With

future technological advancements expected to improve operational range of BEVs and the significant difference in capital cost between additional DCFCs and additional vehicles, Rio Metro will pursue an equal fleet size with plans to add DCFCs for mid-day charging of vehicles to "top off" batteries before returning to service. Beginning in 2030 with the purchase of 5 BEVs, the transition continues through 2036 when the fleet is 100% BEV as shown in Figure 7 and Figure 7. It should be noted that vehicle purchases shown here are based on Rio Metro's existing fleet replacement schedule and some vehicles scheduled for replacement in 2033 may be replaced in adjacent years to "smooth out" capital expenditures.

Utility infrastructure upgrades would need to be completed ahead of the initial deployment at each facility to avoid added construction costs of rework, but chargers would be installed in the same year BEVs are delivered. At full transition, the revenue fleet at Valencia County Transit Facility would include 26 BEVs, 6 Level 2 chargers, and 20 DCFCs. If battery technology improves and the operational range of vehicles increases the number of DCFCs required for mid-day charging may be reduced.

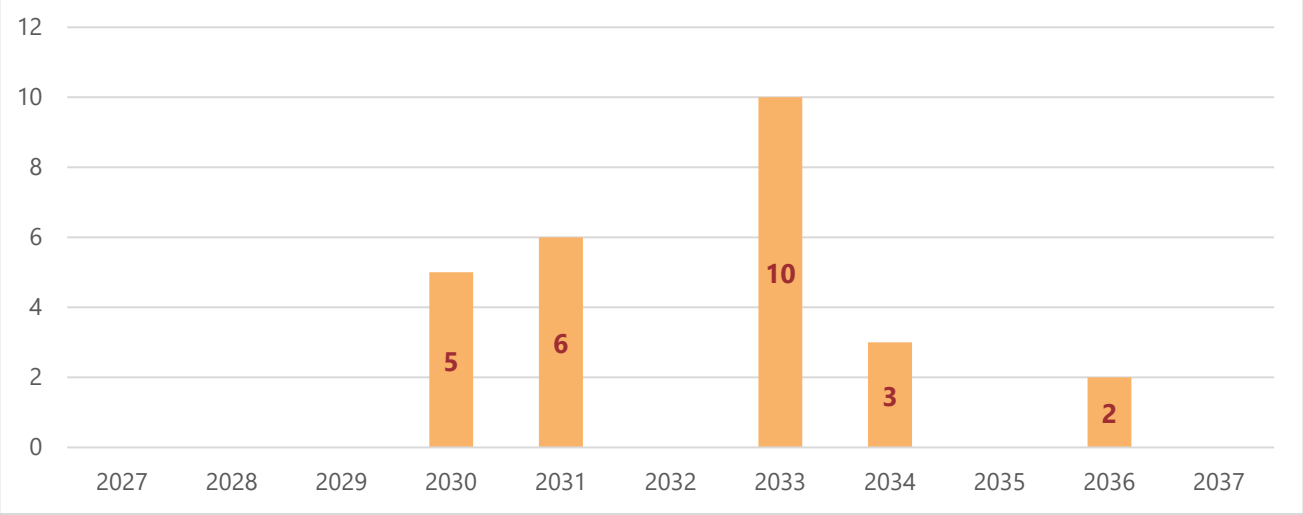



**Figure 6. Revenue Fleet BEV Purchases at Valencia County Transit Facility**

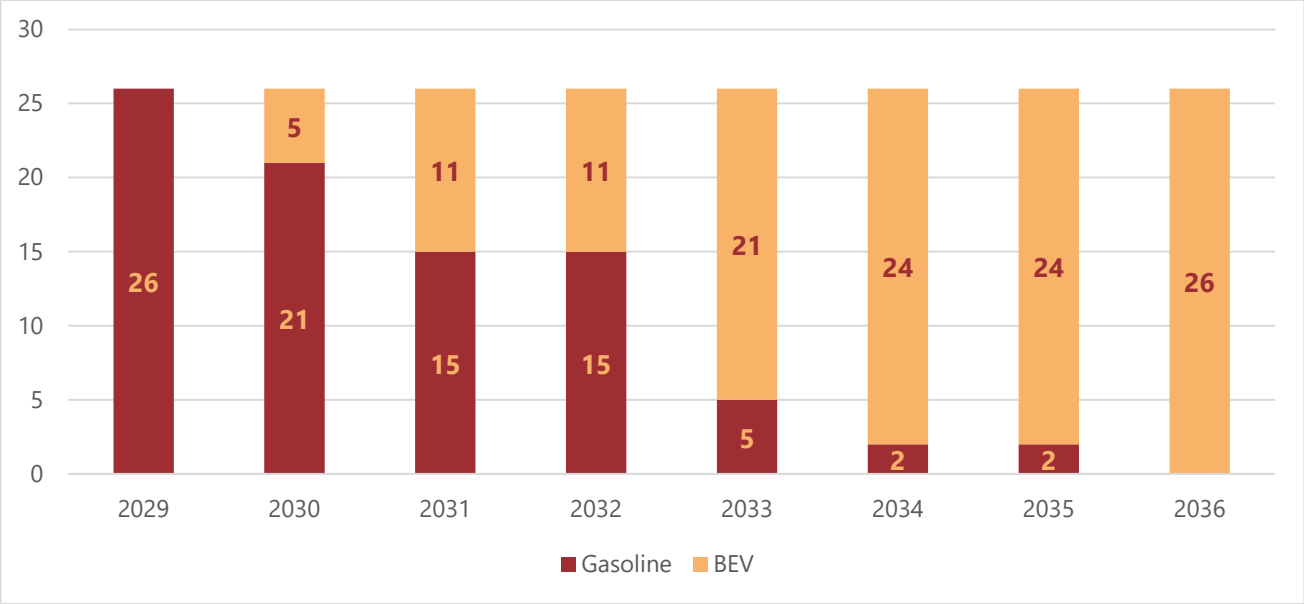



**Figure 7. BEV Revenue Fleet Composition by Fuel Type at Valencia County Transit Facility**

## Hydrogen Fuel Cell Revenue Fleet

FCEVs were modeled at both Sandoval County Transit Facility and Valencia County Transit Facility, but space constraints associated with hydrogen fueling infrastructure make FCEVs at Sandoval County Transit Facility infeasible.

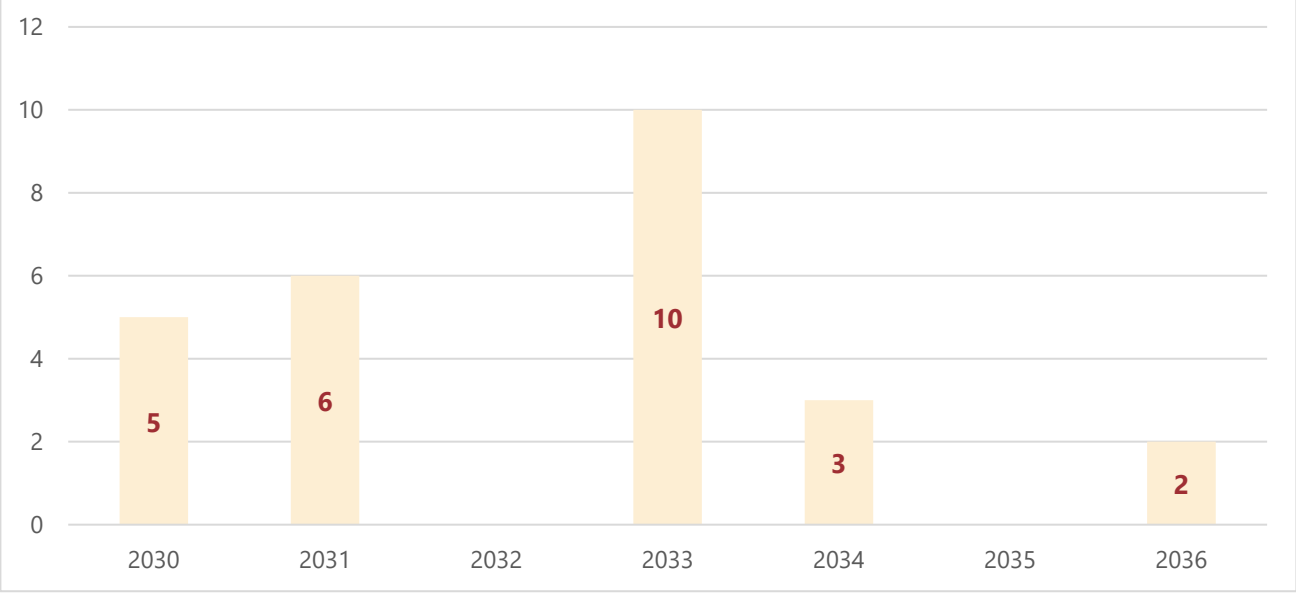



**Figure 8. Revenue Fleet FCEV Purchases at Valencia County Transit Facility**

Beginning in 2030 with the purchase of 5 FCEVs shown in Figure 8, the transition continues through 2036 when the revenue fleet at this facility is 100% FCEV. Hydrogen fueling infrastructure installation would need to be completed ahead of the initial deployment at Valencia County Transit Facility. At full

transition, the revenue fleet at Valencia County Transit Facility would include 27 FCEVs with liquid hydrogen being delivered to the facility for on-site storage and fueling.

Figure 9 shows the revenue fleet composition as a whole, across all facilities, where the BEV purchases mirror the Sandoval County Transit Facility BEV purchases shown above in Figure 4.

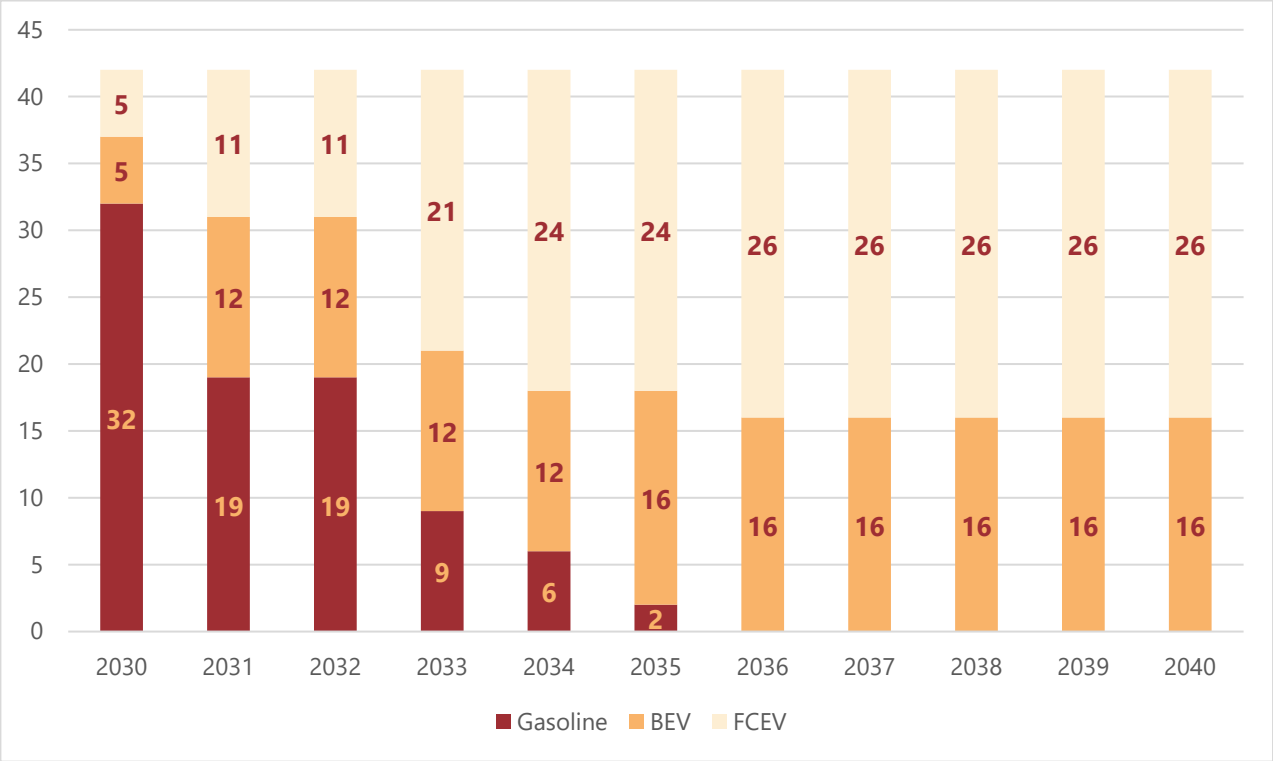



**Figure 9. Mixed Revenue Fleet Composition by Fuel Type**

# Facility & Infrastructure Plan

## Existing Conditions

Rio Metro currently operates out of two facilities, New Mexico Rail Runner Express Yard (100 Iron Ave. SE in Albuquerque, NM) and Sandoval County Transit Facility (1804 Idalia Rd. NE in Rio Rancho, NM), and will soon begin operations out of the under-construction Valencia County Transit Facility (3437 Lambros Loop in Los Lunas, NM). Rio Metro does not currently perform any on-site vehicle maintenance or fueling, but as part of a future expansion may look to construct a maintenance facility at Valencia County Transit Facility.

## Electric Vehicle Charging Infrastructure

Based on the energy modeling performed, Rio Metro can replace all vehicles one-to-one provided DCFCs are installed to allow for mid-day recharging of some vehicles to account for current BEV range limitations. To accommodate range limitations and maintain the same level of service for the directly operated revenue fleet, 5 DCFCs would be required at Sandoval County Transit Facility and up to 20 DCFCs would be required at Valencia County Transit Facility. An additional 8 DCFCs would be required at Sandoval County Transit Facility for use by All Aboard America (AAA) contract buses. All charging infrastructure layouts in the following sections are conceptual in nature and will be refined as each facility progresses through design.

### New Mexico Rail Runner Express (NMRX) Yard

The NMRX Yard is home to 11 active non-revenue vehicles and 4 contingency revenue vehicles, used for bus bridges only. Due to the seldom use of these revenue vehicles, charging infrastructure is sized for the non-revenue fleet with the assumption that these contingency vehicles may use non-revenue vehicle chargers on an as-needed basis. For this facility, 11 Level 2 AC chargers would be installed in the corresponding year each electric vehicle is purchased. This said, all required utility upgrades would be installed in the same year as the first charger installation.

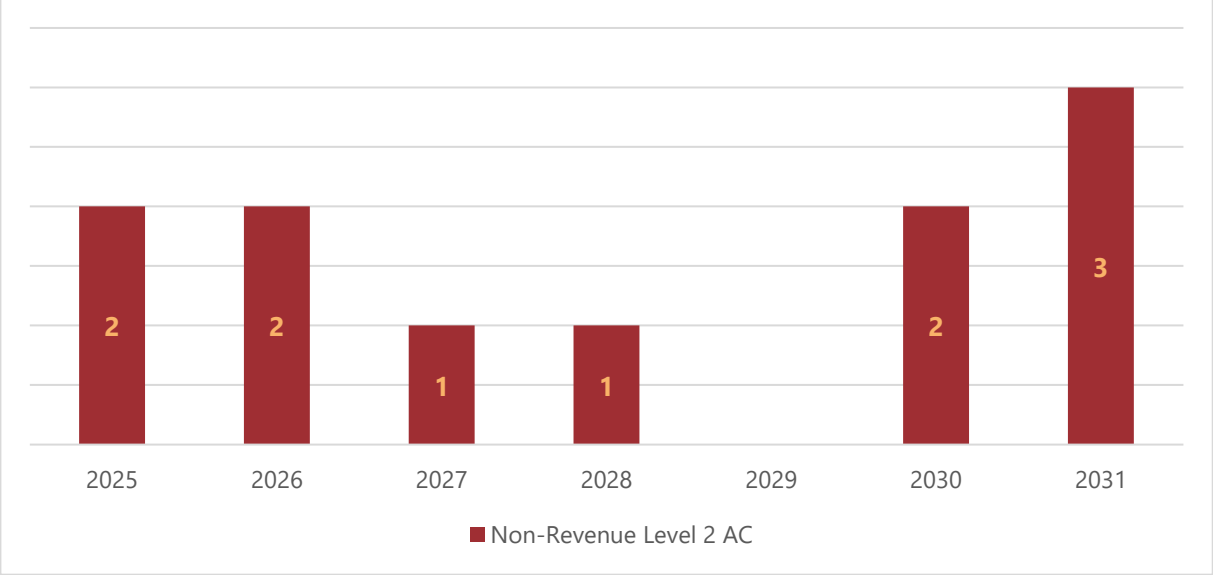



**Figure 10. BEV Charger Installations at NMRX Yard**

For the layout shown in Figure 11, 4 Level 2 AC chargers could be located in the northern parking lot and share the same utility connection as the 7 Level 2 chargers located in the parking lot paralleling the main building. Nevertheless, Rio Metro is working toward the construction of a new operations and maintenance facility at this location; therefore, the installation of the chargers, as well as the timing of the zero emission transition at this location, may be adjusted to align with the facility's construction and opening.

**Figure 11. BEV Charging Infrastructure Conceptual Layout at NMRX Yard**

## Sandoval County Transit Facility

The Sandoval County Transit Facility has a current fleet size of 3 non-revenue vehicles, 12 revenue vehicles, and 8 All Aboard America (AAA) vehicles. In order to maintain the same level of service for the directly operated revenue fleet, 5 DCFCs will be required. All charger installations for both revenue and non-revenue vehicles are shown in Figure 12, with the required utility infrastructure to support a buildout being installed ahead of the Pilot Program to avoid rework and could be aligned with repaving of the parking lot to avoid additional construction phases.

For this layout, the non-revenue fleet will require 2 single dispenser Level 2 AC chargers located at the entrance to the facility. To accommodate the mid-day charging of the revenue fleet, 5 DCFCs at pull-in parking locations could be located at the first row of parking. The remainder of the revenue fleet will be charged by 7 Level 2 AC chargers located at the second row of the parking lot. An additional 8 DCFCs could be installed at back-in parking spots located at the back of the parking lot to provide charging for the AAA fleet.

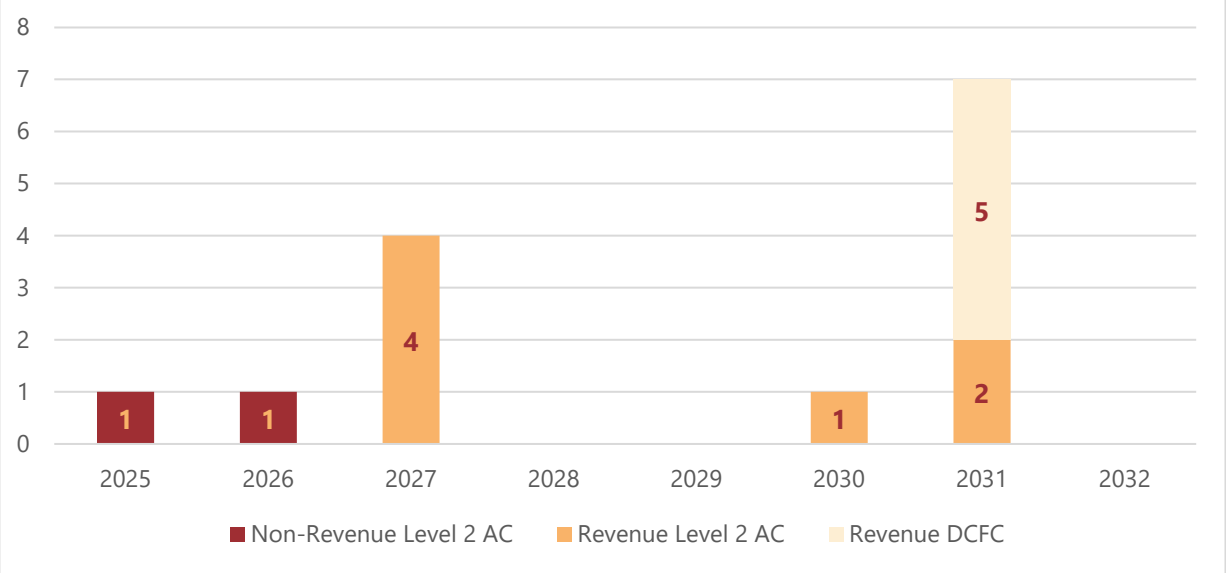



**Figure 12. BEV Charger Installations by Charger Type at Sandoval County Transit Facility**


**Figure 13. BEV Charging Infrastructure Conceptual Layout at Sandoval County Transit Facility**

## Valencia County Transit Facility

The Valencia County Transit Facility has a current fleet size of 7 non-revenue vehicles and 26 revenue vehicles. In order to maintain the same level of service for the directly operated revenue fleet with BEVs, 20 DCFCs will be required. Charger installations for both revenue and non-revenue vehicles are made according to Figure 14, with the required full electrification utility infrastructure being installed during the facility construction. Regardless of fuel type selected for the revenue fleet at Valencia County Transit Facility, non-revenue charger installations remain unchanged.

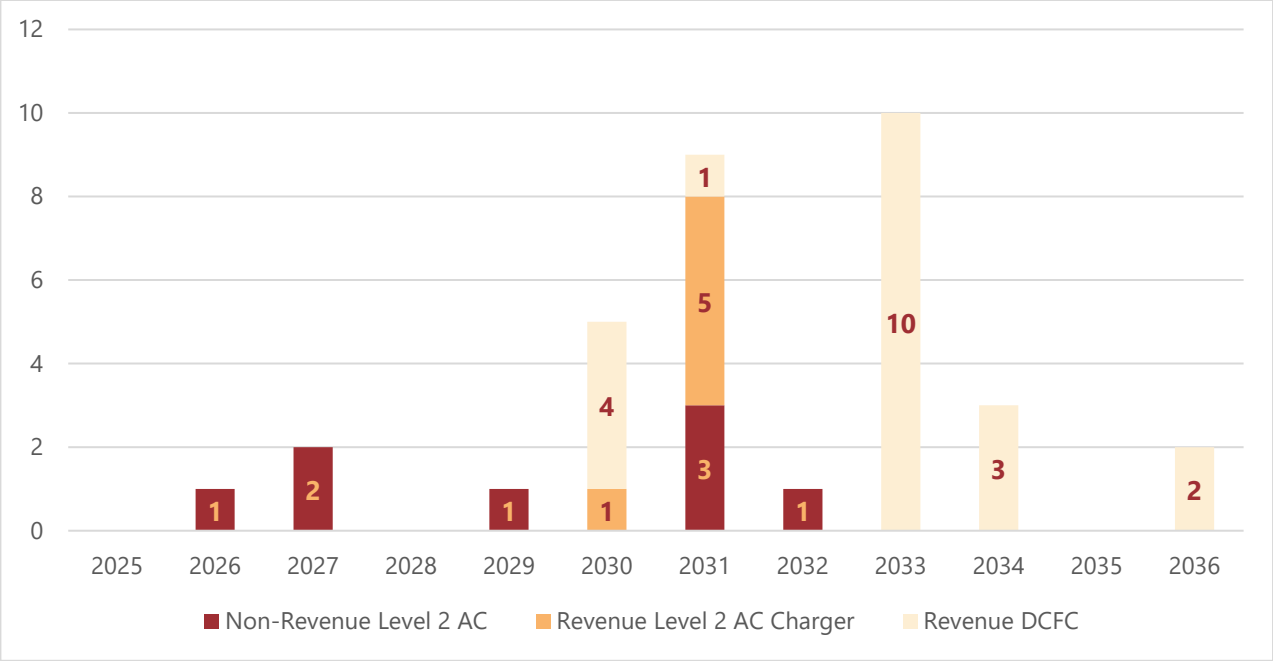



**Figure 14. BEV Charger Installations by Charger Type at Valencia County Transit Facility**

For the layout in Figure 15, the non-revenue fleet will require 8 Level 2 AC chargers located adjacent to the utility equipment and storage shed. To accommodate the mid-day charging of the revenue fleet, 20 DCFC plug dispenser back-in parking locations could be located at the south of the site. Located beside the DCFCs are an additional 6 single port Level 2 AC chargers.

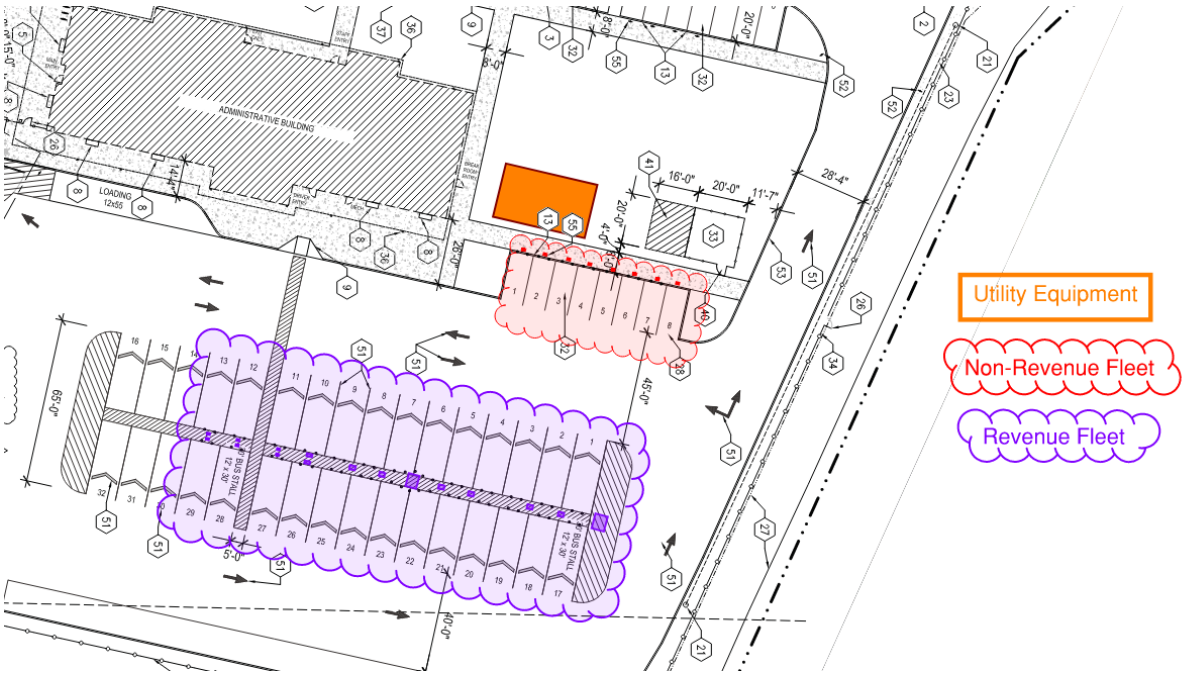



**Figure 15. BEV Charging Infrastructure Conceptual Layout at Valencia County Transit Facility**

## Hydrogen Fueling Infrastructure

Hydrogen consumption modeling revealed that Rio Metro can replace all 26 revenue vehicles one-to-one without any modifications in service or increase in fleet size. Based on the estimated consumption, a liquid hydrogen station was sized to provide two weeks of fuel storage at Valencia County Transit Facility for FCEVs.

### Hydrogen Fueling Station Components

Rio Metro is planning for a delivered liquid hydrogen ($LH_2$) station. $LH_2$ stations are composed of five main components: $LH_2$ tanks, $LH_2$ pumps, vaporizers, gaseous hydrogen ($GH_2$) tanks, and dispensers. The $LH_2$ tanks function as liquid storage; the hydrogen that is delivered via the trailers is unloaded into the liquid tanks and stored on-site. The $LH_2$ tanks are sized for the amount of hydrogen to be dispensed on a daily basis for two weeks, though storage tank size could be increased to allow for a buffer in case a delivery is missed.

$LH_2$ is pumped out of the liquid tanks by a cryogenic $LH_2$ pump. The $LH_2$ pumps used in this design are high-pressure cryopumps that allow the $GH_2$ compression step to be omitted. These cryopumps are an emerging technology, and it should be noted that other station designs will include a gaseous compressor after the vaporization to bring the hydrogen up to desired pressure. The hydrogen is next pumped to a vaporizer, which converts the liquid hydrogen to gaseous hydrogen. The $GH_2$ is then transferred to gaseous storage tanks, where it is stored until buses are ready to fuel. $GH_2$ then travels from the $GH_2$ storage to the dispenser.

The dispenser functions the same way as a diesel dispenser; operators simply insert the nozzle into the bus's fuel tank and hydrogen is dispensed. The station layout shown in Figure 16 assumes one bus is refueled at a time to minimize the size of hydrogen equipment and the number of hydrogen dispensers required.

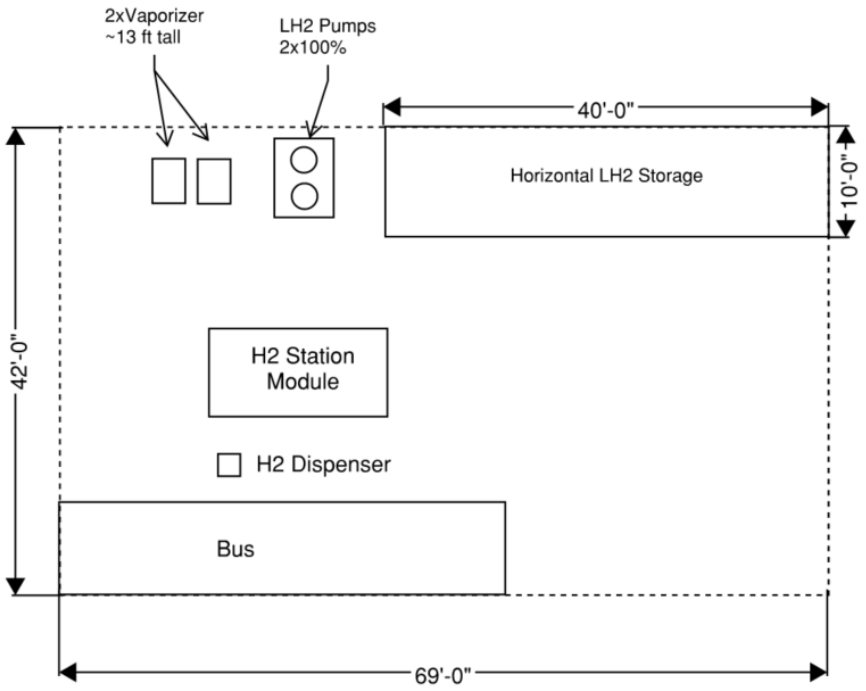



**Figure 16. Hydrogen Fueling Station Conceptual Layout Diagram**

## Hydrogen Fueling Station Placement

The refueling station would be placed in the southeast corner of the property as shown in Figure 17. This land is currently undeveloped but is owned by Rio Metro and may be used for a future facility expansion. Buses would enter the facility from Lambros Loop and proceed through the fueling lanes before being parked overnight. The exact placement of the hydrogen infrastructure will be determined during the preliminary design in coordination with Rio Metro's hydrogen supplier. Hydrogen delivery trucks will need access to one side of the station to transfer hydrogen from the truck to on-site storage.

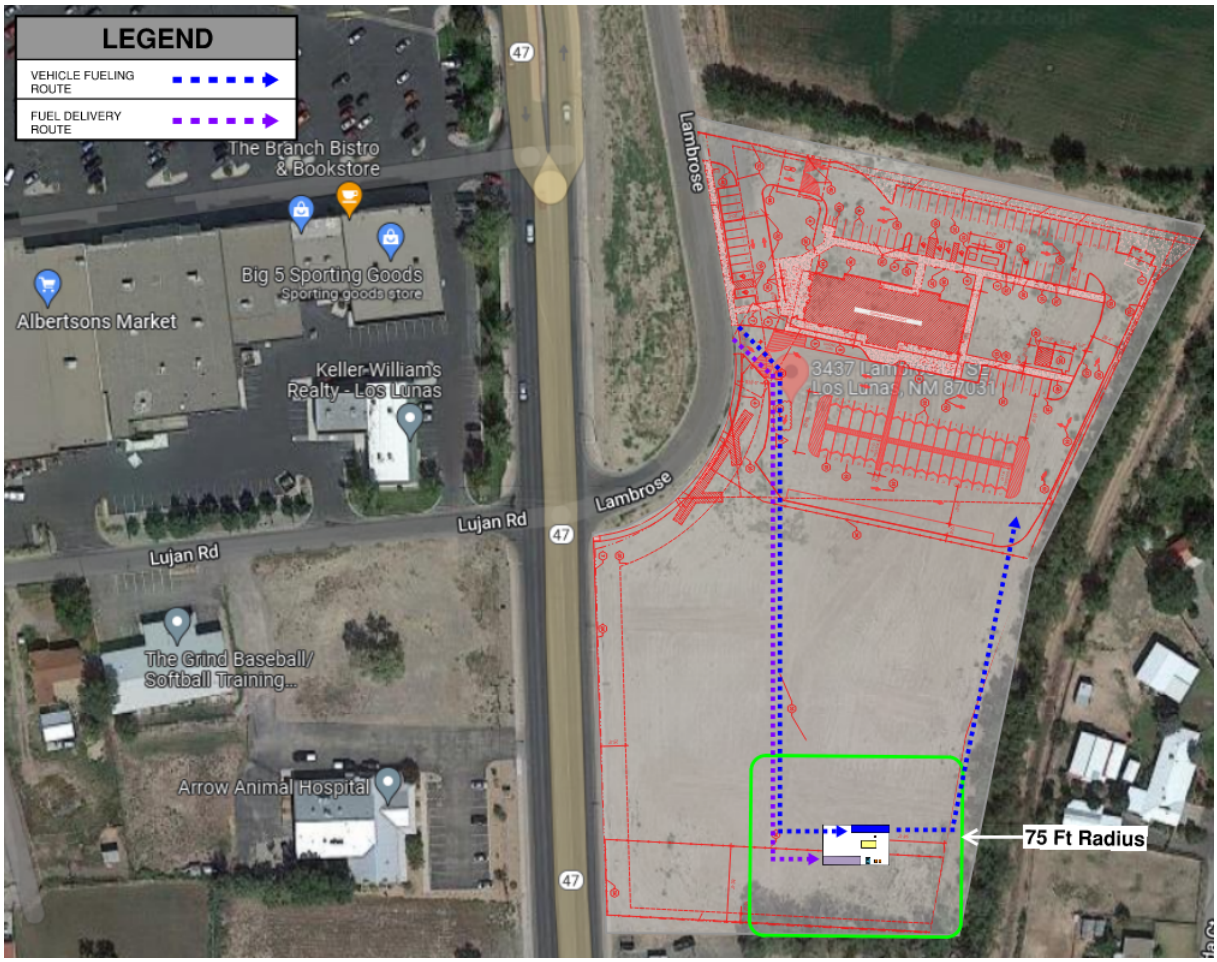



**Figure 17. Hydrogen Fueling Station Placement at Valencia County Transit Facility**

A key consideration for the placement of the hydrogen refueling station equipment is the required minimum distances from flammable liquids and gas storage, buildings, public roads and sidewalks, and property lines; these minimum distances are defined by OSHA 1910.103 as shown in Table 2. The hydrogen fueling station sized for Rio Metro's operations at Valencia County Transit Facility includes liquid storage between 3,501 and 15,000 gallons and the placement shown allows sufficient room to place the equipment without the need for fire walls to reduce setback requirements.

**Table 2. Minimum Distance (Feet) from Liquified Hydrogen Systems to Exposure**

| Type of Exposure | Liquified Hydrogen Storage (Capacity in Gallons) | | |
|---|---|---|---|
| | 39.63 to 3,500 | 3,501 to 15,000 | 15,001 to 30,000 |
| Fire-Resistive building and fire walls | 5 | 5 | 5 |
| Non-Combustible Buildings* | 25 | 50 | 75 |
| Other Buildings* | 50 | 75 | 100 |
| Flammable Liquids* (Above ground and vent or fill openings if below ground) | 50 | 75 | 100 |
| Flammable Gas Storage* | 50 | 75 | 100 |
| Open flames, smoking and welding | 50 | 50 | 50 |
| Concentrations of People | 75 | 75 | 75 |

*The distance may be reduced where protective structures, such as firewalls equal to height of top of the container, to safeguard the liquefied hydrogen storage system, are located between the liquefied hydrogen storage installation and the exposure.

Major repairs and refurbishments to Rio Metro's future FCEV fleet will need to be performed in a facility compliant with established hydrogen safety standards. If Rio Metro builds a maintenance building at Valencia County Transit Facility, the building could be designed and built with the capability of maintaining lighter-than-air fuels like hydrogen pursuant to all applicable safety codes and regulations, including National Fire Protection Association's NFPA 2 Hydrogen Technologies Code. Samples of relevant NFPA 2 relevant codes are provided in Table 3 and Table 4 below.

NFPA 2 is not adopted in all states but are generally accepted as best practices in the hydrogen industry and are referenced to highlight key regulatory and code considerations for deployment of hydrogen vehicles and infrastructure. As part of the design process of a future maintenance facility, Rio Metro will consult with the authority having jurisdiction (AHJ) to ensure compliance with all municipal and state regulations.

**Table 3. Selected Relevant NFPA 2 HVAC System and Sensor Codes**

| Facility / Equipment | Details | NFPA 2 Code |
|---|---|---|
| **HVAC System and Sensor Requirements** | | |
| Hydrogen Detection System | Major repair garages shall be provided with an approved hydrogen detection system such that gas can be detected where vehicle hydrogen fuel storage systems are serviced, or indoor defueling occurs. These must meet the requirements of section 6.13 | 18.3.3 |
| | Detection system shall be designed to activate when LFL exceeds 25% | 18.3.3.1 |
| | 1) inlets to exhaust systems<br>2) high points in service bays<br>3) inlets to mechanical ventilation systems | 18.3.3.2 |
| | Failure of the hydrogen detection system shall result in deactivation of the heating system and activation of the mechanical ventilation system, where the ventilation system is interlocked with gas detection, shall cause a trouble signal to sound in an approved location | 18.3.3.3.3 |
| Hydrogen Sensor Requirements | Where GH2 detection systems are installed, they shall be designed, installed, tested, inspected, calibrated, and maintained in accordance with manufacturer's requirements and equipment listing requirements | 6.13.1 |
| | Testing shall be conducted at least annually, and maintenance, inspection, calibration, and testing records shall be retained for a minimum of 3 years | 6.13.2.1 |
| HVAC System | Mechanical exhaust or natural ventilation shall be provided at a rate of not less than 0.0051 m3/second/m2 of floor area over the area of storage and use | 6.18.1 |
| | Combined ventilation and heating systems shall only recirculate air from areas that are more than 455 mm below the ceiling level | 18.3.4.3 |
| | Return air openings in areas of motor vehicle repair room, shall be more than 455 mm below the ceiling level measured to the bottom of the openings | 18.3.4.2 |

**Table 4. Selected Relevant NFPA 2 Codes for Maintenance of Hydrogen Vehicles**

| Facility / Equipment | Details | NFPA 2 Code |
|---|---|---|
| **Requirements for Repairing Hydrogen Vehicles in a "Major Repair Garage"** | | |
| Walls and Ceilings | Structural sections of repair booths shall be permitted to be sealed with a caulk or sealant to minimize air leakage | 18.3.1.3 |
| | Repair rooms shall be constructed of and separated from surrounding areas of the building by construction assemblies that have a fire resistance rating of one hour | 18.3.1.5 |
| Separation from Other Operations | Repair booths shall be separated from other operations by a minimum distance of 915 mm or by a partition, wall, or floor/ceiling assembly having a minimum fire resistance rating of one hour. Multiple repair booths shall not be considered as other operations | 18.3.1.7.1 |
| | A clear space of not less than 915mm shall be maintained of all sides and above the repair booth - this clear space shall be kept free of any storage or combustible construction.<br>This shall not prohibit locating a repair booth closer than 915 mm to an exterior wall or roof assembly, provided the wall or roof is constructed of non-combustible material and provided the repair booth can be maintained | 18.3.1.7.1.1 |
| Electrical Requirements | The area within 455 mm of the ceiling shall be designated as Class 1 Division 2, Group B hazardous location<br><br>This does not apply to areas where continuous mechanical ventilation system meets the requirements of 18.3.5 | |
| Training Plan | Emergency responder training required, and on-site response team and operator training | 17.1.2 |
| Parking Garages | Parking of hydrogen vehicles subject to same requirements as traditional fueled vehicles | |
| | Storage of GH2 or LH2 other than within the fuel and propulsion systems of the vehicles being stored shall not be allowed unless approved by the authority having jurisdiction (AHJ) | |

# Utility & Fuel Partnerships

The electrical and hydrogen fuel support required at each facility was determined and reviewed with consideration to local utilities. This includes the expected demand for each facility, intended sourcing of the fuel, and potential rate structures.

## Coordination with Electric Utility

Public Service Company of New Mexico (PNM) provided electrical support and considerations for expansion of electrical demand due to infrastructure additions from EV charging. From PNM's initial review, each location is currently receiving single-phase service and will require line extensions to support the anticipated electrical upgrades. This said, a submission of an NSD application is required for PNM to begin an official process of evaluating current service availability for each location, to include required utility upgrades, in support of the new electrical demands.

PNM also offers a commercial rebate for eligible infrastructure and installation costs of non-residential customers, with a total budget of $1,500,000. This budget includes infrastructure installation from the other side of the transformer to the base of the charge unit. The rebate can be extended for workplace and fleet charging infrastructure through the utilities as outlined in Article 7.2.3.2.2 of the approved PNM Transportation Electrification Program[1].

### Power Supply at New Mexico Rail Runner Express (NMRX) Yard

An overhead power line crossing through the facility yard is the intended source of interconnect with the grid for the EV charger infrastructure at the NMRX yard. Full buildout of the EV charger deployment infrastructure is estimated for a load of 93.6 kW and will require the support of a 125 kVA transformer. The transformer could be in the center island of the yard and provide power to all 13 Level 2 EV chargers in the full buildout. This small sized transformer can be pole or pad mounted depending on available square footage within the center island of the yard's parking lot. The transformer serving the EV chargers is separate from any electrical service supplying power to the buildings.

### Power Supply at Sandoval County Transit Facility

Near the entrance of the Sandoval County Transit Facility is the proposed location of the new pad mounted transformer needed for fleet electrification. Full buildout of the charger deployment is estimated for a load of 597 kW and will require the support of a 750 kVA transformer. This transformer will provide electrical support to the EV chargers of the revenue, non-revenue, and AAA fleet located within this lot. All chargers located at this facility provide overnight charging during off-hours, while DCFC equipment also provides mid-day charging to various BEVs in need of additional range to complete revenue routes.

### Power Supply at Valencia County Transit Facility

The Valencia County Transit Facility is currently undergoing construction and will require new electrical infrastructure to support the utility interconnection needed for fleet electrification. The transformer serving the EV chargers is separate from any electrical service supplying power to the buildings. Full buildout of the EV charger deployment infrastructure is estimated for a load of 572 kW and will require

[1] 59f3d1d5-fe64-4a60-eabe-d2c49cb9dd85 (pnm.com)

the support of a 750 kVA transformer. This transformer will need to be pad mounted within the newly constructed yard, currently located adjacent to the storage shed on the Eastern side. The proposed location of the transformer allows for ideal connection to both the Level 2 and DCFC charger equipment. All chargers located at this facility provide overnight charging during off-hours, while DCFC equipment also provides mid-day charging to various BEVs in need of additional range to complete revenue routes.

### Utility Rate Considerations

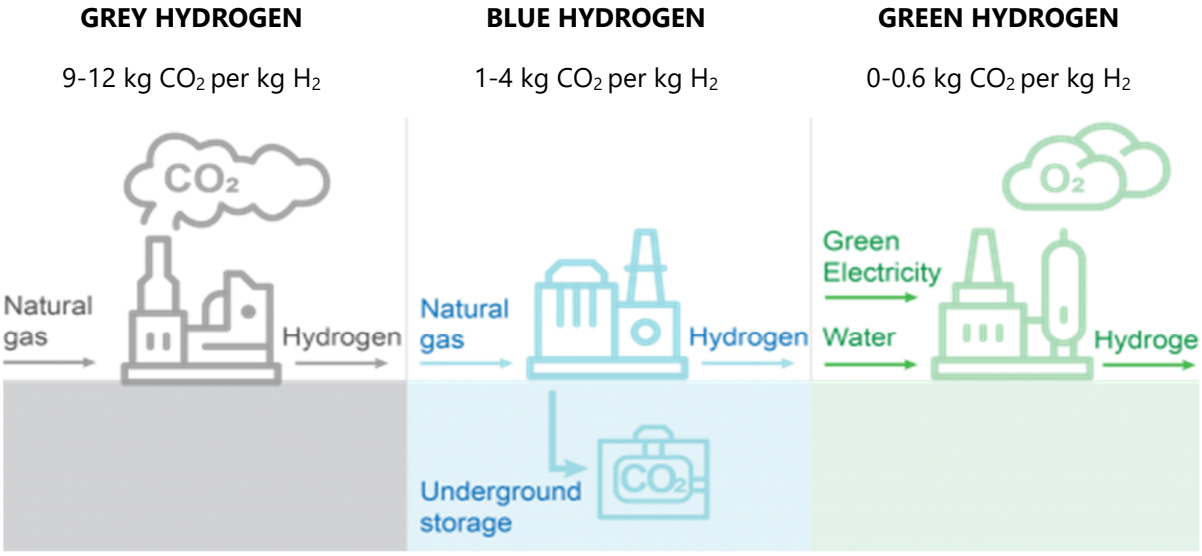
Many utilities have elected to incentivize electric vehicle adoption by decreasing the demand charges in order to decrease the operational cost. Some of these EV rates are temporary, though the utility may elect to keep these indefinitely. It should be noted that some EV rates have been tailored for light-duty vehicle charging and are not always beneficial for transit systems. In some cases, large consumers may be able to work with the utility to develop a rate that is applied only to that customer and benefits both the customer and the utility. Such rate cases often include large industries or other large consumers. In some cases, transit agencies pursuing fleet electrification have been successful in negotiating a new rate for the agency.

PNM is providing incentives to its customers for the transition and use of green energy technologies such as EV charging services. With residential and non-residential EV charging electric promotions, the non-residential rates are currently within a pilot period where PNM offers no demand charges, also known as a volumetric rate. This further reduces the cost of EV charging as the peak loading level will not negatively impact the per kilowatt-hour cost and instead be lumped into a time of use and time of year category for per kilowatt-hour charge. PNM has indicated they are developing an EV rate structure beyond the pilot rate 3F for non-residential charging, but the terms of this future rate structure are still unknown.

## Hydrogen Fuel Supply

Hydrogen is a zero-carbon fuel that emits only water when consumed in a fuel cell; it can be produced through several methods, including solar-driven and biological processes, but is most commonly produced through natural gas reforming (thermal processing) or electrolysis. Although hydrogen emits no carbon into the atmosphere when used as a fuel, producing it can vary from minimally to significantly carbon intensive – depending on the method of production. Grey hydrogen is the most abundantly available form and is generated using natural gas as the primary fuel source in a process called steam methane reformation (SMR). Blue hydrogen is also sourced through SMR, but the carbon generated during this process is then captured and stored underground through carbon capture and storage (CCS); Blue hydrogen is less carbon intensive than grey hydrogen because emissions are not released into the atmosphere. Green hydrogen is produced using electrolysis, a process through which electricity is used to split water molecules into gaseous hydrogen molecules and oxygen; green hydrogen can also vary from minimally to significantly carbon intensive depending on the source of electricity being utilized.






## Expected Hydrogen Demand

To support FCEVs at the Valencia County Transit Facility, Rio Metro would require up to 382 kg $H_2$ each day of operation for the entire revenue fleet. Fueling infrastructure would be sized to store enough fuel for two weeks of operation, resulting in approximately 4,000 kg $H_2$ of stored liquid hydrogen. The average refueling capacity of each vehicle is estimated to be approximately 15.5 kg $H_2$; the refueling rate of a hydrogen vehicle is approximately 3.6 kg per minute, which translates to 4-5 minutes per bus or 2 hours to refuel the entire fleet.

## Hydrogen Sourcing

Air Products has confirmed an adequate capacity of hydrogen is available in the region to supply the fleet. For example, Air Products commissioned a 20 Ton Per Day plant in La Porte, TX in September 2021, approximately 920 miles from Rio Metro's Sandoval and Valencia County facilities. Additionally, Air Products is currently building another hydrogen production facility in Casa Grande, AZ, which will come online in early 2024. Given the close proximity to Rio Metro's Valencia County Transit Facility (approximately 420 miles), hydrogen availability will increase when the Casa Grande plant opens.

The cost of delivered hydrogen will depend on the distance delivered as well as the carbon intensity of the hydrogen; green hydrogen is more expensive than blue or grey hydrogen because it's cleaner. The estimated cost of delivered blue hydrogen from the La Porte Production Facility is $8-$9 per kg of hydrogen, while the cost of delivered green hydrogen from the Casa Grande production facility is estimated to range from $13-$14 per kg of hydrogen. Though the cost of delivered hydrogen is inflated due to the lack of a well-established production network, delivered fuel costs are expected to decrease as this production network grows over time. Government entities work to continue reducing the inflated costs of hydrogen for the consumer by providing incentives up the chain, such as tax credits to the production equipment and cost credits to the delivery of hydrogen[2].

[2] Hydrogen tax credits | Norton Rose Fulbright - June, 2021 (projectfinance.law)

# Financial Analysis & Funding Plan

When undertaking any major transit technology and infrastructure project, the first concern is typically how much it will cost to implement. Although capital costs are often estimated during the planning stage, the costs of operating and maintenance over time, as well as costs associated with vehicle replacements, are frequently left out of the decision-making process. These costs can become significant in the long-term and may influence the decision of which zero emission vehicle alternatives provide the greatest long-term value to the agency. The financial analysis compared Rio Metro's existing gasoline-based fleet to proposed zero emission vehicle alternatives to define the best value alternative for Rio Metro to reach 100 percent conversion to zero emission vehicle technologies by 2040.

## Fleet Transition Scenarios

The costs evaluated include capital, operating and maintenance (O&M), and fueling between 2023 and 2040. Two zero emission scenarios are considered: all vehicles are BEVs at full transition or all non-revenue and Sandoval County Transit Facility revenue vehicles are BEV while Valencia County Transit Facility revenue vehicles are FCEV. Each scenario is compared to a baseline scenario in which costs are projected through 2040 assuming all vehicles remain gasoline. Annual and total costs are compared to calculate the net present value (NPV) of each zero emission transition scenario. In the sections below, costs are separated by fleet type with revenue vehicles being further separated by facility location.

**Baseline:** This scenario assumes that all non-revenue and revenue vehicles are replaced with gasoline vehicles through 2040 according to their historical replacement schedules.

**BEV Revenue Fleet at Valencia County Transit Facility:** This scenario assumes all non-revenue vehicles at all three facilities will be transitioned from the current gasoline fleet to a fully electric fleet by 2032 and all revenue vehicles at both facilities will be fully electric by 2036. This scenario is referred to as BEV Revenue Fleet Scenario throughout the remainder of this section.

**FCEV Revenue Fleet at Valencia County Transit Facility:** This scenario assumes all non-revenue vehicles at all three facilities will be transitioned from the current gasoline fleet to a fully electric fleet by 2032, all revenue vehicles at Sandoval County Transit Facility will be battery electric by 2031, and all revenue vehicles at Valencia County Transit Facility will be hydrogen fuel cell by 2036. This scenario is referred to as FCEV Revenue Fleet Scenario throughout the remainder of this section.

## Lifecycle Cost Comparison

This section provides a comparison of the capital, O&M, and fueling cost estimates among the three scenarios considered. Since non-revenue vehicle purchases and the necessary utility infrastructure will begin to be purchased within the next two years, the full period between 2023 and 2040 will be considered in the analysis.

### Capital Cost Comparison

Table 5 provides a comparison of total capital costs (in millions of 2022 dollars [2022 $]) among the three scenarios. The capital cost of implementing either type of zero emission vehicle technology is significantly higher than continuing with gasoline buses. Battery electric buses have a higher associated per-bus cost compared to fuel cell electric buses. As a result, BEV Revenue Fleet Scenario



has a slightly higher overall capital cost than the FCEV Revenue Fleet Scenario. The necessary utility infrastructure needed to support hydrogen buses at Valencia County Transit Facility is much higher than infrastructure necessary for battery electric buses and is not offset by the additional chargers the BEV Revenue Fleet Scenario demands. The Baseline Scenario is by far the least expensive in capital costs, due to the relative abundance of low-price gasoline vehicles and not needing any additional utility infrastructure to support a gasoline fleet.

**Table 5: Capital Cost Comparison (2022 $, in Millions)**

| | Baseline Scenario | BEV Revenue Scenario | FCEV Revenue Scenario |
|---|---|---|---|
| **Non-Revenue Vehicles** | | | |
| Gasoline | $1.07 | $0.13 | $0.13 |
| Battery Electric | - | $1.80 | $1.80 |
| **Revenue Vehicles** | | | |
| Gasoline | $8.18 | $3.09 | $3.09 |
| Battery Electric | - | $19.60 | $7.68 |
| Hydrogen Fuel Cell | - | - | $5.83 |
| **Total Vehicle Purchases** | **$9.25** | **$24.63** | **$18.54** |
| Utility Infrastructure | - | $5.21 | $9.50 |
| EV Chargers | - | $2.15 | $0.64 |
| **Total Infrastructure Purchases** | **-** | **$7.37** | **$10.14** |
| **Total Purchases** | **$9.25** | **$32.00** | **$28.68** |

## Operations and Maintenance Cost Comparison

Table 6 provides a comparison of total operating and maintenance (O&M) cost estimates over the 2023 to 2040 period. Due to the operating cost for each vehicle being static, differences arise from variation among maintenance costs for each vehicle type. As such, vehicle maintenance costs for hydrogen FCEVs are lowest, having the lowest per-mile rate. However, there is uncertainty in the industry about vehicle maintenance costs for BEVs and FCEVs. Both technologies do not have information as robust as their gasoline counterparts, such that long-term detailed analysis of vehicle maintenance costs is not available.

**Table 6: Operating and Maintenance Cost Comparison (2022 $, in Millions)**

| | Baseline Scenario | BEV Revenue Scenario | FCEV Revenue Scenario |
|---|---|---|---|
| **Non-Revenue Vehicle O&M** | ***$30.36*** | ***$30.25*** | ***$30.25*** |
| Gasoline | $30.36 | $9.10 | $9.10 |
| Battery Electric | - | $21.16 | $21.16 |
| **Revenue Vehicle O&M** | ***$107.91*** | ***$110.16*** | ***$107.60*** |
| Gasoline | $107.91 | $55.81 | $53.30 |
| Battery Electric | - | $54.35 | $22.96 |
| Hydrogen Fuel Cell | - | - | $31.35 |
| **Total Vehicle O&M** | **$138.27** | **$140.42** | **$137.85** |
| Utility Infrastructure O&M | - | - | $1.81 |
| EV Charger O&M | - | $4.61 | $1.90 |
| **Total Infrastructure O&M** | **-** | **$4.61** | **$3.70** |
| **Total O&M** | **$138.27** | **$145.02** | **$141.56** |

### Fuel Cost Comparison

Table 7 provides a comparison of total costs for gasoline, electricity, and hydrogen fuel over the 2023 to 2040 period.

**Table 7: Fueling Cost Comparison (2022 $, in Millions)**

| Fuel Type | Baseline Scenario | BEV Revenue Scenario | FCEV Revenue Scenario |
|---|---|---|---|
| Gasoline | $1.19 | $0.42 | $0.41 |
| Electricity | - | $0.33 | $0.27 |
| Hydrogen | - | - | $0.03 |
| **Total** | **$1.19** | **$0.75** | **$0.71** |

## Funding Plan

With a clear understanding of capital, operating and maintenance (O&M), and fuel/electricity costs associated with a zero emission vehicle transition, Rio Metro can begin to incorporate these costs into future operating and capital budgets. Grant funding will be essential in helping Rio Metro meet the ambitious goal of reaching zero emission by 2040. Rio Metro will utilize formula funding and apply for funding from any relevant competitive grant programs at the local, regional, state, and federal level.

This transition plan has identified that portions of the utility infrastructure needed to support battery electric fleets at each of the transit facilities are grant-applicable. The total utility infrastructure costs that are grant-eligible are summarized in Table 8.[3]

[3] Utility infrastructure costs for the Valencia County Transit Facility in the FCEV Revenue Scenario is inclusive of the hydrogen utility infrastructure, which is not eligible for PNM grant funding.

**Table 8: Grant Eligible Utility Infrastructure Costs (YOE Dollars)**

| | Potential Funding | % of Infrastructure Cost |
|---|---|---|
| **BEV Revenue Scenario** | **$4,519,910** | **77.88%** |
| NMRX Railyard | **$892,796** | **81.83%** |
| Valencia County | **$2,124,248** | **76.63%** |
| Sandoval County | **$1,502,866** | **75.17%** |
| **FCEV Revenue Scenario** | **$3,635,858** | **54.15%** |
| NMRX Railyard | **$1,090,996** | **81.83%** |
| Valencia County | **$545,596** | **5.45%** |
| Sandoval County | **$1,999,266** | **75.17%** |

Funding for the transition strategy can come from grant opportunities including New Mexico Environment Department (NMED) EV Charging Station Funding, the FTA Low or No Emission Vehicle Grant Program, and the FTA Bus and Bus Facilities Grant Program. Rio Metro will also explore innovative funding strategies like PNM's EV Charging Station Rebate, public-private partnerships, and leasing opportunities.



# Workforce Transition Plan

A key aspect of this Zero Emission Transition Plan is to preserve the current workforce and to provide a pathway to empower staff with the necessary skills to support the successful deployment and maintenance of zero emission vehicles (ZEVs). This is done with the goal of ensuring consistent passenger service while delivering environmental benefits as well as recognizing the value and importance of the existing workforce and Rio Metro's role as an employer within the region. Updating the existing training systems to include BEVs while planning for the gradual retirement of gasoline vehicles will be done as part of this transition.

Rio Metro can partner with original equipment manufacturers (OEMs), local colleges and technical schools, and other industry specialists to train trainers, operators, mechanics, and other staff to work with the new ZEVs with the goal of avoiding the displacement of the existing workforce. This Workforce Transition Plan provides a framework to evaluate the skills of the existing workforce, identify skill gaps on an individual basis, and develop a plan to build and implement an effective training program for both vehicle operators and vehicle maintenance personnel. In addition to the development of the existing workforce, this plan also conveys a workforce growth strategy for attracting new employees, retaining new and current employees, and funding opportunities to sponsor growth.

Rio Metro does not currently perform any vehicle maintenance internally, but the agency will ensure there is no displacement of current maintenance workforce as a result of the transition to zero emissions through an inclusion of a full workforce transition plan in contract language for maintenance provider(s). If Rio Metro brings maintenance functions in-house in the future, the developed training program will be consistent with this Workforce Transition Plan.

To assist agencies with an examination of the impact of transition to a zero emission fleet on the current workforce, the Federal Transit Administration (FTA) issued information on a Zero Emission Fleet Transition Plan Workforce Evaluation Tool. In this tool agencies will find seven major questions that they are recommended to address, including:

1. Identify Skills, Training, & Credentials
2. Assess Skills of Current Workforce
3. Identify Skills Gaps
4. Develop Zero Emission Vehicle Transition Workforce Training Program
5. Engage Current Workforce in Planning
6. Incorporate Strategies to Avoid Workforce Displacement
7. Identify Funding for Training Program

## Training Program Development

Rio Metro will review the training program provided by the selected contractor, making sure the appropriate technologies are included into a comprehensive curriculum. The development of a high-quality training program will entail coordination with internal and external resources. The following potential resources may assist Rio Metro's selected contractor with program development:

- Vehicle and charger OEM training curriculum purchased as part of new rolling stock procurements



- Vehicle sub-system/sub-component OEM training curriculum
- Partnership with local first responding agencies
- Collaboration with transit agencies with operational zero emission fleets and in-house training programs
- Membership through training consortiums like National Transit Institute
- Participation in transit associations like American Public Transportation Association, Center for Transportation and the Environment, and Zero Emissions Bus Resource Alliance

Rio Metro is committed to working closely with the contractor to develop a comprehensive training program that integrates a ZEV curriculum with any existing internal operator training programs, contractor vehicle maintenance technical training and behind-the-wheel training. Technical training includes shop and system safety, system familiarization and operations, troubleshooting and diagnostics, rebuild, and preventative maintenance. All ZEV curriculums will be developed and reviewed by Rio Metro, the contractor, and any local unions.

## Training Curriculum

ZEVs contain high voltage batteries, requiring all maintenance technicians to be certified to work on high voltage systems. Rio Metro will work closely with the selected contractor to ensure the existing Electronic and Electrical Safety Program with guidance from the National Fire Protection Agency (NFPA 70E), Occupational Safety and Health Administration, OEMs, and industry best practices are supplemented appropriately. These programs can be reviewed and utilized by the contractor as a foundation to establish and maintain electrically safe work conditions for vehicle maintenance personnel servicing Rio Metro's fleet of ZEVs. The selected contractor should consider including the following program in their curriculum:

- Proper use and inspection of personal protective equipment
- CPR and first aid training
- High voltage onboard systems familiarization and identification
- Lock-Out-Tag-Out training and compliance

## Training Program Implementation

Rio Metro will work closely with contractors to ensure current technical training programs are up to date, moving forward from older systems and making sure newer systems are adequately integrated into program. The selected contractor is expected to provide a training program which includes a comprehensive curriculum on all vehicle systems and subsystems. Through the selected contractor's program, Rio Metro will review all maintenance department training, to make sure employees are provided with specialized training that encompasses current information about new and existing equipment including modern electronic and mechanical vehicle systems, OEM changes that impact maintenance practices, and refresher training if necessary.

Rio Metro encourages the selected contractor to identify maintenance management and front-line supervisors for Safety Orientation Training and Maintenance Department training sessions. Additional programs and supplemental professional development events supported by the contractor, including Federal Emergency Management Agency (FEMA) National Incident Response Training, Maintenance Program and Process Benchmarking, and National Transit Institute's Transit Trainers Workshops have been identified as useful for training purposes.



Initially, the selected contractor should identify and develop a core group of subject matter experts to serve as ZEV fleet specialists to be reviewed by Rio Metro. This approach will proactively develop qualified fleet specialists through hands-on experience and learning.

Rio Metro will work with the contractor to develop an appropriate timeline for training. The training effort is envisioned to be phased; as the zero emission fleet grows, more mechanics will complete zero emission maintenance training under the contractor. For example, if Rio Metro is expecting delivery of 10 ZEVs, transition training for 5 mechanics to become ZEV-certified fleet specialists will begin one month prior to delivery.

## Workforce Right-Sizing

As Rio Metro transitions to a zero emissions fleet, the agency will work closely with the selected contractor to evaluate staffing needs on a rolling basis based on overall fleet growth and approve additional positions as determined by the contractor's maintenance staffing guidelines.

Rio Metro continues to develop more creative recruitment strategies to combat the nationwide shortage of mechanics and vehicle operators. Properly marketing the Rio Metro Zero Emission Fleet Transition, including the opportunity for a cutting-edge technical career, is critical to the attraction, development, and retention of the largely contracted workforce.

## Funding Opportunities

The anticipated cost of workforce training will likely fluctuate in response to the adoption of ZEVs. Suggested contractor funding is anticipated to come from several sources including procurement, existing funding sources used for training, and federal and local funding shares.

While the cost of the training is one item to consider, the labor cost to train vehicle maintenance personnel is anticipated to be high. As highlighted by the International Transportation Learning Center, the following costs will be considered when budgeting for workforce training:

- Classroom training hours
- Instructor hours (instruction and preparation)
- Instructor hourly wages and benefits
- Instructor costs per class
- Instructor cost per trainee
- On the job training hours
- Mentor hours
- Mentor hourly cost
- Mentor cost per trainee
- Facilities cost
- Training materials/mock-ups/software/simulation cost

Rio Metro will work closely with the contractor to identify funding sources for worker training and re-training and utilize the training funding offered through federal grants to support the agency's zero emission workforce training costs. Rio Metro will work to secure funding for zero emissions vehicle maintenance and operation training on behalf of the contractor, including, but not limited to, the 5% workforce development requirement of FTA's Low or No Emissions Grant.



# Conclusion & Next Steps

This Zero Emission Transition Plan is a roadmap for Rio Metro to convert a gasoline-fueled fleet to 100% zero emission by 2040. This study included route modeling and simulations, lifecycle cost analysis, infrastructure and facility needs, utility coordination and identification of hydrogen fuel providers, and a phased fleet transition strategy. Rio Metro will cease purchasing gasoline vehicles after 2030 and all future vehicle procurements will be zero emission. Rio Metro will begin deploying BEVs in their non-revenue fleet in 2025 and will begin the transition of their revenue fleet with a battery electric pilot program in 2027 at Sandoval County Transit Facility. During this two-year program, the market will mature, technological advancements will occur, and Rio Metro will gain valuable real-world experience with BEVs. By 2029, Rio Metro will decide whether the agency will pivot to hydrogen at Valencia County Transit Facility or pursue an exclusively battery electric fleet for their full transition.

With a clear understanding of capital, operating and maintenance (O&M), and fuel/electricity costs associated with a zero emission transition, Rio Metro can begin to incorporate these costs into future operating and capital budgets. Grant funding will be essential in helping Rio Metro meet the ambitious goal of reaching zero emissions by 2040; Rio Metro will utilize formula funding and apply for funding from any relevant competitive grant programs at the local, regional, state, and federal level including the FTA Low or No Emission Vehicle Grant Program and the FTA Bus and Bus Facilities Grant Program.

This Zero Emission Transition Plan will help Rio Metro continue their commitment to sustainability by reducing emissions to improve air quality in the region and to protect the environment.