



CITY OF CORONADO

CITY COUNCIL STAFF REPORT

November 19, 2024

10d

CONSIDERATION OF ELECTRIC FIRE ENGINE ACQUISITION

RECOMMENDATION:

Provide direction on the purchase of an electric or diesel fire engine and authorize the City Manager to execute a sole source purchase agreement in accordance with Council direction, and appropriate funds and amend the Fiscal Year 2024-25 Budget, as needed.

BACKGROUND:

On September 17, 2024, the City Council received a presentation on an electric fire engine as an option for the replacement of a retiring diesel engine (report attached). The presentation included an initial analysis of the technology and operational capabilities of electric fire engines. Given that the Fire Department currently operates predominantly with diesel powered Pierce Fire Apparatus vehicles, Councilmembers posed several questions regarding the cost-benefit analysis and reliability of transitioning to an electric engine from Rosenbauer, a different fire apparatus manufacturer. The following analysis addresses these questions to provide clarity and support informed decision making.

ANALYSIS:

The analysis focused on the cost of operations, maintenance, warranty, long-term expenditures and environmental impact. The specific cost analysis covered service and maintenance expenses, downtime, fuel or charging costs, and overall lifespan. While data on the electric fire engine remains an estimation due to the recent introduction of this technology, it is important to note that large electric vehicle technology itself is well-established. The drive train of the electric fire apparatus is powered by the Volvo Penta, a recognized leader in electric motor technology for large-scale commercial and marine applications. This experience provides a level of confidence in the reliability of the underlying technology, despite limited time-based data specific for fire apparatus. Additionally, Rosenbauer is recognized as the largest manufacturer of firefighting vehicles in the world, with over 150 years of experience and an annual production of more than 2,000 vehicles.

Operational, Maintenance, Warranty and Cost Analysis

A side-by-side comparison of the diesel and electric fire apparatus reveals similar operational capabilities. Both models feature a 1,500-gallon-per-minute (GPM) pump capacity, hold 500 gallons of water, and can sustain continuous pumping for over four hours. Equipment storage capacity is much greater in the electric engine due to the elimination of the motor which increases cabinet space. Both apparatuses comply to the National Fire Protection Agency (NFPA) 1901, the standard for fire apparatus. The diesel fire apparatus is equipped with a 65-gallon fuel tank and achieves approximately 2.5 miles per gallon (MPG), providing a range of around 170 miles. In contrast, the electric fire apparatus operates entirely on battery power, offering an estimated range of 62 miles in electric mode. However, when engaging the auxiliary energy backup system, a 33-gallon BMW clean diesel engine, the range extends to approximately 310 miles. Notably, this combination of battery and diesel backup delivers nearly double the range with half the diesel consumption compared to the diesel-powered apparatus. Historical data indicates that our fire apparatus typically travel less than 15 miles in a 24-hour

period, suggesting that most operations within the City would rely primarily on the battery system.

The operational cost analysis focused on the cost per mile traveled and the total maintenance expenses over the vehicle's lifespan. A diesel fire apparatus achieves an average fuel efficiency of approximately 2.5 miles per gallon. With the current diesel price at \$4.913 per gallon, the estimated fuel cost over an 8-year lifespan for a diesel apparatus is approximately \$105,000.

In comparison, the cost per mile for an electric vehicle (EV) varies depending on factors such as charging schedules and potential solar panel augmentation. A study by the Idaho National Laboratory found that energy costs per mile for electric vehicles are, on average, 50% lower than those for internal combustion engines, based on an average utility rate of \$0.17 per kWh. Applying these findings, we estimate a potential reduction of approximately \$55,000 in power costs over the lifespan of the electric apparatus.

During a trial of the electric engine by the Los Angeles Fire Department (LAFD), the engine consumed a total of 22 gallons of diesel over a 26-week period. In comparison, our current diesel apparatus consumes approximately 1,400 gallons of diesel over the same timeframe. This substantial reduction illustrates the significant fuel savings and environmental benefits that could be achieved by transitioning to an electric apparatus.

In our analysis of vehicle maintenance costs, we reviewed historical data from the City's current diesel apparatus. Since the frontline diesel apparatus entered service in September 2017, maintenance expenses have totaled \$150,314, with City fleet mechanics dedicating 373 hours to its repairs. Although not all repairs were directly associated with the diesel powertrain, diesel apparatus generally require more frequent preventative and traditional engine maintenance, a demand that will be reduced with an electric vehicle. Moreover, the electric fire apparatus is equipped with advanced connectivity and diagnostic capabilities, potentially reducing labor time required for issue identification and resolution. Although we were not able to obtain specific maintenance history on the electric fire apparatus, the Deputy Fire Chief of LAFD Operations stated that the unit did not have any maintenance issues they would typically expect in a fire apparatus, and the sustainability and return on investment has been positive for their department.

The electric fire apparatus also includes comprehensive warranties: a 5-year service warranty, a 7-year pump warranty, a 5-year chassis warranty, a 10-year body and superstructure warranty, and a 10-year water and foam tank warranty.

It is also important to note the City's frontline diesel apparatus has accumulated 692 days of out-of-service time since entering service in 2017. While assigning a precise cost to this downtime is challenging, it may indicate a lower overall reliability for diesel apparatus due to higher maintenance demands. When our frontline apparatus is out of service, a reserve apparatus is typically placed into service. The City maintains two reserve fire apparatus: a 2010 Crimson Spartan, and a unit owned by the California Office of Emergency Services (Cal-OES). With the acquisition of a new engine, the current 2017 Pierce frontline apparatus will transition to a reserve role, and the Cal-OES fire engine will be upgraded this year, replacing an outdated 2010 model. This would provide two reliable and fully functional reserve units to support operational readiness.

Lastly, the City's replacement timeline for front-line apparatus is set at eight years. This timeline was developed collaboratively by the Fire Department and City Fleet experts, drawing on

decades of experience in maintaining diesel fire apparatus and balancing total ownership costs against vehicle age and mileage. While data on total maintenance costs for electric apparatus remains limited, the Fire Department is confident that these costs will be lower overall. This potential reduction in maintenance demands may extend the front-line service life beyond the current eight-year amortization to a ten-year or longer period.

Environmental Impact

The environmental impact of an electric fire apparatus is significantly lower than that of a traditional diesel-powered unit. A diesel fire apparatus in the City consumes approximately 22,400 gallons of diesel over its eight-year frontline service, resulting in an estimated 200 metric tons of carbon dioxide emissions. According to the Environmental Protection Agency's equivalencies calculator, this consumption is equivalent to the emissions of 47 passenger vehicles driven for one year, 219,389 pounds of coal burned (equivalent to 1.1 railcars of coal), 461 barrels of oil consumed, or approximately 509,132 miles driven by an average passenger vehicle.

An electric engine is emissions-free while operated from battery power, which would be its primary operating mode considering the area of the City and service demands. This eliminates point source pollution of approximately 25 metric tons of CO₂ each year or 200 metric tons over eight years. By comparison, a 10-kilowatt residential rooftop solar system can save up to four metric tons of GHG emissions per year. A typical 10-kilowatt residential rooftop solar system provides enough power for a 2,000-square-foot home in the United States.

Finally, while this report was focused on life-cycle costs of maintenance and fuel and the service needs, there are other elements discussed in more detail in the September 17 report that distinguished the electric engine. These include the maneuverability of the electric engine in constrained spaces, the vastly quieter operations which lessens noise impacts on firefighters and the community, the reduced exposure to emissions, the single cab compartment which allows for open communication and debriefing of the entire Engine Company, and an array of features supporting public safety operations and the physical and mental wellness of first responders. These benefits are difficult to quantify in financial terms but lead to positive qualitative change in community and firefighter impacts.

FISCAL IMPACT:

The City has \$1.3 million budgeted in FY 2024-25 for replacement of a fire engine, the cost of a diesel fire engine. If the Council approves a diesel fire engine, no additional funds are needed. If the Council approves the acquisition of an electric fire engine, an additional \$900,000 is needed and would be recommended from the CDA Loan Fund, Fund 160, which currently has a balance of approximately \$4.5 million and must be spent by an estimated timeline of September 2027 on eligible expenditures.

ALTERNATIVE:

The Council may direct staff to purchase a diesel fire engine or conduct additional research.

CALIFORNIA ENVIRONMENTAL QUALITY ACT:

Not a project under CEQA.

PUBLIC NOTICE:

No notice required.

ATTACHMENTS:

1. Agenda Report from September 17, 2024

Submitted By: Fire Department / Chief Summers