



April 2023

# U.S. POSTAL SERVICE

## Action Needed to Improve Credibility of Cost Assumptions for Next Generation Delivery Vehicles

Accessible Version

# GAO Highlights

Highlights of [GAO-23-106677](#), a report to congressional requesters

## Why GAO Did This Study

USPS is planning to replace its fleet of roughly 200,000 delivery vehicles. To begin updating its delivery fleet, USPS has awarded a contract to build the next generation delivery vehicle—a custom designed, right-hand drive vehicle with increased cargo capacity, modern safety feature and both a gas and electric vehicle option.

GAO was asked to review USPS's efforts to acquire electric delivery vehicles. This report assesses (1) the extent to which USPS's cost estimate reflected leading practices; (2) the key factors that affect the percentage of gas and electric vehicles USPS's purchasing model recommends; and (3) the extent to which USPS clearly explained the basis for its initial purchasing decision, among other objectives. GAO compared cost estimate data with leading practices in GAO's *Cost Estimating and Assessment Guide*, reviewed purchasing model data, and compared capital request documents with USPS investment policies.

This is a public version of a sensitive report that is being issued concurrently. Information that USPS deemed sensitive has been omitted.

## What GAO Recommends

GAO is recommending that USPS (1) use leading practices to improve the credibility of its cost estimates, and (2) clearly explain changes to cost assumptions in capital request reports to decision makers. USPS disagreed with the first recommendation and, while agreeing with the second, believes it has already clearly explained its cost assumptions. GAO maintains that both recommendations are valid, as discussed in the report.

View [GAO-23-106677](#). For more information, contact Jill Naamane at (202) 512-2834 or [naamanej@gao.gov](mailto:naamanej@gao.gov).

April 2023

## U.S. POSTAL SERVICE

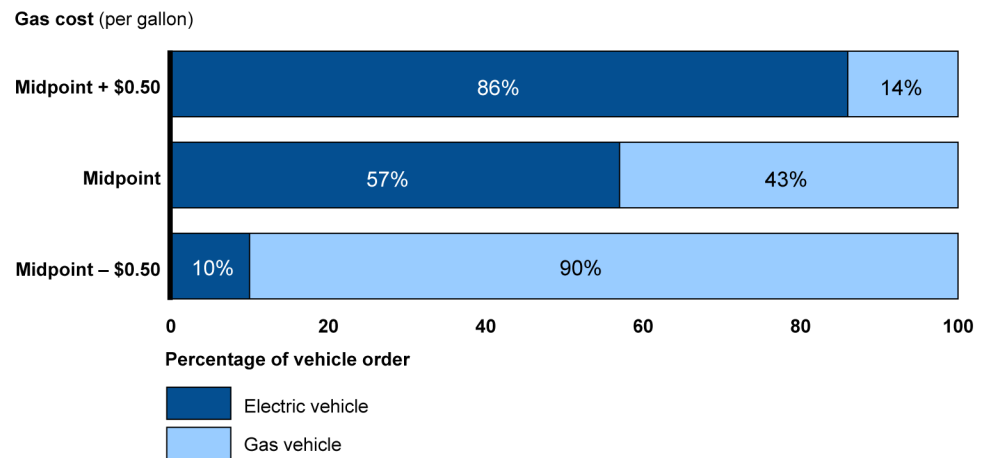
### Action Needed to Improve Credibility of Cost Assumptions for Next Generation Delivery Vehicles

## What GAO Found

The United States Postal Service's (USPS) cost estimate for acquiring the next generation delivery vehicle followed most leading practices for a comprehensive, well documented, and accurate estimate. However, USPS did not fully use practices related to credibility from GAO's *Cost Estimating and Assessment Guide*, such as including a sensitivity analysis of how different assumptions affected the underlying cost estimate. USPS officials said they use internal policies and are not subject to the *Cost Guide*. However, this guide reflects leading practices used by government and industry. Using these practices can strengthen the estimate's credibility and ensure effective cost management.

GAO's analysis of the purchasing model USPS created to inform its vehicle order in 2022 found that two cost factors—the price of gas and the cost of installing charging infrastructure—could considerably affect the model's recommendations. For example, changing the gas price by \$1.00 in a selected range resulted in the model recommending that almost 90 percent of the delivery vehicles be electric, instead of 10 percent (see figure). Thus, it is important for USPS to consider this sensitivity and monitor fuel costs as it evaluates the mix for its vehicle order.

#### Effect of a Range of Selected Gas Prices on U.S. Postal Service Purchasing Model's Recommendation for a 2022 Order of Next Generation Delivery Vehicles



Source: GAO analysis of US Postal Service data. | GAO-23-106677

#### Accessible Data for Effect of a Range of Selected Gas Prices on U.S. Postal Service Purchasing Model's Recommendation for a 2022 Order of Next Generation Delivery Vehicles

Gas cost (per gallon)	Electric (Percentage)	Gas (Percentage)
Midpoint + \$0.50	86	14
Midpoint	57	43
Midpoint - \$0.50	10	90

GAO's analysis of the capital request report USPS used for its March 2022 vehicle order found USPS did not clearly explain the basis for all cost assumptions. Specifically, USPS used \$2.71 as the gas price. The report stated that costs reflected current market conditions and updated pricing in March 2022. However, USPS did not describe the methodology it used to calculate the gas price—a fiscal year average—or disclose that the methodology excluded the increase in the national average gas price from \$3.19 in October 2021 to \$4.24 in March 2022. Clearly explaining changes to cost assumptions, including important methodological details, better positions decision makers to determine whether the information supporting the proposed number and mix of vehicles to purchase is reasonable, accurate, and valid.

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### Abbreviations

COSO Framework	Committee of Sponsoring Organizations of the Treadway Commission Internal Control-Integrate Framework
Cost Guide	Cost Estimating and Assessment Guide
EIA	U.S. Energy Information Administration
NEPA	National Environmental Policy Act of 1969
OIG	Office of Inspector General
USPS	United States Postal Service

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April 20, 2023

The Honorable Jamie Raskin  
Ranking Member  
Committee on Oversight and Accountability  
House of Representatives

The Honorable Thomas R. Carper  
United States Senate

The United States Postal Service (USPS) plans to replace its current delivery vehicle fleet—consisting of roughly 200,000 vehicles—at a time when the landscape of available vehicles is changing. A vast majority of USPS’s current delivery vehicles lack modern safety features and are costly to maintain, heightening the urgency of USPS’s efforts. To begin updating its delivery fleet, USPS awarded a contract to Oshkosh Defense in 2021 to build a custom designed, right-hand drive vehicle for mail and package delivery. These “next generation delivery vehicles” will have increased cargo capacity, modern safety and ergonomic features, and two powertrain options: an internal combustion engine that uses gasoline (gas vehicles) and a battery electric vehicle that requires charging equipment (electric vehicles).

To guide this major acquisition, USPS created a model (hereafter referred to as “the purchasing model”) that uses various cost factors to compare the gas and electric next generation vehicles with each other and with other commercial vehicles. The purchasing model is intended to help USPS identify the lowest cost or “optimal” vehicle to purchase for each delivery route, as well as the overall percentage of gas and electric vehicles to purchase.<sup>1</sup>

In March 2022, USPS placed an initial order for 50,000 next generation vehicles—39,981 gas and 10,019 electric—at a cost of \$2.98 billion. In June 2022, USPS announced that it would evaluate whether it should

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<sup>1</sup>USPS’s purchasing model analyzed costs for the gas and electric next generation delivery vehicle, including a two-wheel and four-wheel drive version, and some gas commercial vehicles. USPS officials said any vehicle could be added to the model for analysis, but no commercial electric delivery vehicles were available in the market when USPS developed the model.

revise its initial order to consist of at least 50 percent electric vehicles, as part of a planned additional environmental analysis.<sup>2</sup> In August 2022, Congress passed the Inflation Reduction Act, which included an appropriation of \$3 billion for USPS to purchase zero-emission delivery vehicles, including electric vehicles, and infrastructure to support the vehicles.<sup>3</sup> In advance of the environmental analysis, USPS announced in December 2022 that it expects to modify its order to a minimum of 75 percent electric vehicles as part of an order of 60,000 next generation vehicles. USPS also stated that it would use the \$3 billion appropriation to partially fund this order.

You asked us to review USPS's efforts to acquire electric delivery vehicles.<sup>4</sup> This report assesses four objectives:

1. the extent to which USPS's updated cost estimate for acquiring next generation delivery vehicles reflected leading practices;
2. the key factors that affect the purchasing model's recommended percentage of gas and electric delivery vehicles;
3. the extent to which USPS clearly explained the basis for its initial purchasing decision; and
4. the key risks USPS identified for the next generation delivery vehicle program, and actions USPS has taken to address those risks.

This is a public version of a sensitive report that is being issued concurrently.<sup>5</sup> USPS deemed some of the information to be sensitive, which must be protected from public disclosure. Therefore, this report omits sensitive information about (1) the effect of specific prices on

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<sup>2</sup>USPS expects to publish a Draft Supplemental Environmental Impact Statement by May 2023 that will assess the potential environmental impacts of vehicle purchase alternatives.

<sup>3</sup>Battery electric vehicles are considered zero-emission vehicles as they produce zero tailpipe greenhouse gas emissions. The Inflation Reduction Act provided \$1.29 billion for purchasing zero-emission vehicles through September 2031 and \$1.71 billion for the purchase, design, and installation of infrastructure to support zero-emission delivery vehicles at postal facilities. Pub. L. No. 117-169, § 70002, 136 Stat. 1818, 2086–87 (2022).

<sup>4</sup>In our testimony statement for an April 2022 congressional hearing, we discussed our preliminary work examining USPS's efforts to acquire electric delivery vehicles. See [GAO-22-105931](#).

<sup>5</sup>GAO, *U.S. Postal Service: Action Needed to Improve Credibility of Cost Assumptions for Next Generation Delivery Vehicles*. GAO 23-105409SU (Washington, D.C.: April 2023).

USPS's purchasing model results, (2) risks to the next generation delivery vehicle program, and (3) USPS actions to mitigate those risks. Although the information provided in the report is more limited, the report addresses the same objectives as the sensitive report and uses the same methodology.

To address our first objective, we compared USPS's documentation and data with leading practices in the GAO's *Cost Estimating and Assessment Guide (Cost Guide)* for a high-quality, reliable cost estimate.<sup>6</sup> To address our second objective, we reviewed USPS's acquisition documentation, analysis of the total cost of ownership for the next generation vehicle, and purchasing model to identify how key factor formulas, assumptions, and requirements affected the model's results. We used USPS's model to test the extent to which assumptions about selected cost factors affect the model's recommended vehicle mix for an order placed in 2022.<sup>7</sup> To address our third objective, we compared USPS's decision analysis report with USPS's *Investment Policies and Procedures*, and with the Committee of Sponsoring Organizations of the Treadway Commission Internal Control-Integrated Framework (COSO Framework).<sup>8</sup> To address our fourth objective, we reviewed USPS documents to identify USPS's approach to identifying, assessing, and managing production and deployment risks. In addition, we interviewed USPS officials and representatives of four private delivery companies to understand their experiences with acquiring electric vehicles and associated challenges and benefits. Further details on our scope and methodology can be found in appendix I.

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<sup>6</sup>GAO, *Cost Estimating and Assessment Guide*, [GAO-20-195G](#) (Washington, D.C.: March 2020).

<sup>7</sup>We selected the price of gas and cost of charging infrastructure as factors to test because they were not fixed in the model and had a wide range of assumptions or fluctuations. Factors such as upfront acquisition and maintenance costs, fuel efficiency, and the price of electricity were not selected because these costs are either fixed in the model, were refreshed by USPS based on recent testing data, or had not fluctuated widely.

<sup>8</sup>We reviewed USPS's *Handbook F-66 General Investment Policies and Procedures and Handbook F-66B, Investment Policies and Procedures — Major Equipment*. In addition, the COSO Framework is recognized as a leading framework for designing, implementing, and conducting internal control and assessing the effectiveness of internal control. We have applied the COSO Framework in evaluating USPS's operational internal controls in recent reports, and the USPS Office of Inspector General (OIG) has done so as well.



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We conducted this performance audit from September 2021 to April 2023 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

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## Background

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### USPS Efforts to Update Its Delivery Vehicle Fleet

USPS uses its delivery vehicle fleet to complete a wide range of delivery routes across the country.<sup>9</sup> About 153,000 of the 200,000 delivery vehicles on these routes are custom designed, right-hand drive, light-duty vehicles that USPS purchased between 1987 and 2001.<sup>10</sup> These vehicles do not have modern features such as airbags or air conditioning, and they are experiencing increasing maintenance costs and are at greater risk of safety incidents. In addition to these approximately 153,000 vehicles, USPS has acquired various commercial vehicles over the past few decades that make up the rest of its delivery vehicle fleet.<sup>11</sup> USPS plans to continue to purchase commercial vehicles that are not custom designed for USPS. These commercial vehicles are less expensive than the next generation delivery vehicle but have shorter lifecycles and can only be used on a subset of delivery routes.<sup>12</sup>

USPS's fleet management office is taking several steps to begin replacing its delivery fleet, including:

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<sup>9</sup>More than half of all routes are less than 20 miles, according to USPS officials.

<sup>10</sup>As of September 2022, the fleet includes 133,000 vehicles purchased from 1987-1994 and 20,000 vehicles purchased from 2000-2001, according to USPS officials. The fleet also includes commercial vehicles.

<sup>11</sup>For some routes, USPS carriers use their personally owned vehicles. This report focuses on the USPS-owned delivery vehicles.

<sup>12</sup>According to USPS officials, commercial vehicles generally have limited cargo capacity and do not meet USPS ergonomic and operational requirements on the majority of USPS routes.

### U.S. Postal Service's Next Generation Delivery Vehicle



Source: GAO. | GAO-23-106677

U.S. Postal Service designed the next generation vehicle with various safety, operating, and ergonomic features. The vehicle includes a large front windshield and side windows, a driver air bag, a monitor on the dashboard that shows the vehicle's surroundings using a 360-degree camera, and front and rear collision warning sensors with automatic braking. The vehicle also has a large standing cargo area with a rear roll-up door and a curbside cargo door, adjustable cargo shelving and mail tray next to the driver in the cab, air conditioning, and an adjustable driver seat to accommodate different carrier heights delivering mail curbside from the cab.

Source: U.S. Postal Service information. | 106677

- Developing cost estimates.** USPS created a total cost of ownership estimate for the next generation vehicle in 2018. USPS updated the cost estimate in 2021 and 2022. The cost-of-ownership estimates identified the initial acquisition cost and the expected continuing operating costs, and included infrastructure costs associated with each electric vehicle.
- Designing a purchasing model.** USPS used data from the total cost-of-ownership estimate to create a purchasing model in 2018. The model compares vehicle service-life data, costs, and benefits to identify whether a gas or electric vehicle is optimal for each delivery route. The model assesses different costs including acquisition, fuel, and maintenance costs and calculates a vehicle's daily cost. The model applies operational requirements based on each route, and these requirements can limit which vehicle can be selected for a delivery route. For example, USPS established an operational requirement that the driving range of the next generation electric vehicle be 70 miles on a full battery charge. Thus, if a route is longer than 70 miles, the model excludes an electric vehicle from selection for that route.

The model conducts these analyses for all delivery routes and generates an output of a recommended vehicle mix if the entire vehicle fleet were replaced in a specific year of the model's analysis. In 2022, USPS updated assumptions in the model to account for various changes in costs and vehicle performance, including changes in energy prices and lessons learned from USPS's internal analyses and fuel efficiency tests performed by Oshkosh Defense. USPS uses the model's results to inform its decision on the mix of vehicles to order and its request for capital.<sup>13</sup>
- Determining the vehicles to order.** Under the terms of the contract with Oshkosh Defense, USPS may order 50,000 to 165,000 next generation vehicles. USPS ordered 50,000 vehicles from Oshkosh Defense in March 2022.<sup>14</sup> In December 2022, USPS announced that it anticipates increasing the order to 60,000 vehicles and purchasing 21,000 electric delivery vehicles on the commercial market through

<sup>13</sup>In addition to the model's results, USPS uses other factors to determine USPS's vehicle order.

<sup>14</sup>USPS has stated that any additional purchase would be subject to future supplemental Environmental Impact Statements through the National Environmental Policy Act of 1969 (NEPA) procedures. NEPA requires agencies to consider the environmental impact of their proposed major actions and inform the public about their decision making. 42 U.S.C. § 4332(2)(C) Our review of USPS's decision-making process did not include the National Environmental Policy Act process.

2028. USPS officials said that they plan to monitor the need for additional vehicle orders as technology evolves, the market changes, and the availability of commercial electric delivery vehicles increases.

- **Receiving approval from USPS management for orders.** For a vehicle order to be placed, USPS management—including senior executives from an internal review committee and the Postmaster General—must approve the quantity of vehicles, and the necessary amount of capital to support the purchase decision and associated expenses. To document this approval, USPS uses a required decision analysis report to describe various aspects of the project, including the project’s business case, projected costs, requested capital and expected expenses, and vehicle quantity. Before submitting the initial order for 50,000 vehicles in 2022, USPS management reviewed and approved the analysis report, which included the recommended vehicle quantity and percentage of gas and electric vehicles to purchase.
- **Preparing for the vehicles’ production.** USPS funded the initial design and pre-production costs associated with the next generation vehicle. These included the cost of building initial test vehicles and the equipment needed to build the vehicles. USPS also worked with Oshkosh Defense to perform technical reviews of test vehicles, according to USPS officials.
- **Planning for the vehicles’ deployment.** Officials said they will receive the vehicles from Oshkosh Defense in increments through 2027, with the first vehicles expected in late 2023. To prepare for vehicles, USPS created a deployment model that analyzes which USPS routes could be used for electric delivery vehicles.<sup>15</sup> According to USPS officials, this model allows USPS to assess regional cost differences of using gas or electric vehicles, and score and rank locations that are most suitable for electric vehicles. USPS is planning to aggregate its nationwide operations to make delivery routes more efficient, a step that will affect the number of gas and electric vehicles USPS decides to purchase.<sup>16</sup>

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<sup>15</sup>For the purpose of this report, we did not review the deployment model methodology or results.

<sup>16</sup>USPS officials did not specify when the network changes would be completed.

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## Challenges and Benefits of Electric Vehicles

In December 2021, the Biden Administration issued an Executive Order calling for all federal vehicle acquisitions to be zero-emission by 2035, including 100 percent zero-emission light-duty vehicle acquisitions by 2027.<sup>17</sup> While this Executive Order does not apply to USPS, inclusion of electric vehicles in USPS's first order of next generation vehicles is consistent with the broader efforts of federal agencies to acquire electric vehicles and explore other alternative fuels.

Package delivery companies have announced commitments to update their delivery fleets to electric and other alternative fuel vehicles. Amazon plans to deploy 100,000 electric delivery vehicles across the U.S. by 2030. FedEx Express plans to increase the number of electric delivery vehicles in its fleet and to purchase only electric pickup and delivery vehicles by 2030. UPS has committed to purchasing up to 10,000 electric delivery vehicles. In addition, Deutsche Post–DHL Group, through its subsidiary DHL Express, has been operating electric vehicles in the U.S. for more than a decade and plans to increase its use of electric delivery vehicles to 80,000 globally by 2030.

Electric vehicles present both challenges and benefits to the government agencies and private companies taking steps to add them to their fleets.

- **Challenges.** Gas vehicles are more widely available than electric vehicles. However, our previous work found that the availability of electric vehicles options for all vehicle sizes is expected to increase in the next few years.<sup>18</sup> From a cost perspective, electric vehicles have higher up-front acquisition and unique infrastructure costs compared to gas vehicles. This cost includes the cost of installing charging stations. Such costs can include site preparation, electrical upgrades, and installing hardware and software.<sup>19</sup> In addition, the International Energy Agency reported in 2022 that costs for raw materials and minerals used to manufacture the batteries for electric vehicles have increased since 2021. This increase presents a challenge to the

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<sup>17</sup>Exec. Order No. 14057, §§ 102(ii), 204, 86 Fed. Reg. 70935 (Dec. 8, 2021).

<sup>18</sup>GAO, *Federal Vehicle Fleets: Observations on the Transition to Electric Vehicles*, [GAO-23-105635](#), (Washington, D.C.: Oct. 20, 2022).

<sup>19</sup>[GAO-23-105635](#).

electric vehicle industry.<sup>20</sup> A study by the Argonne National Laboratory also identified certain challenges for owning and operating electric vehicles.<sup>21</sup> For example, the study found that the costs of installing charging equipment could vary and that the time it takes to charge electric vehicles could be a challenge, depending on the equipment installed.

- **Benefits.** According to the Argonne study, electric vehicles have lower maintenance, repair, and energy costs than gas vehicles.<sup>22</sup> In addition, electric vehicles produce no tailpipe emissions and fewer pollutants than gas vehicles.<sup>23</sup> Replacing significant portions of USPS's delivery fleet with electric vehicles could generate substantial environmental benefits given the size of the fleet and nationwide scope of USPS's delivery network. Our prior work found government officials expect the overall price of electric vehicles to decline over time as production increases and manufacturing costs decrease. However, according to these officials, pricing may not decline as rapidly as anticipated prior to the global pandemic.<sup>24</sup>

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## USPS's Cost Estimates for Acquiring New Delivery Vehicles Followed Most Leading Practices but Did Not Conform to Those Related to Credibility

We assessed USPS's updated cost estimate as substantially meeting the *Cost Guide's* characteristics of comprehensive, well documented, and

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<sup>20</sup>International Energy Agency, *Global Supply Chains of EV Batteries* (July 2022)

<sup>21</sup>U.S. Department of Energy, Argonne National Laboratory, *Comprehensive Total Cost of Ownership Quantification for Vehicles with Different Size Classes and Powertrains*, ANL/ESD-21/4, (April 2021).

<sup>22</sup>ANL/ESD-21/4.

<sup>23</sup>USPS, *Final Environmental Impact Statement, Next Generation Delivery Vehicle Acquisitions*, (Washington, D.C.: December 2021).

<sup>24</sup>GAO. *Federal Vehicle Fleets: Observations on the Transition to Electric Vehicles*, [GAO-23-105635](#) (Washington, D.C.: Oct. 20, 2022).

accurate.<sup>25</sup> Thus, we found USPS to be conforming to most leading practices for a high-quality, reliable cost estimate. However, we found that USPS’s updated cost estimate did not substantially meet the characteristic of credible.<sup>26</sup> While USPS has taken some actions to develop a credible cost estimate, by not following leading practices for this characteristic, USPS cannot ensure a reliable cost estimate. For a summary of our assessment and examples of leading practices associated with each characteristic, see table 1.

**Table 1: Extent to which the U.S. Postal Service’s (USPS) Cost Estimates for the Next Generation Delivery Vehicle Met the Four Characteristics of a High-Quality, Reliable Cost Estimate**

Characteristic	Examples of a cost estimate reflecting leading practices	GAO Assessment
Comprehensive	<ul style="list-style-type: none"> <li>Includes all life-cycle costs</li> <li>Is based on a technical baseline description<sup>a</sup></li> <li>Documents cost-influencing ground rules and assumptions</li> <li>Is based on a product-oriented work breakdown structure<sup>b</sup></li> </ul>	Substantially Met
Well-documented	<ul style="list-style-type: none"> <li>Shows the source data used</li> <li>Describes step by step how the estimate was developed</li> <li>Discusses the technical baseline description</li> <li>Provides evidence that the cost estimate was reviewed and accepted</li> </ul>	Substantially Met
Accurate	<ul style="list-style-type: none"> <li>Properly adjusts inflation</li> <li>Is based on a historical record</li> <li>Uses the best methodology from the data collected</li> <li>Contains few, if any, minor mistakes</li> <li>Documents and explains variances</li> <li>Is updated regularly</li> </ul>	Substantially Met
Credible	<ul style="list-style-type: none"> <li>Includes a sensitivity analysis<sup>c</sup></li> <li>Includes a risk and uncertainty analysis<sup>d</sup></li> <li>Includes cross-checks<sup>e</sup></li> <li>Is compared to an independent estimate</li> </ul>	Partially Met

Source: GAO analysis of USPS documentation | GAO-23-106677

<sup>25</sup>GAO-20-195G. As outlined in the *Cost Guide*, we have found that a reliable cost estimate has four characteristics—comprehensive, well-documented, accurate, and credible. If the overall assessment ratings for each of the four characteristics are substantially or fully met, the estimate conformed to leading practices and therefore could be considered reliable. If any of the characteristics are not met, minimally met, or partially met, then the cost estimate does not fully conform to the leading practices and cannot be considered reliable. More information on the scoring ranges and how we conducted this assessment can be found in appendix I.

<sup>26</sup>We compared the cost-estimating practices USPS used for acquiring and operating the next generation delivery vehicle with leading practices associated with each characteristic.

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Note: The four characteristics of a high-quality, reliable cost estimate are found in GAO's *Cost Estimating and Assessment Guide*.

<sup>a</sup>A technical baseline description is a document or set of documents that describe the program's or project's purpose, system, performance characteristics, and system configuration.

<sup>b</sup>A work breakdown structure is a framework for planning and assigning responsibility for work necessary to accomplish a program's objectives. It deconstructs a program's end product into smaller specific elements that are suitable for management control.

<sup>c</sup>A sensitivity analysis is an examination of the effect on program cost of changing one assumption or cost driver at a time while holding all other variables constant.

<sup>d</sup>A risk and uncertainty analysis uses statistical techniques to predict the probability of successfully executing a program within its budget by capturing the cumulative effect of program risks and uncertainty.

<sup>e</sup>Cross-checks—or alternative methodologies—on major cost elements are performed to validate results.

Our analysis found USPS's estimates did not fully incorporate several leading practices associated with the credible characteristic, which resulted in our assessment of partially met for that characteristic.

**Sensitivity analysis.** A credible cost estimate should include a sensitivity analysis that examines the effect on the program of changing one assumption or cost driver at a time, while holding all other variables constant. Our analysis found USPS's documentation did not include an assessment of how different assumptions affected the underlying cost estimate for the next generation delivery vehicle program. USPS officials said they used their purchasing model to conduct a sensitivity analysis that analyzed variables to determine which vehicles to acquire for the delivery fleet. The officials said they also used information from the Argonne National Laboratory study, which includes a sensitivity analysis, on the total cost of ownership for vehicles with different size classes and powertrains to inform the cost estimate. However, we could not trace how the costs in the purchasing model related specifically to the next generation delivery vehicle program's cost estimate. An agency that does not conduct a sensitivity analysis to identify the effect of uncertainties associated with different assumptions risks making decisions without a clear understanding of these impacts on costs.

**Risk and uncertainty analysis.** A credible cost estimate should include a risk and uncertainty analysis that quantifies the probability of successfully executing a program within its budget. USPS officials said they hold weekly meetings with internal stakeholders and a monthly meeting with Oshkosh Defense to identify risks. USPS also provided information on schedule risks. However, we found USPS did not conduct a risk and uncertainty assessment as defined in the *Cost Guide*. For example, the documentation USPS provided did not include information on technical or cost risks. In addition, USPS did not identify probability

distributions, address the correlation between cost elements, or use a modeling technique to develop a distribution of total possible costs, all of which are important elements of a risk and uncertainty analysis. Without a risk and uncertainty analysis, the cost estimate will not reflect the degree of uncertainty, and the agency cannot provide a level of confidence about the estimate.

**Cross-checks.** A credible cost estimate's major cost elements should be cross-checked to see if results are similar. A cross-check is an alternative methodology that the agency uses to validate estimates of the program's major cost elements. USPS provided several examples of alternative costs by comparing vendor quotes. For example, USPS collected market data to obtain an analogous range of potential costs for electric charging installation and provided documentation that reflected the use of cross-checks for these costs. USPS also conducted a comparison between the next generation delivery vehicle and a similar vehicle being built for Canada Post. In addition, officials stated that USPS used a financial analysis completed by another USPS office outside the acquisition program to assist in validating its capital request for the March 2022 order. However, our analysis found USPS did not use alternative estimating methodologies to conduct cross-checks of the estimate. Alternative estimating methodologies should be used for all major cost drivers in the cost estimate. Without cross-checks, stakeholders will have no assurance that alternative estimating methodologies produce similar results.

**Independent cost estimate.** A credible cost estimate should be compared to an independent cost estimate conducted by a group outside the acquiring organization to determine whether other estimating methods produce similar results. USPS identified its infrastructure analysis for electric vehicles, which summarized vendor quotes for different charger designs and installation costs, as an example of an independent cost estimate. However, the analysis only covered infrastructure installation and did not encompass the total cost of the next generation delivery vehicle. Additionally, USPS officials said they relied on preliminary research estimates and experience, as well as the competitive bidding process to develop effective cost estimates. Officials said their use of a financial analysis completed by another USPS office to help validate the capital request should qualify as an independent cost estimate. However, we found USPS's use of this analysis did not meet most of the qualifications of an independent cost estimate discussed in the *Cost Guide*, such as having the independent cost estimate for the entire life cycle of the program. Without an independent cost estimate, decision



makers will lack insight into a program's potential costs because independent cost estimates frequently use different methods and are less burdened with organizational bias.

USPS officials said they are not subject to the *Cost Guide* and instead follow USPS investment policies that reflect what the competitive market can bear rather than estimates.<sup>27</sup> However, we believe the *Cost Guide* is relevant, as it reflects leading practices that federal cost-estimating organizations, the public sector, and industry use to develop and maintain reliable cost estimates throughout the life of a government program. Applying leading practices from our cost-estimating guide, including those to enhance the credibility of USPS's estimates, does not preclude the use of other approaches, such as USPS's own investment policies, and can strengthen or supplement those approaches. By implementing the leading practices in the *Cost Guide*, USPS can enhance the credibility of its estimates, which can in turn help USPS to more effectively manage the costs of acquiring additional vehicles to update the delivery fleet.

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## Cost of Gas and Charging Infrastructure Are Key Factors That Affect the Mix of Gas and Electric Vehicles the USPS Model Recommends

We found that assumptions about two cost factors included in USPS's purchasing model—the price of gas and the cost of installing electric charging infrastructure—had the potential to considerably affect the model's recommendation of the number of gas and electric vehicles to purchase. Specifically, we found that changing the assumptions about the price of gas and the cost of installing charging infrastructure considerably affected results for an order placed in 2022. We describe these potential outcomes in further detail below.

As discussed earlier, USPS created its purchasing model to help determine the percentage of gas and electric vehicles to buy if the entire vehicle fleet were replaced in a particular year based on identifying the optimal vehicle for each route. The methodologies to determine costs and changes to these cost factors can affect the model's results. We

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<sup>27</sup>USPS, *Handbook F-66B, Investment Policies and Procedures — Major Equipment* (Washington, D.C.: November, 2019).

summarize selected methodologies and effects on the model's results in table 2.

**Table 2: Selected Examples of Cost Factors, Methodologies, and Effects on Results in U.S. Postal Service's (USPS) Purchasing Model for Next Generation Delivery Vehicles**

Cost factor	Methodology	Effect on model results
Acquisition	The model converts the vehicle's purchase price into a daily acquisition cost by spreading the cost across the maximum service life of the vehicle.	The acquisition cost is higher for the electric vehicle than for the gas vehicle, resulting in a higher daily cost for electric vehicles.
Electric charging equipment	The model spreads an \$18,000 estimated installation cost for charging equipment across the equipment's expected service life of 30 years. This cost assumes each vehicle would receive a dedicated charger. USPS based this cost on three projects in which it installed chargers at post offices from 2017 to 2018.	This cost is unique to electric vehicles, making gas vehicles a potentially lower-cost option depending on the route's length and fuel prices.
Fuel (gas or electricity)	The model calculates fuel cost by factoring in the miles driven to complete the route, a vehicle's fuel efficiency, and the national average price of gasoline or electricity. For each year of the analysis, the model adjusts the initial base price set in the model using energy price projections.	A route's length, vehicle fuel efficiency, and the price of fuel affect the model's results. For example, as the price of gasoline increases, the model selects more electric vehicles.
Maintenance	The model uses maintenance and ownership costs over the vehicle's expected service life to compute a daily maintenance cost.	USPS estimates electric vehicle maintenance will cost less than gas vehicles. However, the model's use of a longer expected service life for electric vehicles results in a similar maintenance cost per day for gas and electric vehicles.

Source: GAO analysis of USPS data. | GAO-23-106677

Note: We summarized these factors because each factor can have a different effect on the gas and electric vehicle option. USPS's model also included a labor cost that calculated the cost to complete a route based on the vehicle's cargo capacity. We did not include the labor cost in our analysis, as this cost is the same for the gas and electric vehicle option.

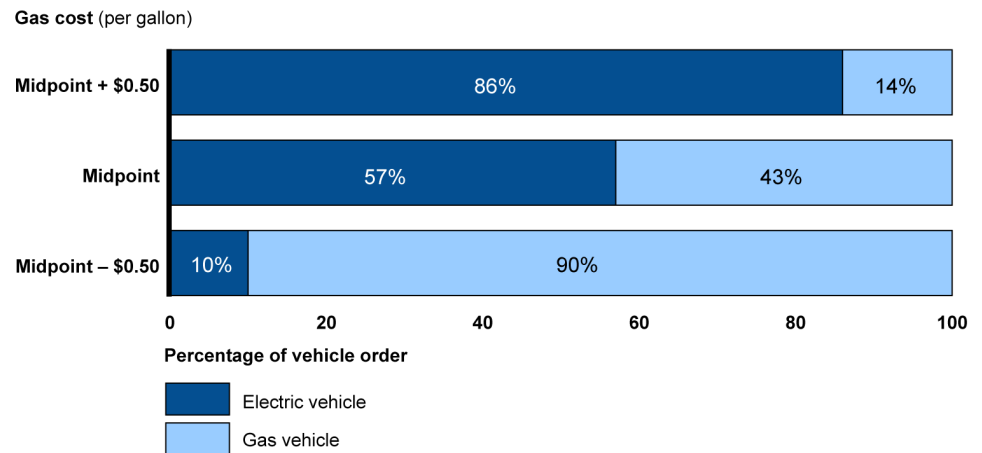
In our April 2022 testimony, we raised questions from preliminary observations about how the model estimated fuel efficiency and maintenance costs.<sup>28</sup> Details on the information USPS provided to respond to these questions can be found in appendix II.

**Price of gas.** Our analysis found that changing assumptions about the price of gas can considerably alter the model's recommended number of gas and electric vehicles to purchase. We tested the sensitivity of the price of gas on the model's results due to the significant increase in the price of gas that occurred between USPS's contract award in February 2021 and the initial vehicle order placed in March 2022. Our analysis found that testing a range of selected gas prices greatly affected the

<sup>28</sup>GAO. *Fleet Management: Preliminary Observations on Electric Vehicles in the Postal and Federal Fleets*, GAO-22-105931 (Washington, D.C.: April 5, 2022).

number of gas and electric vehicles the model recommended USPS purchase in 2022. Specifically, increasing the gas price by \$1.00 in our selected range of prices resulted in the model recommending that almost 90 percent of the delivery vehicles be electric, instead of 10 percent (see fig. 1).<sup>29</sup> As changes in fuel cost will likely result in meaningful changes in the model’s outcome, it is important for USPS to consider this sensitivity and monitor fuel costs as it evaluates the mix of gas and electric vehicles to purchase.

**Figure 1: Effect of a Range of Selected Gas Prices on the U.S. Postal Service Purchasing Model’s Recommendation for a 2022 Order of Next Generation Delivery Vehicles**



Source: GAO analysis of US Postal Service data. | GAO-23-106677

**Accessible Data for Figure 1: Effect of a Range of Selected Gas Prices on the U.S. Postal Service Purchasing Model’s Recommendation for a 2022 Order of Next Generation Delivery Vehicles**

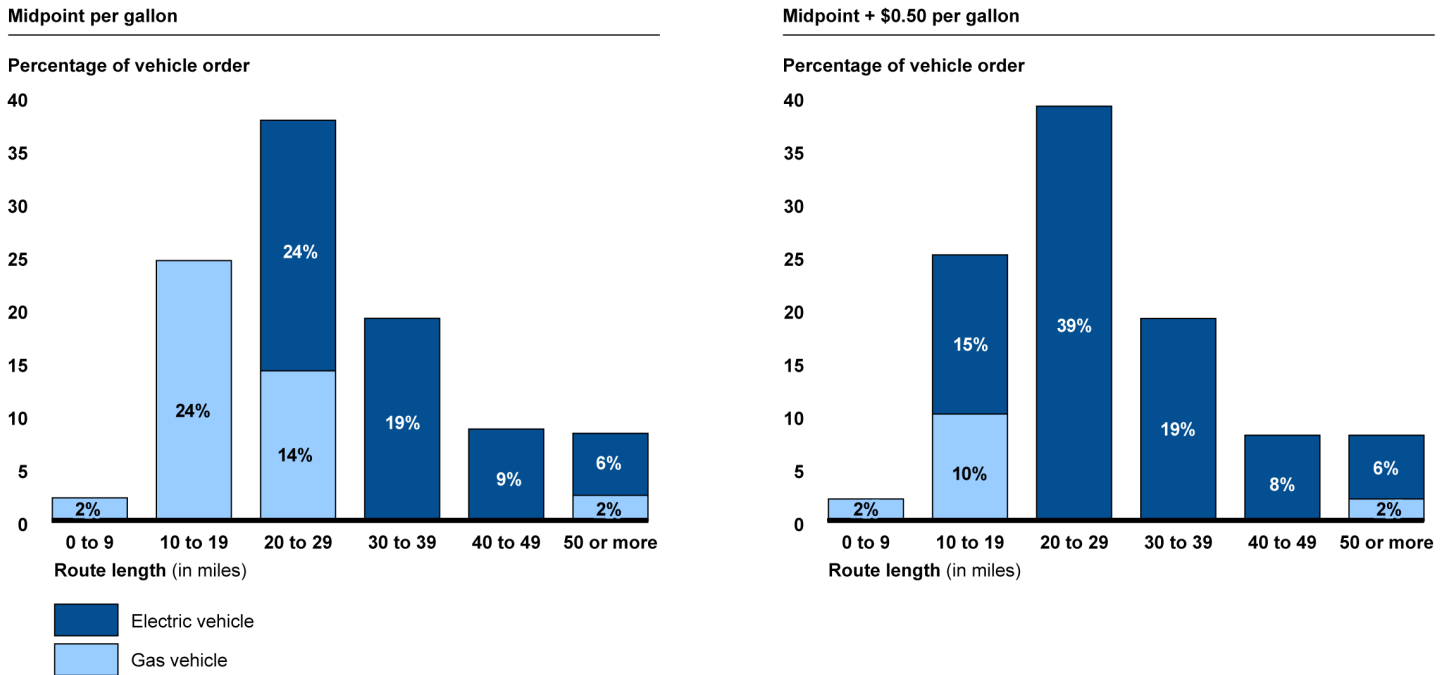
Gas cost (per gallon)	Percentage of vehicle order - Electric	Percentage of vehicle order - Gas
Midpoint + \$0.50	86	14
Midpoint	57	43
Midpoint - \$0.50	10	90

<sup>29</sup>In these tests, the model converts the selected gas prices using 2019 real dollars and gasoline index projections from U.S. Energy Information Administration (EIA).

Note: In these tests, the model converts the selected gas prices using 2019 real dollars and gasoline index projections from U.S. Energy Information Administration (EIA).

Our analysis also found that changing the price of gas affected the mix of gas and electric vehicles the model recommended for routes of different lengths. The median route length is about 20 miles.<sup>30</sup> With the price of gas set to \$.50 below our selected midpoint, the model selected nearly all gas vehicles on routes shorter than 40 miles. USPS officials said a selective deployment of electric vehicles on routes could be beneficial on longer routes with higher proportions of curbside deliveries. However, changing the price of gas to the midpoint and \$.50 above the midpoint per gallon resulted in the model selecting an increasing number of electric vehicles on shorter routes, including routes ranging from 10 to 29 miles (see fig. 2).

**Figure 2: Effect of Selected Gas Prices on U.S. Postal Service Purchasing Model’s Recommendation for 2022 Order of Next Generation Delivery Vehicles, by Route Length**



Source: GAO analysis of US Postal Service data. | GAO-23-106677

<sup>30</sup>We used USPS’s purchasing model to calculate the median route length for all routes. For this calculation, we excluded routes where carriers use their personal vehicles.

**Accessible Data for Figure 2: Effect of Selected Gas Prices on U.S. Postal Service Purchasing Model’s Recommendation for 2022 Order of Next Generation Delivery Vehicles, by Route Length**

Mile range	Midpoint per gallon, Percentage of vehicle order - Gas	Midpoint per gallon, Percentage of vehicle order - Electric
0 to 9	2	0
10 to 19	24	0
20 to 29	14	24
30 to 39	0	19
40 to 49	0	9
50 or more	2	6

Mile range	Midpoint + \$0.50 per gallon, Percentage of vehicle order - Gas	Midpoint + \$0.50 per gallon, Percentage of vehicle order - Electric
0 to 9	2	0
10 to 19	10	15
20 to 29	0	39
30 to 39	0	19
40 to 49	0	8
50 or more	2	6

Note: In these tests, the model converts the selected gas prices using 2019 real dollars and gasoline index projections from U.S. Energy Information Administration (EIA). In addition, the percentage sums for each electric and gas vehicle order for each test may not add up to exactly 100 percent due to rounded numbers.

**Charging installation costs.** Our analysis also found that changing assumptions about the cost of installing charging infrastructure for electric vehicles largely affected the mix of gas and electric vehicles the model recommended USPS order. With USPS’s estimated cost to install one charger per vehicle at \$18,000, the model recommended purchasing slightly more electric vehicles than gas vehicles in 2022.<sup>31</sup> As the installation cost of a charger increases to \$24,000 per vehicle, the model recommends a greater percentage of gas vehicles. As the installation cost of a charger decreases to \$12,000 per vehicle, the model recommends mostly electric vehicles.

<sup>31</sup>To conduct this analysis, we set the price of gas to the midpoint for our gas price sensitivity tests.

We tested the sensitivity of costs of installing charging infrastructure because this cost can vary. For example, delivery company officials we spoke with said the cost to install chargers could range from \$9,000 to \$26,000 per charger. In addition, USPS conducted three installation projects from 2017 to 2018 and found some variance in the cost of each charger. The projects included installing hardware and software, and the site preparation included permitting, electrical upgrades, and facility modifications.<sup>32</sup>

**Other factors.** USPS also considers other factors in its vehicle order decisions. For example, USPS considers factors such as regional cost differences for operating gas and electric vehicles and USPS's planned nationwide route consolidation. Another factor affecting USPS's vehicle order decision-making is the availability of funding resources. As previously discussed, the Inflation Reduction Act appropriated \$1.29 billion to USPS to purchase zero emission vehicles, including electric vehicles, and \$1.71 billion for the purchase, design, and installation of infrastructure to support the vehicles. USPS announced in December 2022 that it plans to use the \$3 billion appropriation as part of its broader effort to update its delivery vehicle fleet and intends to order 60,000 vehicles, including 45,000 electric vehicles. Additionally, the appropriation could assist USPS with the costs to install charging infrastructure. Applying the appropriation to lower the cost of charging infrastructure would improve the business case for USPS to purchase a greater percentage of electric vehicles. For example, as mentioned above, lowering the cost of charging infrastructure to \$12,000 results in the model recommending mostly electric vehicles.

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## USPS Did Not Clearly Explain the Basis for the Gas Price Assumption Used in Its Capital Request

We found that the analysis report USPS used to support its March 2022 vehicle capital request did not clearly explain how USPS updated the cost

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<sup>32</sup>Officials said these projects did not have transformer costs, which officials said would likely be an additional cost for many of USPS's anticipated charging infrastructure installations.

assumption for the price of gas.<sup>33</sup> As described earlier, USPS placed its initial order in March 2022 for 50,000 next generation delivery vehicles, which comprised approximately 80 percent gas and 20 percent electric vehicles. To inform its decision about the mix of gas and electric vehicles to order, USPS developed an analysis report in February 2022 that requested approval from management for the funds to purchase the vehicles. Senior executives from an internal review committee and the Postmaster General completed their review and approval of the report in February and March 2022.

The analysis report contained program information that included a description of the business case, updates made to cost assumptions, and the reasons for making the updates. This analysis report was a revised version of a 2021 report that had requested approval to purchase some vehicles, of which 90 percent were gas and 10 percent electric.

USPS policy requires analysis reports to adequately explain why a project should be approved and funded.<sup>34</sup> If the project changes or USPS identifies a need to adjust the requested capital for the project, USPS is required to create a revised analysis report that updates cost assumptions and documents the reasons for the changes. In addition, USPS policy requires management to validate the analysis report in order to provide assurance that the information in the report is reasonable, accurate, logical, valid, and auditable.

We found that the analysis report USPS used to support its capital request for the March 2022 order did not clearly explain the methodology USPS used to update the cost assumption about the price of gas.<sup>35</sup> Specifically, USPS updated the price of gas in the report to \$2.71. The report documented that USPS changed the cost assumption by, among other things, using updated historical data from the U.S. Energy Information Administration (EIA). However, the analysis report did not state the methodology used to calculate \$2.71. We found that USPS

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<sup>33</sup>We reviewed USPS's decision analysis report developed to support its decision to place a vehicle order in March 2022. Our analysis did not include USPS's decision in June 2022 to re-evaluate how many electric vehicles it would purchase within the initial order.

<sup>34</sup>USPS, *Handbook F-66B, Investment Policies and Procedures — Major Equipment* (Washington, D.C.: November 2019).

<sup>35</sup>USPS updated the assumptions because many of them were developed during the previous analysis report.

based this cost assumption on a fiscal year average using earlier EIA data.<sup>36</sup> Further, while the report stated that the cost assumptions reflected the current market conditions as of March 2022 and updated actual prices, it did not disclose that the price of gas methodology excluded the increase in the national average price of gas from \$3.19 in October 2021 to \$4.24 in March 2022, according to EIA data.

As noted above, USPS policy requires management to validate the analysis report in order to provide assurance that the information in the report is reasonable, accurate, logical, valid, and auditable. In addition, COSO internal control principles state that an organization should generate and use relevant, quality information to support the functioning of internal control. Specifically, these principles state that an organization's information should be verifiable, among other factors.<sup>37</sup> USPS's March 2022 analysis report clearly explained the basis for the changes to certain original cost assumptions but not for the price of gas. USPS found that changes in assumptions affected the overall costs for the gas vehicle, which affected the per-unit cost and quantity USPS intended to purchase in the initial order. USPS updated the vehicle acquisition cost factor and cited a specific increase in the per-vehicle cost due to vehicle design adjustments and a reduction in the number of vehicles purchased. However, the report did not provide a similar explanation for the basis for the change to the gas price. USPS officials said their approach for updating the methodology was based on using the same methodology USPS used in the original analysis report. They also said that the details of the calculation were contained in additional supporting documentation.

Without clearly explaining in the analysis report that the methodology used an average of fiscal year data to determine the price of gas cost assumption, decision makers could not determine whether the information provided was reasonable, accurate, and valid as of March 2022. We have previously found that a lack of transparency about the methodology an agency uses in a process can raise concerns regarding the transparency and objectivity of the entire process and jeopardize its purpose.<sup>38</sup> Clearly

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<sup>36</sup>The officials also said they used EIA projections for the remainder of the year when selecting \$2.71 for the price of gas.

<sup>37</sup>*COSO Internal Control – Integrated Framework (2013)*.

<sup>38</sup>GAO, *Federal Courthouse Construction: Judiciary Should Refine Its Methods for Determining Which Projects are Most Urgent*, [GAO-22-104034](#) (Washington, D.C.: January 2022).



explaining how changes were made to key cost assumptions in its analysis reports can not only provide the information decision makers need to validate that the recommendations on the number and mix of vehicles to purchase are reasonable and accurate, but also help ensure the objectivity of the decision process.

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## USPS Has Identified and Acted to Address Several Production and Deployment Risks, but Faces Challenges as It Plans Charging Infrastructure Installation

As part of its program management activities, USPS has assessed several risks in the production and deployment of next generation delivery vehicles that could result in delays to its schedule. USPS assessed these risks using an internal risk assessment process in 2021 and through ongoing meetings with suppliers. Also, as part of these assessments, USPS identified actions to address these risks.<sup>39</sup> For example, to address the risk of not having enough charging stations in place once vehicles have been produced, USPS adjusted its deployment schedule to install charging stations more quickly.

**Production schedule risks.** USPS officials told us they continue to address production risks through meetings with internal stakeholders as well as suppliers. USPS officials told us they track the progress of suppliers toward meeting milestones and review and approve changes to the vehicle's design, among other things. USPS officials also told us they hold monthly meetings with Oshkosh Defense to update and address its list of identified risks.

**Electric vehicle deployment risks.** USPS developed an initial plan in early 2022 to address deployment risks. As previously mentioned, USPS

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<sup>39</sup>USPS conducted this risk assessment of its production schedule to address a recommendation from the USPS Office of Inspector General (OIG). The OIG issued a report that found USPS needed to evaluate the risk of next generation delivery vehicle program delays and determine whether a modification to the acquisition strategy was warranted. See U.S. Postal Service, Office of Inspector General, *Audit Report: Delivery Vehicle Acquisition Strategy*, Report Number 19-002-R20 (Washington, D.C.: August 2020).

also uses its deployment model to identify potential postal facility locations for electric vehicles.

However, USPS officials acknowledge that USPS faces risks in deploying the necessary charging equipment and number of electric vehicles as officials continue to make decisions that could fundamentally change USPS's network of facilities and routes. Specifically, USPS's ongoing efforts to consolidate facilities and delivery routes nationwide, coupled with its December 2022 announcement that USPS plans to change the number and type of delivery vehicles it plans to purchase, introduces new challenges to implementing its infrastructure plan and may limit USPS's ability to quickly finalize its deployment plans for electric vehicles. USPS officials told us that they recognize and will continue to re-assess these risks.

In addition to the risks USPS acknowledged, delivery company representatives we spoke with described additional complex challenges organizations are likely to face in planning the installation of charging infrastructure. These challenges included:

- **Coordination with utility companies.** Representatives said they have to coordinate with many utility companies, not all of which have the resources to quickly bring additional electricity to the site. This coordination can add significant lead times to an installation project. Representatives from one company said planning and installing electric charging infrastructure can take on average 18 to 36 months, but in some cases longer. A representative from another company stated these delays were so significant that officials decided not to purchase any additional vehicles until after charging infrastructure was in place.
- **Differences in grid capacity.** Representatives from two companies cited the need to plan for different capacities. Officials from one company cited concerns regarding the potential limits of the electric grid in rural areas. Officials from another company said a significant conversion to electric vehicles cannot take place until there is an increase in electric power generation and grid capacity.
- **Electrical outages.** Representatives said delivery companies need to account for the possibility of electrical outages and emergencies, including natural disasters, adding to the challenge of planning and installing charging stations.

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## Conclusions

With delivery routes spanning the country, it is critical that USPS have safe and efficient vehicles to deliver mail. USPS has taken several steps to update its aging delivery fleet, including estimating the cost of acquiring and owning new vehicles. We found that USPS is following most leading practices associated with developing a high-quality, reliable cost estimate. USPS has processes to help ensure that its cost estimates are comprehensive, well documented, and accurate. However, USPS is not following leading practices related to credibility. Incorporating such practices into its processes could help USPS more effectively manage the cost of acquiring vehicles.

USPS's efforts to update its delivery fleet have also included assessing the lowest-cost vehicle for each of its routes, and determining the overall percentage of gas and electric vehicles to purchase. In doing so, USPS has considered several factors, including the price of gas, which can substantially affect the projected cost of operating a gas vehicle. By clearly explaining changes about cost assumptions in capital requests, USPS can ensure managers are positioned to validate that each cost assumption is reasonable, accurate, and valid. With this information, decision makers would be able to make an informed decision about the proposed mix of gas and electric vehicles to purchase. Moreover, explaining in its analysis reports the reason for changes in cost assumptions and important methodological details can also provide assurance to decision makers that the recommended vehicle order represents an objective process to identify the optimal number and mix of vehicles to purchase.

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## Recommendations for Executive Action

We are making the following two recommendations to USPS:

The Director of Fleet Management should incorporate leading practices from GAO's *Cost Guide* into future updates of USPS's cost estimates for acquiring new delivery vehicles. These leading practices include conducting a sensitivity analysis, a risk and uncertainty analysis, cross-checks, and an independent cost estimate. (Recommendation 1)

The Director of Fleet Management should clearly explain the changes to cost assumptions, including reasons for the change and important

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methodological details used, in decision analysis reports requesting capital for vehicle orders placed in USPS's vehicle acquisition programs. (Recommendation 2)

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## Agency Comments and our Evaluation

We provided a draft of this report to USPS for review and comment. In its comments, emailed by the Executive Director of the NGDV Program, USPS did not concur with our first recommendation to incorporate leading practices from GAO's *Cost Guide* into future updates of USPS's cost estimates for acquiring new delivery vehicles, and concurred with our second recommendation to explain changes to cost assumptions in decision analysis reports.

With regard to our first recommendation, USPS reiterated its position that it has its own financial policies and procedures that it will continue to follow. USPS stated that GAO's *Cost Guide* is intended for major systems and that the purchase of a commercial product such as vehicles does not constitute a major system. However, USPS noted in its comments that it will review GAO's *Cost Guide* to determine whether incorporating key elements into its policies and procedures would be beneficial.

While we recognize that USPS has its own financial policies and procedures, we maintain that USPS would benefit from incorporating leading practices from the *Cost Guide* into future updates of cost estimates for delivery vehicles. We also maintain that the *Cost Guide* is relevant, as it reflects leading practices that federal cost-estimating organizations, the public sector, and industry use to develop and maintain reliable cost estimates throughout the life of a government program. The best practices in the *Cost Guide* are intended for use in any acquisition, such as the acquisition of delivery vehicles. We acknowledge USPS's willingness to review the *Cost Guide* and believe that the best practices in the *Cost Guide* are both relevant and useful to USPS's acquisition of delivery vehicles.

In its comments, USPS concurred with our recommendation to clearly explain the changes in cost assumptions in decision analysis reports requesting capital for vehicle orders. However, USPS stated that the agency has already met these criteria in the analysis report, as a table in the analysis report showed which fiscal year was used to determine the price of gas. USPS also stated that a footnote in the table stated that the assumptions were explained in a worksheet attached to the report, and

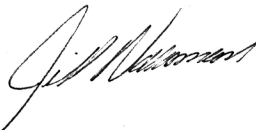
that worksheet included a reference to a third document which contained the EIA data that USPS used to compute the average fuel cost.

We maintain that stating in the report that the price of gas was an average that did not include the recent increase in the national price of gas at the time the report was approved would provide the information decision makers need to validate that the recommended actions are reasonable and accurate.

USPS also provided technical comments, which we incorporated as appropriate.

We are sending copies of this report to appropriate congressional committees, the Postmaster General, and other interested parties. In addition, the report is available at no charge on the GAO website at <http://www.gao.gov>.

If you or your staff members have any questions about this report, please contact me at (202) 512-2834 or [naamanej@gao.gov](mailto:naamanej@gao.gov). Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made key contributions to this report are listed in appendix III.



Jill Naamane, Director  
Physical Infrastructure Issues

## Appendix I: Objectives, Scope, and Methodology

GAO was asked to review USPS's efforts to acquire electric delivery vehicles. In this report, GAO assessed: (1) the extent to which USPS's updated cost estimate for acquiring the next generation delivery vehicles reflected leading practices; (2) the key factors that affect the purchasing model's recommended percentage of gas and electric vehicles; (3) the extent to which USPS clearly explained the basis for its initial purchasing decision; and (4) key risks USPS identified for the next generation delivery vehicle program, and actions USPS has taken to address those risks.

To assess the extent to which USPS's updated cost estimate for acquiring the next generation delivery vehicles reflected leading practices of a high-quality, reliable cost estimate, we compared USPS's cost estimating methodologies with the characteristics and leading practices for developing a reliable cost estimate identified in GAO's *Cost Estimating and Assessment Guide*.<sup>1</sup> As outlined in the *Cost Guide*, we have found that a reliable cost estimate has four characteristics—comprehensive, well documented, accurate, and credible. In performing our assessment, we determined an overall assessment rating for each of the four characteristics.

To determine an overall assessment rating for each characteristic, we assigned a rating to each individual leading practice within each characteristic using the following scale: Not Met = 1, Minimally Met = 2, Partially Met = 3, Substantially Met = 4, and Met = 5. Then, we took the average of the individual assessment ratings within each characteristic to determine the overall rating for each of the four characteristics. The resulting average becomes the Overall Assessment Score for each characteristic to include: Not Met = 1.0 to 1.4, Minimally Met = 1.5 to 2.4, Partially Met = 2.5 to 3.4, Substantially Met = 3.5 to 4.4, and Met = 4.5 to 5.0. If the overall assessment ratings for each of the four characteristics are substantially or fully met, the estimate conformed to leading practices and therefore could be considered reliable. If any of the characteristics are not met, minimally met, or partially met, then the cost estimate does

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<sup>1</sup>GAO, *Cost Estimating and Assessment Guide*, [GAO-20-195G](#) (Washington, D.C.: March 2020).

not fully conform to the leading practices and cannot be considered reliable.

We shared our *Cost Guide*, the criteria against which we evaluated the program's cost estimates, as well as our preliminary findings with USPS officials. We then discussed our preliminary assessment results with USPS officials. USPS officials provided additional documentation and clarification on USPS methodologies. When warranted, we updated our analyses based on USPS responses and the additional information provided. To assess the reliability of the cost estimate data that we used to support findings in this report, we reviewed relevant program documentation, such as cost estimating models, as available, to substantiate evidence obtained from interviews with USPS officials.

To assess what key factors affect the purchasing model's recommended percentage of gas and electric next generation delivery vehicles USPS should order, we analyzed USPS documentation on the purchasing model's inputs and parameters. We obtained and analyzed the purchasing model including its methodology and ways the model's total cost of ownership formulas could affect the model's results. We identified each of the costs in the model and how the formulas calculated the total daily cost to operate a vehicle. We also identified the model's use of exclusion rules to limit which vehicles are selected as optimal for each route. We interviewed USPS officials to understand the model's purpose, methodology, and updates USPS made to the model since its creation.

To test the sensitivity of the cost factors on the model's recommended mix of gas and electric next generation delivery vehicles, three GAO staff independently tested the model's results using a range of cost assumptions for certain factors. For each model test, we analyzed two cost factors from the model's cost formulas—the price of gasoline and the cost of installing electric vehicle charging equipment. We selected these factors due to the significant increase in the price of gas that occurred between USPS's contract award in February 2021 and the initial vehicle order placed in March 2022, and USPS data that showed charging installation costs can vary.<sup>2</sup> In addition, these factors were not fixed in the model. We excluded from our selection other cost factors in the model, such as up-front acquisition and maintenance costs, fuel efficiency, and the price of electricity because these costs are either fixed in the model,

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<sup>2</sup>Regarding the price of electricity, we did not test the sensitivity of the assumption as the average price of electricity has not fluctuated as much as the average price of gas.

were refreshed by USPS based on recent testing data, or had not fluctuated widely.

The range of assumptions we used in the analyses were based on Energy Information Administration gas price projections and USPS infrastructure pilot projects to install charging equipment. We ensured our tests followed the same approach that USPS took when using the model. To demonstrate the impact of changes on these cost factors, we held other factors constant.<sup>3</sup> We also analyzed the results from the price of gas tests and identified how the recommended mix of gas and electric vehicles changed based on a route's length.

When reviewing a draft of this report, USPS officials pointed to limitations of setting gas prices to reflect prices at the top of our selected range. Specifically, USPS officials said increasing the gas price creates elevated prices for the model's analysis over a 30-year period, which USPS officials said were well above EIA forecasted data. USPS officials told us the purpose of the purchasing model is to assist USPS in identifying over a 30-year analysis period the optimal mix of vehicles to purchase specifically for the year in which USPS decides to place an order. Therefore, to highlight how gas prices and the cost of installing electric vehicle charging equipment affected the model's 2022 results, our analysis shows the model's recommendations only for the year 2022 because USPS placed its first vehicle order in that year.

To assess the extent to which USPS clearly explained the basis for its initial purchasing decision, we reviewed USPS's *Handbook F-66 General Investment Policies and Procedures and Handbook F-66B, Investment Policies and Procedures — Major Equipment* to identify the policies and requirements for USPS when developing decision analysis reports and any modifications to those reports. We reviewed the decision analysis report and other documentation that USPS created to support the capital approval process related to the initial purchasing decision in March 2022. We compared the contents of the decision analysis report with policies in USPS's *Handbook F-66B*, and with the principles of the Committee of Sponsoring Organizations of the Treadway Commission Internal Control-

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<sup>3</sup>Our analysis did not examine the sensitivity of costs on the model's recommendation regarding other vehicles considered in the model.



Integrated Framework (COSO Framework).<sup>4</sup> We did not examine the extent to which any modification to the March 2022 order met these criteria, as USPS officials told us that the reevaluation of the mix for the first order was ongoing and that capital approval documentation had not yet been created at the time of this review.

To describe what risks USPS identified for the next generation delivery vehicle program, and actions USPS has taken to address those risks, we reviewed documents and interviewed USPS officials related to USPS's approach to identifying, assessing, and managing production and deployment risks. Specifically, we obtained information about USPS's work to identify, assess, and address production and deployment risks, including USPS's initial assessment of the likelihood and impact of individual production and deployment risks. This documentation, provided by USPS, also included descriptions of proposed steps by USPS working with suppliers to address these risks. Also, we interviewed USPS officials about the process USPS used to identify and assess these risks and steps they have taken or planned to take to address both production and deployment risks, including the deployment of electric vehicle charging infrastructure. In addition, to identify challenges that USPS is likely to face as part of deploying electric vehicles, we interviewed representatives from Amazon, DHL, FedEx, and UPS about this topic. We selected these package delivery companies to interview based on their fleet size and plans to deploy electric delivery vehicles.

We conducted this performance audit from September 2021 to April 2023 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

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<sup>4</sup>The COSO Framework is recognized as a leading framework for designing, implementing, and conducting internal control and assessing the effectiveness of internal control. It provides a means to apply internal control to any type of entity and requirements for an effective system of internal control. We have applied the COSO Framework in evaluating USPS's operational internal controls in recent reports and the USPS Office of Inspector General (OIG) has done so as well.

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## Appendix II: Updates to GAO's Preliminary Analysis

We testified in April 2022 that our preliminary analysis of the model's methodology raised questions about the ways the model estimates the costs and benefits of the gas and electric next generation delivery vehicle.<sup>1</sup> USPS provided additional documentation to respond to these questions. Specifically, we testified that USPS's assumption for fuel efficiency used a gas mileage assumption that did not reflect the use of air conditioning. USPS provided documentation that demonstrated the updated model also uses a revised fuel efficiency assumption that reflects contractor data from fuel efficiency performance tests. We also testified that USPS's assumption for maintenance costs appeared to show electric vehicles as having a higher maintenance cost per mile than gas vehicles. USPS provided additional documentation that showed USPS determines maintenance costs over the expected service life of the vehicle. While USPS estimates electric vehicle maintenance will cost less than gas vehicles on an annual basis, the model's average process for electric vehicles with a longer service life results in similar maintenance cost per mile for gas and electric vehicles.

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<sup>1</sup>GAO. *Fleet Management: Preliminary Observations on Electric Vehicles in the Postal and Federal Fleets*, [GAO-22-105931](#) (Washington, D.C.: Apr. 5, 2022).

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## Appendix III: GAO Contact and Staff Acknowledgments

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### GAO Contact

Jill Naamane, (202) 512-2834 or [naamanej@gao.gov](mailto:naamanej@gao.gov)

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### Staff Acknowledgments

In addition to the individual named above, the following staff made key contributions to this report: John W. Shumann (Assistant Director), Michael Sweet (Analyst-in-Charge), and Todd Schartung. Also contributing to this report were Jennifer Echard, Anna Irvine, Jennifer Leotta, Joshua Ormond, Michael Soressi, Janet Temko-Blinder, Laurel Voloder, Jack Wang, Alicia Wilson, and Elizabeth Wood.

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## GAO's Mission

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