



January 2024

# COMMUTER RAIL

## Agencies' Estimates of Operations and Maintenance Costs for Positive Train Control

Accessible Version

# GAO Highlights

Highlights of [GAO-24-106329](#), a report to congressional committees

## Why GAO Did This Study

Across the country, commuter rail brings people to work, school, medical appointments, and recreational activities. Commuter railroads are among the railroads required to implement PTC.

The Infrastructure Investment and Jobs Act includes a provision for GAO to examine commuter rail PTC O&M costs. This report describes (1) the challenges commuter rail agencies reported facing in determining their annual PTC O&M costs for fiscal years 2020–2025, and the extent to which they were able to estimate these costs; and (2) what commuter rail agencies estimated as their PTC O&M costs.

To obtain information on commuter rail agencies' PTC O&M costs, GAO surveyed all 29 public commuter rail agencies required to implement PTC, and 26 responded. Survey questions related to the challenges agencies face trying to estimate PTC costs as well as questions about agencies' existing PTC cost estimates. GAO checked survey responses for reporting errors and conducted follow-up with commuter rail agencies based on their survey responses. GAO developed descriptive statistics for the ranges of costs and compared the costs to the size of the agency and to its total O&M costs.

View [GAO-24-106329](#). For more information, contact Elizabeth Repko at (202) 512-2834 or [repkoe@gao.gov](mailto:repkoe@gao.gov).

January 2024

## COMMUTER RAIL

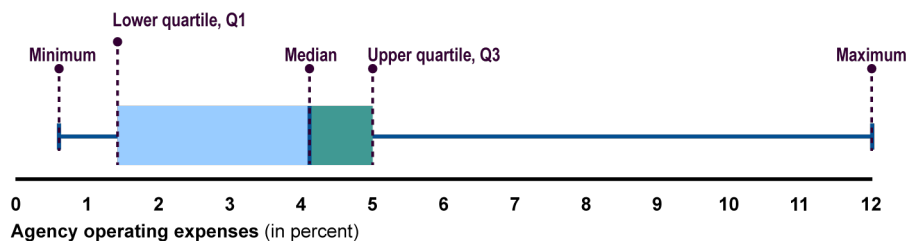
### Agencies' Estimates of Operations and Maintenance Costs for Positive Train Control

#### What GAO Found

Commuter railroads incur costs to implement and operate positive train control (PTC)—a system which can prevent collisions and other types of accidents. However, they are not required to report those costs separately from other operations and maintenance (O&M) costs. Most of the 26 commuter rail agencies that responded to GAO's survey reported that it was challenging to identify prior years' PTC O&M costs, because they are integrated into other O&M costs. Agencies reported that isolating PTC O&M costs is complicated, because (1) PTC technology is overlaid on existing systems and (2) employees' PTC O&M-related tasks are not tracked separately from other tasks, among other reasons. For example, 25 of the 26 commuter rail agencies reported their PTC systems were overlaid on other systems; 12 of these also reported that this made it extremely or very challenging to estimate PTC-specific O&M costs. Moreover, some commuter rail agencies said it can be challenging to project their future PTC O&M costs due to uncertainties such as the timing—and therefore cost—of certain software or hardware upgrades. Despite these challenges, 17 of the 26 agencies were able to provide GAO complete estimates or projections for fiscal years 2022 through 2025 by, for example, reviewing invoices for materials or discussing costs with their Information Technology specialists.

Of the 17 agencies that provided complete estimates, a majority spent 5 percent or less of their total operating costs on PTC O&M in fiscal year 2022. These 17 estimates ranged from less than 1 percent to 12 percent, with a median of about 4 percent (see fig.). In addition, the majority (15 of 17) projected that their PTC O&M costs would increase between fiscal years 2023 and 2025.

**Distribution of Estimated Commuter Rail Positive Train Control Operations and Maintenance Costs as Percentage of Total Operating Costs for Fiscal Year 2022**



Source: GAO analysis of Federal Transit Administration and survey data. | GAO-24-106329

To understand the relationship between PTC O&M costs and agency size, GAO analyzed ridership and route miles in PTC operation and found that these factors were moderately to strongly associated with fiscal year 2022 PTC O&M costs. Specifically, commuter rail agencies with higher ridership or more route miles in PTC operation tended to have higher PTC O&M costs. However, GAO cannot make conclusions about whether these factors influenced PTC O&M costs, because this study did not control for other factors such as PTC type.



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### **Abbreviations**

ACSES II	Advanced Civil Speed Enforcement System II
DOT	Department of Transportation
E-ATC	Enhanced Automatic Train Control
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
I-ETMS	Interoperable Electronic Train Management System
NTD	National Transit Database
O&M	operations and maintenance
PTC	positive train control

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January 10, 2024

The Honorable Maria Cantwell  
Chair  
The Honorable Ted Cruz  
Ranking Member  
Committee on Commerce, Science, and Transportation  
United States Senate  
The Honorable Sam Graves  
Chair  
The Honorable Rick Larsen  
Ranking Member  
Committee on Transportation and Infrastructure  
House of Representatives

Commuter rail passengers across the country take hundreds of millions of trips each year traveling to work, school, medical appointments, and recreational activities. Positive train control (PTC) technology—a system designed to help control train movements, including braking—improves the safety of commuter rail by preventing train-to-train collisions and other types of accidents. For example, according to the National Transportation Safety Board, PTC could have prevented 22 rail accidents that occurred between 2008—when the statute requiring commuter and certain other railroads to implement PTC was first enacted—and 2018, the deadline for railroads to implement PTC systems or otherwise qualify for an extension by law.<sup>1</sup>

During the COVID-19 pandemic, fewer passengers used commuter rail, which led to commuter railroads losing revenue from passenger fares. In addition, as we have previously reported, the COVID-19 pandemic resulted in shifts in commuting patterns that may affect commuter rail funding in the future, even after the immediate effects of the pandemic are over.<sup>2</sup> This has made some commuter railroad officials concerned about the ability to fund the ongoing operations and maintenance (O&M) of PTC for commuter railroads.

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<sup>1</sup>National Transportation Safety Board, *The State of Positive Train Control Implementation in the United States* (Washington, D.C.: Sept. 13, 2018).

<sup>2</sup>GAO, *Commuter Rail: Information on Benefits and Funding Challenges for Service in Less Urbanized Communities*, GAO-21.355R, (Washington, D.C.: April 1, 2021).

The Infrastructure Investment and Jobs Act includes a provision for us to determine the annual PTC system O&M costs for commuter rail agencies.<sup>3</sup> This report examines (1) challenges, if any, that commuter rail agencies reported facing in determining their annual PTC O&M costs from fiscal year 2020 through fiscal year 2025, and the extent to which they were able to estimate these costs, and (2) the annual PTC O&M costs from fiscal year 2020 through fiscal year 2025 estimated by commuter rail agencies.

For both objectives, we surveyed all 29 public commuter rail agencies required to implement PTC, and received 26 responses.<sup>4</sup> Survey questions asked commuter rail agencies to explain the types of PTC O&M costs they incur, estimates of those costs, and any challenges with estimating them.<sup>5</sup>

To develop the survey questions, we (1) held a discussion group with eight selected commuter rail agencies to discuss their recommended cost categories and estimation methods, and (2) pre-tested the survey with five commuter rail agencies. We selected the commuter rail agencies for the discussion group and pre-tests to represent a variety of ridership levels and PTC systems. We included commuter rail agencies that perform PTC maintenance tasks themselves and those that contract out their PTC maintenance tasks to a service provider. We conducted the web-based survey from May 10 through June 21, 2023. Our survey collected PTC O&M cost information for five cost categories: (1) materials and supplies, (2) contracts and agreements, (3) in-house labor, (4) utilities, and (5) miscellaneous.<sup>6</sup> We reviewed the 26 completed surveys to check for errors and conducted follow-up with respondents to increase the quality of the survey data. We received full-year, complete estimates from 15 agencies for fiscal year 2020, 14 agencies for fiscal year 2021,

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<sup>3</sup>Pub. L. No. 117-58, § 22409, 135 Stat. 429, 740 (2021).

<sup>4</sup>In 2008, a federal law was enacted requiring certain railroads—including those providing commuter service—to implement PTC to prevent train-to-train collisions and other types of accidents: The Rail Safety Improvement Act of 2008, Pub. L. No. 110-432, § 104(a), 122 Stat. 4848, 4856-57 (2008) (codified as amended at 49 U.S.C. § 20157).

<sup>5</sup>We define commuter rail agencies as public agencies with passenger rail service between an urban area and the surrounding suburban communities. Intercity passenger rail such as Amtrak and Brightline are excluded from this review as they are operated as for-profit companies, rather than as public authorities. The WeGo Star, previously the Music City Star, a commuter rail service running between Nashville and Lebanon, Tennessee, is also excluded because it was exempted from the requirement to install PTC.

<sup>6</sup>See appendix I for a description of each of these categories.

and 17 agencies for fiscal years 2022-2025. We also determined that data from 17 of the commuter rail agencies were sufficiently reliable for the purposes of reporting these agencies' PTC O&M costs in fiscal year 2022-2025. We developed descriptive statistics for the 17 estimates of PTC O&M costs agencies provided for fiscal year 2022 and compared these costs to each agency's size (e.g., total ridership and route miles) and total operating costs.

For both objectives, we interviewed (1) Department of Transportation (DOT) officials; (2) five commuter rail agencies (which did not participate in the discussion group) selected to obtain a range of geographic location, agency size, and PTC system type used; and (3) other stakeholders such as the American Public Transportation Association and the Commuter Rail Coalition.

To obtain background information on commuter rail and PTC, we reviewed our previous reports. We also reviewed applicable statutes and regulations to identify O&M funding available for PTC, any data collection and reporting requirements related to PTC, and the Federal Railroad Administration's (FRA) and the Federal Transit Administration's (FTA) roles in collecting data and reporting PTC costs. For more information on our scope, objectives, and methodology, please see appendix I.

We conducted this performance audit from October 2022 to January 2024 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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### Commuter Railroads

Passenger rail systems—including commuter rail—tend to have relatively high capital and operating costs. This is because

- they require a substantial amount of capital (e.g., infrastructure and equipment) such as tracks, bridges, passenger stations, and rail cars; and
- they have costs related to the personnel that operate and maintain this infrastructure and equipment, according to DOT officials.

In addition, most commuter rail agencies operate some or all of their trains as “tenants” on the track of another railroad—such as Amtrak or a freight railroad—known as the “host.” The tenant may pay the host fees to access, dispatch, and maintain the track infrastructure.

Commuter rail agencies’ capital costs are funded through a mix of federal and state funds; federal funds supplied about 37 percent of capital costs in fiscal year 2019, on average.<sup>7</sup> Operating costs are largely funded through a mix of state and local funding as well as from passenger fares. For example, in fiscal year 2019, state and local sources and fares riders paid accounted for 90 percent of commuter rail agencies’ operating funding on average, while federal funds accounted for 10 percent on average.<sup>8</sup>

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## Positive Train Control

PTC is a technology designed to prevent train-to-train collisions, over-speed derailments, incursions into established work zones, and the movement of a train through a switch left in the wrong position.<sup>9</sup> For example, PTC is designed to automatically slow or stop a train in certain cases. PTC is generally implemented as an overlay to existing signal and train control systems. In 2008, a federal law was enacted requiring railroads—including 29 commuter rail agencies—to implement PTC to prevent train-to-train collisions and other types of accidents.<sup>10</sup> By December 2020, all 29 commuter rail agencies had fully implemented PTC.

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<sup>7</sup>According to the National Transit Database (NTD), data for commuter rail agency funding sources in 2019 and 2021.

<sup>8</sup>We used fiscal year 2019 to show the funding sources for the last year of normal data before the COVID-19 pandemic. During fiscal year 2021, on average, commuter rail agencies’ funding sources for operating expenses were 62 percent state and local and 38 percent federal due to the Coronavirus Aid, Relief, and Economic Security (CARES) Act, Coronavirus Response and Relief Supplemental Appropriations Act, 2021 (CRRSAA), and American Rescue Plan Act appropriating funds for operating expenses through certain FTA programs.

<sup>9</sup>49 U.S.C. § 20157(i)(5).

<sup>10</sup>Rail Safety Improvement Act of 2008, Pub. L. No. 110-432, § 104(a), 122 Stat. 4848, 4856-57 (2008) (codified as amended at 49 U.S.C. § 20157). In 2015, Congress extended the original deadline of December 31, 2015, to December 31, 2018, and allowed railroads to apply for an extension of up to 24 months if they met certain requirements. Positive Train Control Enforcement and Implementation Act of 2015, Pub. L. No. 114-73, § 1302, 129 Stat. 576, 576-77 (2015).



We previously reported that PTC implementation was a complex and lengthy process.<sup>11</sup> It requires the integration of multiple components, including communication systems; hardware on locomotives and the track; and software in centralized office locations, onboard the train, and along the track. To implement PTC, railroads designed, produced, and installed more than 20 major components that enable them to (1) communicate trains' locations, movements, speed, and, when necessary, (2) slow or stop a train that is not being operated safely or is facing certain other risks. Many of these components were new technologies designed and developed specifically for PTC, and railroads had to integrate them with their existing systems.

The railroads—including commuter rail agencies—have primarily implemented one of three PTC systems to meet the federal law: (1) Interoperable Electronic Train Management System (I-ETMS), (2) Advanced Civil Speed Enforcement System II (ACSES II), or (3) Enhanced Automatic Train Control (E-ATC). Each of these systems uses different technologies and interacts with existing signaling technology differently. Nonetheless, all three are capable of delivering functionality that meets FRA's PTC requirements.<sup>12</sup> The intended safety benefits of PTC can only be achieved when all required hardware and software has been installed; a railroad has verified and validated that the PTC system operates as designed, including ensuring the PTC system is interoperable; and a railroad has obtained PTC system certification from FRA.<sup>13</sup> Once all of these steps have been implemented, a PTC system allows a railroad to communicate timely information on changing track conditions, such as temporary speed restrictions where railroad employees are conducting track maintenance. Absent this

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<sup>11</sup>GAO, *Positive Train Control: Many Commuter Railroads Still Have Significant Additional Implementation Work and Opportunities Exist to Provide Federal Assistance*, [GAO-18-367T](#), (Washington, D.C.: March 1, 2018); GAO, *Positive Train Control: Additional Oversight Needed As Most Railroads Do Not Expect to Meet 2015 Implementation Deadline*, [GAO-15-739](#) (Washington, D.C.: Sept. 4, 2015), and GAO, *Positive Train Control: Additional Authorities Could Benefit Implementation*, [GAO-13-720](#) (Washington D.C.: Aug. 16, 2013).

<sup>12</sup>For example, to determine a train's location, ACSES II and E-ATC rely on equipment embedded on the track, while I-ETMS uses Global Positioning System information. ACSES II and E-ATC both supplement existing train control systems to provide all required PTC functionality, while I-ETMS was designed as a new system to provide this functionality.

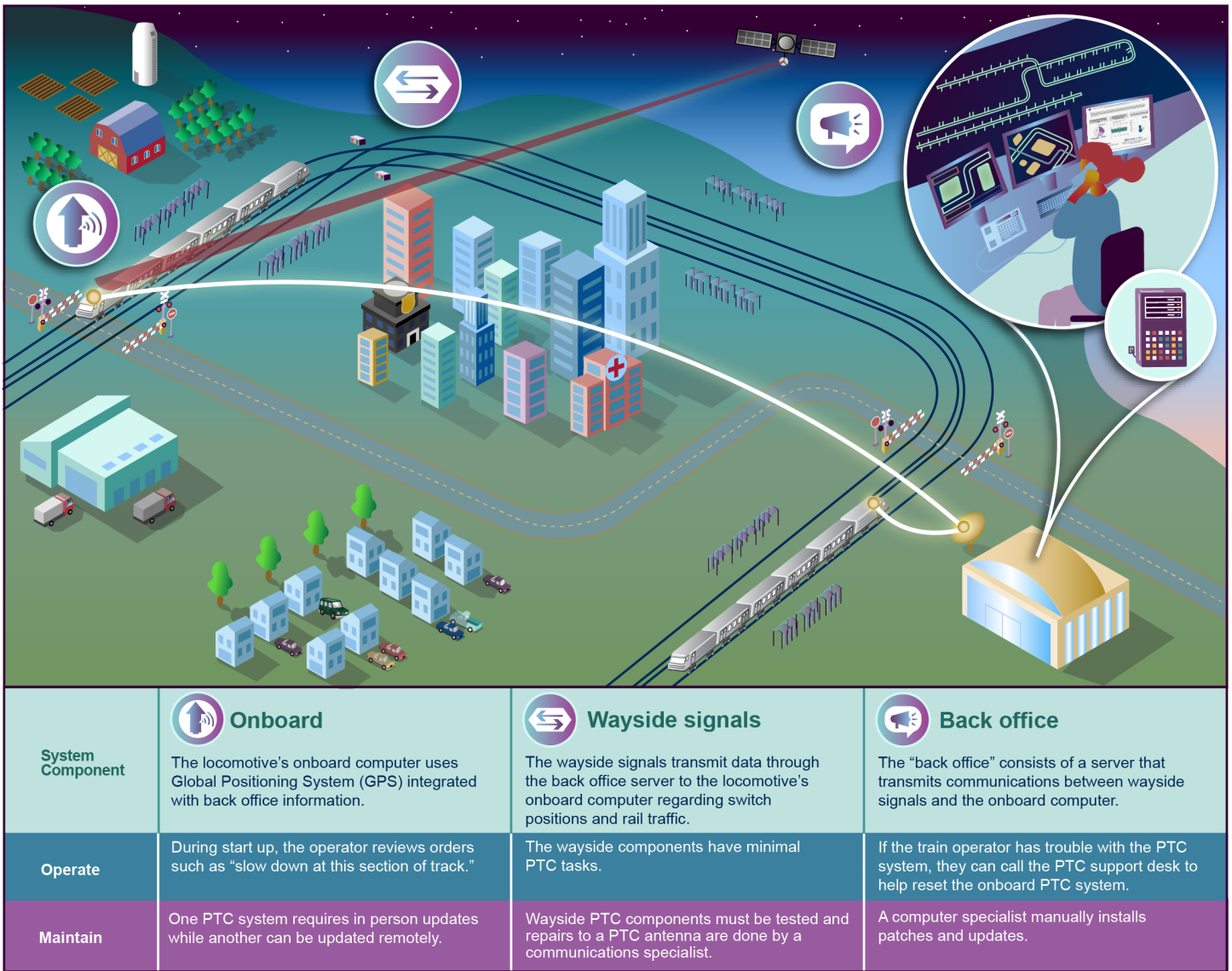
<sup>13</sup>The Rail Safety and Improvement Act of 2008 and FRA's implementing regulations also require PTC systems to be interoperable, meaning that the locomotives of host and tenant railroads operating on the same main line must communicate with and respond to the PTC system, including during uninterrupted movements over property boundaries.

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communication, a train might proceed at normal speeds through this area and cause an accident.

Each of the three PTC systems requires individuals to operate and maintain them. Specifically, each PTC technology includes a multitude of tasks for train operators and other employees that vary depending on the PTC technology type used. For example, IT specialists are sometimes required to install software updates on PTC systems (see figure 1).

Figure 1: Basic Operation of Positive Train Control and Its Operations and Maintenance Tasks



Source: GAO illustration and analysis. Monitor screen image; railroads.dot.gov, Positive Train Control. | GAO-24-106329

**Figure 1: Basic Operation of Positive Train Control and Its Operations and Maintenance Tasks**

	<b>Onboard</b>	<b>Wayside signals</b>	<b>Back office</b>
System Component	The locomotive's onboard computer uses Global Positioning System (GPS) integrated with back office information.	The wayside signals transmit data through the back office server to the locomotive's onboard computer regarding switch positions and rail traffic.	The "back office" consists of a server that transmits communications between wayside signals and the onboard computer.
Operate	During start up, the operator reviews orders such as "slow down at this section of track."	The wayside components have minimal PTC tasks.	If the train operator has trouble with the PTC system, they can call the PTC support desk to help reset the onboard PTC system.
Maintain	One PTC system requires in person updates while another can be updated remotely.	Wayside PTC components must be tested and repairs to a PTC antenna are done by a communications specialist.	A computer specialist manually installs patches and updates.

Source: GAO illustration and analysis. Monitor screen image; railroads.dot.gov, Positive Train Control. | GAO-24-106329

## Federal Roles and Responsibilities

FTA and FRA respectively support and oversee commuter rail agencies' use of PTC. The FTA provides financial assistance to public transit systems, including commuter rail agencies. FRA has responsibility for overseeing railroads' PTC implementation and ongoing compliance with PTC regulations.

**Federal Transit Administration.** FTA has funding programs that commuter rail agencies can use for PTC-related capital costs, which include Urbanized Area Formula Grants, Formula Grants for Rural Areas, and the State of Good Repair Formula Program.<sup>14</sup> These programs primarily reimburse capital expenses and generally require commuter rail agencies to provide a 20 percent match from other sources.<sup>15</sup> Following the decline in commuter rail ridership during the COVID-19 pandemic, a series of new laws provided temporary funds with a 100 percent federal share that commuter rail agencies, regardless of size, could use for operating expenses to maintain service, which could include PTC

<sup>14</sup>In addition, the Department of Transportation (DOT) has other grant programs that may be available for commuter rail agencies' certain other capital expenses, such as the Rebuilding American Infrastructure with Sustainability and Equity (RAISE) Grant Program, which provides for capital investments in surface transportation infrastructure.

<sup>15</sup>In addition, transit systems in small urbanized and rural areas, as well as some transit systems in large urbanized areas, may use eligible formula funds for certain operating expenses with a 50 percent match from other sources. See: 49 U.S.C. § 5307(a)(1)(D)-(a)(2)(A), (d)(2); 49 U.S.C. § 5311(b)(1)(C), (g)(2)(B).

operating expenses. Specifically, the CARES Act, CRRSAA, and American Rescue Plan Act appropriated approximately \$25 billion, \$14 billion, and \$30.5 billion, respectively, to FTA to support the transit industry through FTA programs, including the Urbanized Area and Rural Area formula programs.<sup>16</sup>

Because all aspects of transit operations were affected by the COVID-19 pandemic and the consequent loss of revenue, the CARES Act, CRRSAA, and American Rescue Plan Act permitted recipients of federal transit funding—including commuter rail agencies—to use the funding for a wide array of expenses with no limit on the amount used for operating expenses.<sup>17</sup> Some of the COVID-19 funding required that it be used for payroll and operating expenses to the maximum extent possible. However, if the recipient certified to FTA that the recipient had not furloughed any employees, then the recipient was not required to prioritize payroll and operating expenses before other expenses.

FTA also administers the National Transit Database (NTD), which is intended to provide information to the federal government and others on which to base public transportation service planning. All recipients and direct beneficiaries of grants from the Urbanized Area formula program and Rural Area formula program are required by statute to submit data to the NTD, such as operating expenses, ridership levels, and funding sources.<sup>18</sup> While agencies submit information of their total operations and maintenance expenses to NTD, they do not specifically identify their PTC O&M costs as part of this reporting, because there are no federal requirements for reporting of PTC O&M costs. As part of its annual data validation process, FTA evaluates agency-submitted data in the NTD and looks for outliers.

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<sup>16</sup>CARES Act, Pub. L. No. 116-136, 134 Stat. 281, 599-600 (2020); CRRSAA, Pub. L. No. 116-260, 134 Stat. 1909, 1945-47 (2020); American Rescue Plan Act, Pub. L. No. 117-2, 135 Stat. 4, 72-73 (2021).

<sup>17</sup>These flexibilities are exceptions to the usual requirements of FTA's Urbanized Area and Rural Area formula programs. Additional exceptions are that funds provided pursuant to the CARES Act, CRRSAA, and American Rescue Plan Act have no requirement for local matching funds and operating expenses are not required to be included in a transportation improvement program, a long-range transportation or statewide transportation plan, or a statewide transportation improvement program. All other program requirements apply to funds provided by these Acts.

<sup>18</sup>49 U.S.C. § 5335(b). We recently examined commuter rail agencies' O&M costs using NTD Data. See GAO, *Commuter Rail: Information on Benefits and Funding Challenges for Service in Less Urbanized Communities*, [GAO-21-355R](#), (Washington, D.C., Apr. 1, 2021).

**Federal Railroad Administration.** FRA is responsible for overseeing railroads' PTC implementation, providing technical assistance, and issuing regulations.<sup>19</sup> FRA reviews and approves railroads' required PTC system documentation, including test and safety plans, and certifies PTC systems, and has the authority to impose civil penalties when a railroad fails to meet certain PTC requirements.<sup>20</sup> FRA also oversees railroads' ongoing compliance with PTC regulations by auditing railroads' operation of their PTC systems and reviewing failure-related notifications and quarterly reports of PTC system performance. FRA generally does not provide funding for commuter rail passenger transportation to cover the costs of operating and maintaining PTC; however, it does offer funding to cover some capital costs.<sup>21</sup>

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## Commuter Rail Agency Officials Reported Challenges Determining PTC O&M Costs, but Many Were Able to Provide Estimates

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### Most Commuter Rail Agency Officials Cited Separating PTC Costs from Other Costs as a Challenge

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Most commuter rail agencies said that it was challenging to determine prior years' PTC O&M costs because PTC O&M costs are integrated into other O&M costs. Agencies reported three key reasons that isolating PTC O&M costs can be complicated: 1) PTC technology is overlaid on existing systems, 2) host and tenant agreements and contracts may not break out specific PTC costs, and 3) employees' PTC O&M-related tasks are not tracked separately from other tasks.

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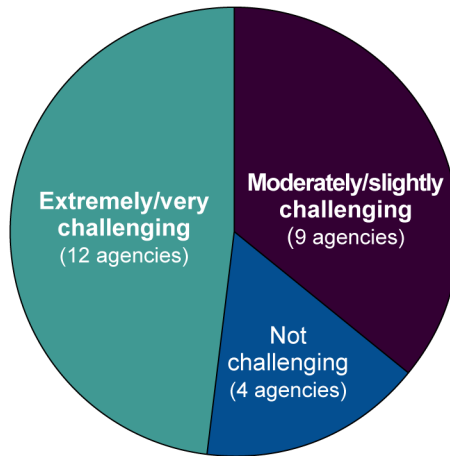
<sup>19</sup>49 U.S.C. § 20157.

<sup>20</sup>49 U.S.C. § 20157.

<sup>21</sup>As authorized by the Fixing America's Surface Transportation Act, FRA, together with FTA, jointly administered the Positive Train Control Grant Program, which provided funding for the capital costs of installing PTC systems. Pub. L. No. 114-94, § 3028, 129 Stat. 1312, 1495-96 (2015). In some cases, where permitted by annual appropriations, FRA may also provide funding for PTC capital projects to commuter rail passenger transportation through the Consolidated Rail Infrastructure and Safety Improvements Program. 49 U.S.C. § 22907. FRA may also provide funding for PTC capital expenses to commuter rail passenger transportation under the Railroad Crossing Elimination Program. 49 U.S.C. § 22909. However, FRA is generally prohibited under 49 U.S.C. § 22905(f) from providing grant funding for commuter rail passenger transportation.

**PTC Overlay System Design.** Twenty-five of the 26 commuter rail agencies that responded to our survey said that their PTC technology is overlaid onto existing track signaling systems.<sup>22</sup> Most of these agencies said that this can make distinguishing PTC costs from overall signaling costs challenging. Specifically, about half of these commuter rail agencies (12 of the 25 with overlaid PTC systems) reported that this made it extremely or very challenging to estimate PTC-specific O&M costs for fiscal years 2020 through fiscal year 2022 (see fig. 2). For example, one commuter rail agency said that it and other agencies on the Northeast Corridor, which runs between Boston and Washington, D.C., operate PTC as an overlay to the underlying wayside signaling systems, so costs are not separated.<sup>23</sup>

**Figure 2: Degree to Which Having a Positive Train Control (PTC) Overlay System Design Makes It Challenging to Determine PTC Operations and Maintenance (O&M) Costs**



Source: GAO. | GAO-24-106329

Note: Two of the agencies that reported no challenge for estimating PTC costs operate the Interoperable Electronic Train Management System (I-ETMS), and two operate a mix of I-ETMS and Advanced Civil Speed Enforcement System II (ACSES II) PTC technology.

<sup>22</sup>Existing track signaling systems are those in which dispatchers in centralized offices issue train movement instructions that allow trains to enter specific track segments, or blocks. These instructions are communicated to train operators through signals alongside the track, or, in some cases, by verbal radio communication.

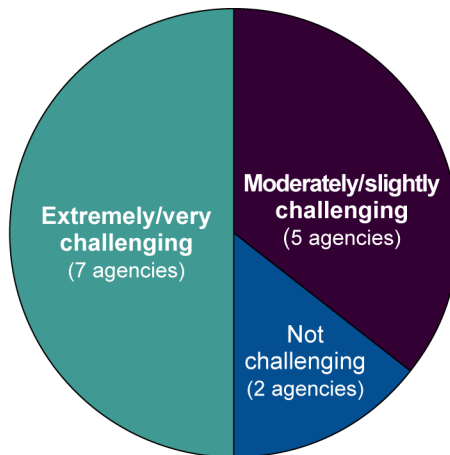
<sup>23</sup>FRA certified these PTC systems to operate as an overlay to the underlying wayside signaling systems. The initial version of ACSES (ACSES I) alone does not meet all technical requirements for PTC systems; ACSES II includes the additional mandated functions for PTC, according to DOT.



**Host/Tenant Agreements and Contracts.** Surveyed agencies told us that host and tenant agreements between railroads—in which the tenant may pay the host fees to access, dispatch, and maintain the track infrastructure—may not break out PTC-specific costs.<sup>24</sup>

- For the 15 commuter rail agencies that host other railroads, all 15 said their agreements to host another railroad on their tracks did not specify PTC-specific O&M costs. About half (seven) of these host agencies said this made it extremely or very challenging to estimate PTC O&M costs for fiscal year 2020 through fiscal year 2022 (see fig.3).
- For the 26 commuter rail agencies that are tenants of another railroad, 12 said their agreement to be a tenant on another entity’s tracks did not break out PTC costs specifically.<sup>25</sup> Seven of these 12 tenant agencies said this made it extremely or very challenging to estimate PTC O&M costs (see fig. 4).

**Figure 3: Degree to Which Having a Host Agreement That Does Not Break Out Positive Train Control (PTC) Operations and Maintenance (O&M) Costs Makes It Challenging to Determine Those Costs**

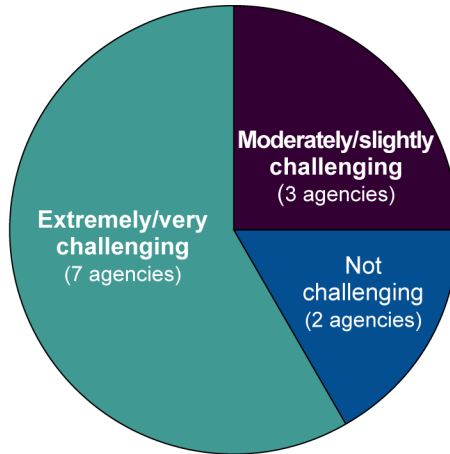


Source: GAO. | GAO-24-106329

<sup>24</sup>Many railroads can be a host for some portion of track that they own and be a tenant on track that another railroad owns, so the total respondents in both the host and tenant contract questions are not mutually exclusive of one another and do not add up to the total number of survey respondents. All of the responding agencies were tenants in some capacity.

<sup>25</sup>An additional three agencies said their contract did break out PTC costs and another 11 did not answer the question. We did not ask the 11 agencies with no answer why they did not answer.

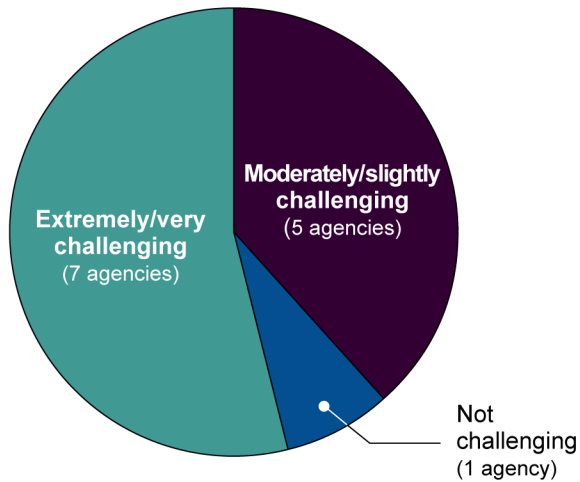
**Figure 4: Degree to Which Having a Tenant Agreement That Does Not Break Out Positive Train Control (PTC) Operations and Maintenance (O&M) Costs Makes It Challenging to Determine Those Costs**



Source: GAO. | GAO-24-106329

In addition, 22 commuter rail agencies responding to our survey said that they have contracts for O&M services such as repairing broken equipment. Of these, just over half (13) said that their service contracts did not break out PTC-specific O&M costs. About half (seven) of the 13 said this made it extremely or very challenging to estimate PTC O&M costs for fiscal year 2020 through fiscal year 2022. Five agencies said it made it moderately challenging, and one agency said it was not a challenge to estimate PTC costs for the service that it directly runs and maintains because their accounting records tracked PTC costs separately (see fig. 5).

**Figure 5: Degree to Which Having a Service Contract That Does Not Break Out Positive Train Control (PTC) Operations and Maintenance (O&M) Costs Makes It Challenging to Determine Those Costs**



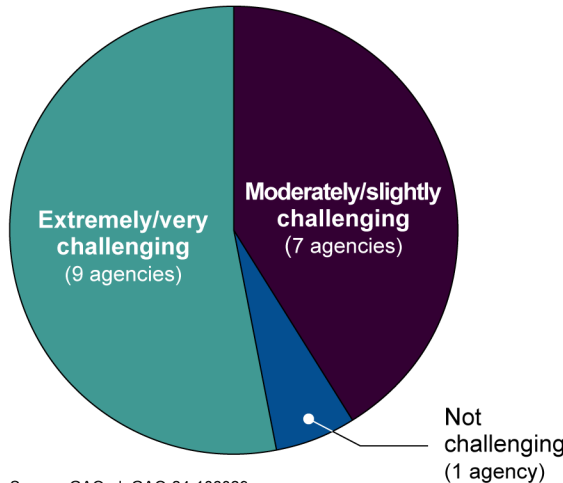
Source: GAO. | GAO-24-106329

**Labor Costs.** Eighteen of the 26 commuter rail agencies responding to our survey said that they do not track some employees' PTC O&M-related tasks separately from their non-PTC O&M tasks.<sup>26</sup> Nine of these said this made it extremely or very challenging to estimate PTC O&M costs (see fig. 6).<sup>27</sup> One commuter rail agency said that officials would have to add new job codes that were specific to PTC to determine the amount of time spent on PTC-related tasks. However, officials at this agency said that they have found in the past that the more detailed job codes become, the less accurate their use tends to be.

<sup>26</sup>The other eight commuter rail agencies said their accounting systems have separate labor codes for PTC-related tasks.

<sup>27</sup>The remaining agency did not answer the question.

**Figure 6: Degree to Which Not Tracking Employees' Positive Train Control (PTC) Operations and Maintenance (O&M) Tasks Makes It Challenging to Determine PTC O&M Costs**



Source: GAO. | GAO-24-106329

In addition to the three reasons listed above, a few agencies also said that PTC costs were still being funded through capital funds and are, therefore, not accounted for as O&M costs. For example, one agency said that its PTC system was in the project phase, and thus, costs associated with materials and supplies are under the primary contract within its capital budget for installing the technology.

Moreover, some commuter rail agencies said it can be challenging to project future PTC O&M costs. Eighteen of the 25 commuter rail agencies that answered our survey questions related to projecting costs said that having only one vendor for PTC components made projecting future PTC O&M costs extremely or very challenging (e.g., some PTC systems parts are manufactured by a single company), because the vendor could make unanticipated changes to prices in the future. Sixteen (of the 25 answering these questions) reported that the uncertain timing of software and hardware upgrades made projecting future costs extremely or very challenging. For example, one commuter rail agency said it is difficult to know when PTC software will become obsolete, which makes it challenging to project (and therefore budget for) the software's replacement or upgrade costs.

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## Despite These Challenges, Many Commuter Rail Agencies Were Able to Provide Estimates

Just over half of the 26 commuter rail agencies that responded to our survey were able to provide “complete” estimates of their PTC O&M costs for each fiscal year from fiscal years 2020 through 2025. We refer to estimates as “complete” when (1) the estimate was for a full fiscal year of costs and (2) the estimate included all cost categories or sufficient reasons as to why a category was not included (e.g., these costs were included in another category).

Agencies that were not able to provide complete estimates cited two reasons. First, in fiscal years 2020 and 2021, some agencies had not yet fully implemented PTC.<sup>28</sup> In these years, agencies might not have had PTC O&M costs or might have had some costs but only for part of the year. Second, some agencies provided full-year estimates for certain cost categories but not others.<sup>29</sup> For example, an agency might be able to estimate their contracts and agreements costs but not their PTC O&M material and supply costs.

Despite these challenges, we received full-year, complete estimates from 15 agencies for fiscal year 2020, 14 agencies for fiscal year 2021, and 17 agencies for fiscal years 2022-2025.<sup>30</sup> Fiscal year 2022 had the most complete estimates since some agencies had not yet fully implemented PTC in fiscal years 2020 and 2021. As a result, we focused our analysis on fiscal year 2022. We determined the data these 17 commuter rail agencies provided were sufficiently reliable for the purposes of describing them in this report.

Although many agencies reported it was challenging, they reported that they used a variety of approaches to generate estimates. For example, one agency estimated its fiscal years 2020-2022 material and supply

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<sup>28</sup>The final deadline to implement PTC was December 31, 2020, and many commuter rail agencies finished their implementation in the closing months and days of 2020. This time period fell during some agencies’ fiscal year 2020 and other agencies’ fiscal year 2021. Therefore, agencies’ fiscal year 2022 was the first fiscal year in which all commuter rail agencies had PTC fully implemented.

<sup>29</sup>There were instances in which an agency did not provide an actual cost or estimated cost for a category but had a complete estimate. Specifically, an agency might not have provided costs for a category because it had provided this cost within another category. For example, contracts and agreements sometimes included materials and supplies costs.

<sup>30</sup>Some agencies provided estimated ranges rather than exact amounts, and we take this uncertainty into consideration when reporting summary statistics.

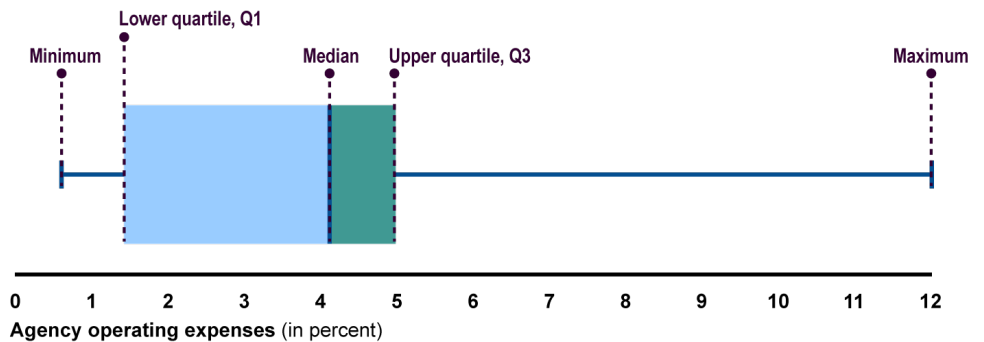
costs by reviewing invoices for the costs of parts purchased to operate its PTC system. Another agency estimated its fiscal years 2020-2022 PTC O&M utility costs by holding discussions with its IT staff. A third agency said that it analyzed the past failure rate of PTC system parts and took into account expected future obsolescence of parts to project material and supply costs for fiscal years 2023-2025.

## Most Estimates Showed Agencies Spent a Small Portion of Their Total Operating Costs on PTC in Fiscal Year 2022, with Costs Increasing in Future Years

### Most Agencies Reported PTC O&M Costs Less Than 5 Percent of Their Total Operating Costs in Fiscal Year 2022, and Costs Tended to Increase with Agency Size

Of the 17 agencies that were able to provide complete estimates for fiscal year 2022, a majority spent 5 percent or less of their total operating costs on PTC O&M. These 17 estimates ranged from less than 1 percent to 12 percent, with a median of about 4 percent (see fig. 7 for this distribution).<sup>31</sup>

**Figure 7: Distribution of Estimated Commuter Rail Positive Train Control Operations and Maintenance Costs, as Percentage of Total Operating Costs, in Fiscal Year 2022**



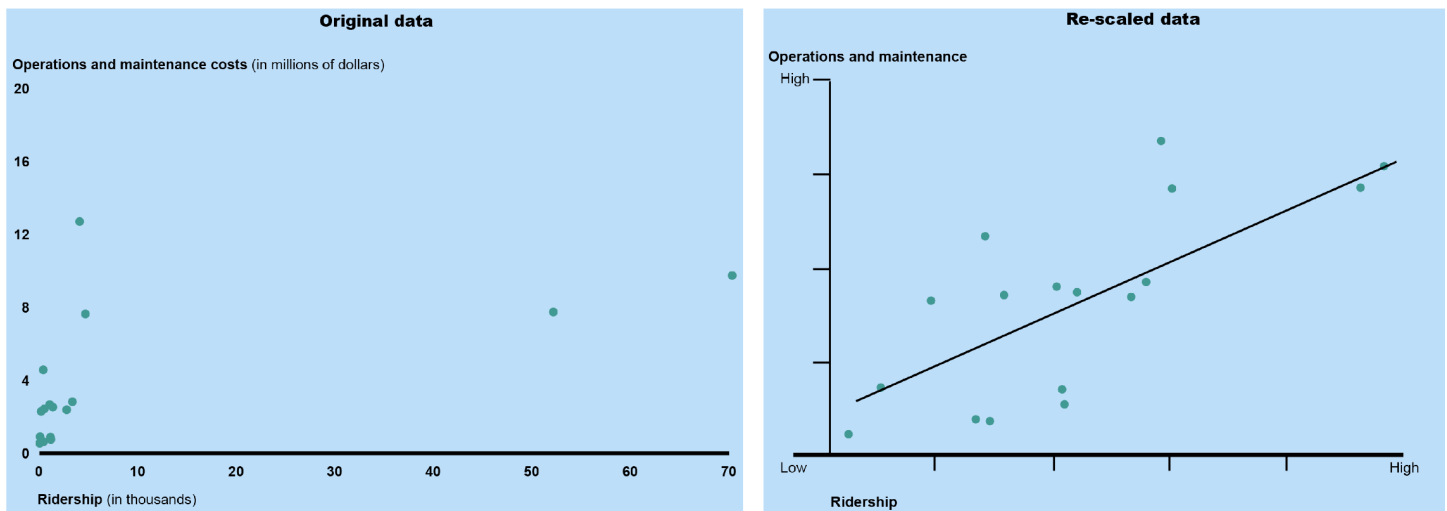
Source: GAO analysis of Federal Transit Administration and survey data. | GAO-24-106329

<sup>31</sup>Further, we determined that 19 agencies were able to self-report plausible estimates of the share of total operating costs that they spend on PTC to be less than 20 percent, with most being less than 5 percent.

In dollar terms, 13 of the 17 agency-provided estimates of total PTC O&M costs in fiscal year 2022 were for amounts less than \$5 million, and the median was about \$2.4 million (i.e., eight of the estimates were below \$2.4 million and eight were above it).

We analyzed two factors that can be proxies for railroad system size and found that they have discernible relationships with fiscal year 2022 PTC O&M costs: ridership and route miles in PTC operation. First, our analysis showed that higher ridership is strongly associated with higher PTC O&M costs. That is, as calendar year 2022 ridership increased, there was a strong tendency for fiscal year 2022 PTC O&M costs to increase. Specifically, we found a linear relationship between ridership and operations and maintenance costs after re-scaling each variable, as shown in the right panel of Figure 8.<sup>32</sup> See appendix I for more detail on this re-scaling.

**Figure 8: Relationship Between Fiscal Year 2022 Commuter Rail Positive Train Control Operations and Maintenance Cost Estimates and Calendar Year 2022 Ridership, for 17 Commuter Rail Agencies**



Source: GAO analysis of American Public Transportation Association and survey data. | GAO-24-106329

<sup>32</sup>We did not conduct analysis to determine the degree to which the relationship between measures of agency size and PTC O&M costs is causal due to the small number of respondents and the combination of actual costs and estimates.



**Accessible Data Table for Figure 8: Relationship Between Fiscal Year 2022 Commuter Rail Positive Train Control Operations and Maintenance Cost Estimates and Calendar Year 2022 Ridership, for 17 Commuter Rail Agencies**

Original data

Operations and maintenance (in millions of dollars)	Ridership (thousands)
2.2964	0.2204
0.645	0.3891
0.6327	0.4668
0.7584	1.2085
9.75	70.3427
2.3857	2.8159
7.75	52.1976
4.5765	0.4392
2.5316	1.4064
0.5507	0.0771
7.6407	4.7179
2.8248	3.3958
12.706	4.1345
2.4365	0.5563
0.9084	0.1156
2.6732	1.0898
0.8867	1.1727

Re-scaled data

Operations and maintenance (Low to High)	Ridership (Low to High)
14.65	12.3
13.38	12.87
13.36	13.05
13.54	14
16.09	18.07
14.69	14.85
15.86	17.77
15.34	12.99
14.74	14.16
13.22	11.25
15.85	15.37
14.85	15.04

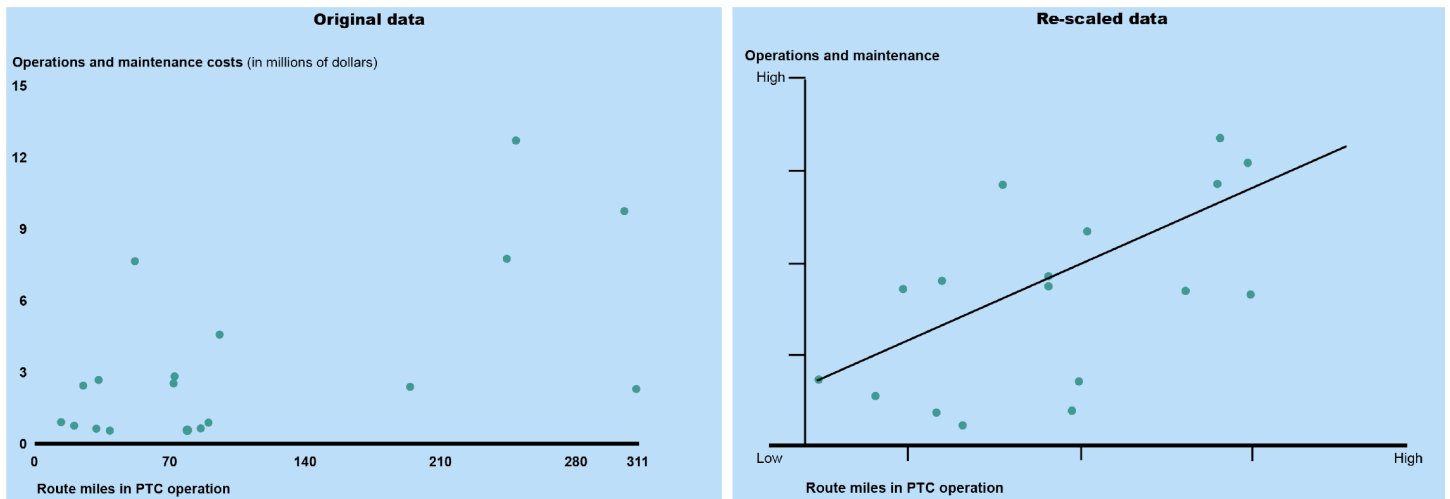
Operations and maintenance (Low to High)	Ridership (Low to High)
16.36	15.23
14.71	13.23
13.72	11.66
14.8	13.9

Source: GAO analysis of American Public Transportation Association and survey data. | GAO-24-106329

Note: In our sample of 17 agencies, PTC O&M cost tended to increase with ridership. To assess the strength of this relationship (shown on left), we re-scaled each variable to make the relationship linear (shown on right). The re-scaled variables help illustrate the tendency of costs to increase as ridership increased, as shown by the regression line.

Second, the number of a commuter rail agency’s route miles in PTC operation is also moderately to strongly associated with PTC O&M costs (see fig. 9). That is, as route miles in PTC operation as of December 29, 2020 increased, there was a moderate to strong tendency for fiscal year 2022 PTC O&M costs to increase.<sup>33</sup>

**Figure 9: Relationship Between Fiscal Year 2022 Commuter Rail Positive Train Control (PTC) Operations and Maintenance Cost Estimates and Route Miles in PTC Operation as of December 29, 2020, for 17 Commuter Rail Agencies**



Source: GAO analysis of Federal Railroad Administration and survey data. | GAO-24-106329

<sup>33</sup>We used route miles in PTC operation as of December 29, 2020 because that was the date of the data provided by DOT.

**Accessible Data Table for Accessible Data Table for Figure 9: Relationship Between Fiscal Year 2022 Commuter Rail Positive Train Control (PTC) Operations and Maintenance Cost Estimates and Route Miles in PTC Operation as of December 29, 2020, for 17 Commuter Rail Agencies**

**Original data**

<b>Operations and maintenance (in millions of dollars)</b>	<b>Route miles in Positive Train Control operation</b>
2.29636	311.2
0.645	86
0.6327	32.1
0.75845	20.6
9.75	305
2.38572	194.3
7.75	244.3
4.57651	95.8
2.53163	72
0.55074	39
7.64965	52
2.82485	72.5
12.706	249
2.4365	25.3
0.90837	13.8
2.67319	33.3
0.88673	90

**Re-scaled data**

<b>Operations and maintenance (Low to High)</b>	<b>Route miles in Positive Train Control operation (Low to High)</b>
14.65	5.74
13.38	4.45
13.36	3.47
13.54	3.03
16.09	5.72
14.69	5.27
15.86	5.5
15.34	4.56
14.74	4.28
13.22	3.66
15.85	3.95

Operations and maintenance (Low to High)	Route miles in Positive Train Control operation (Low to High)
14.85	4.28
16.36	5.52
14.71	3.23
13.72	2.62
14.8	3.51
13.7	4.5

Source: GAO analysis of Federal Railroad Administration and survey data. | GAO-24-106329

Although we found ridership and route miles to be positively associated with PTC O&M costs, the actual increase in costs associated with increased railroad system size was relatively small. Specifically, for every 10 percent increase in ridership, there was a 4 percent increase in cost, on average, and for every 10 percent increase in route miles in PTC operation, there was a 6 percent increase in cost, on average. Our survey data are non-generalizable because only a nonrandom subset of agencies provided complete estimates. We also cannot make conclusions about whether these system characteristics influenced PTC O&M costs, because we did not control for other factors that might affect costs such as PTC type.

### Most Agencies Projected Increases in PTC O&M Costs From Fiscal Year 2023 through 2025

Of the 26 agencies that responded to our survey, 17 provided complete projections of their annual PTC O&M costs from fiscal year 2023 through fiscal year 2025.<sup>34</sup> See Table 1 for a summary of agencies' fiscal years 2023–2025 annual projections.

**Table 1: Positive Train Control Operations and Maintenance Cost Projections from 17 Commuter Rail Agencies, Fiscal Years 2023 –2025**

Fiscal Year	Min	Max	Median
2023	\$401,437	\$17,000,000	\$3,038,578
2024	\$452,041	\$21,500,000	\$4,542,939
2025	\$295,817	\$26,500,000	\$4,453,638

Source: GAO Analysis of Survey Data. | GAO-24-106329

<sup>34</sup>Sixteen of the 17 agencies with complete projections of their annual PTC O&M costs for fiscal year 2023 through fiscal year 2025 were the same as the agencies that submitted complete estimates of their annual PTC O&M costs in fiscal year 2022.

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Note: The three maximum values in this table are the midpoints of the following estimated cost ranges provided by three agencies responding to our survey: \$14,000,000 - \$20,000,000 (FY2023), \$18,000,000 - \$25,000,000 (FY2024), and \$23,000,000 - \$30,000,000 (FY2025).

The majority of these agencies (15) projected that their PTC O&M costs would increase over the 3 fiscal years.<sup>35</sup> The remaining two agencies projected that their costs would decrease over this time frame. The amount of the projected increases from fiscal year 2023 through fiscal year 2025 varied across agencies, ranging from an increase of 0.9 percent to an increase of 112 percent with a median of about 14 percent. The two agencies expecting cost decreases projected their costs would decline by 0.9 percent and about 26 percent, respectively. Officials from one of these agencies said that the decrease was due to planned position reductions now that PTC was past implementation. Officials from the other agency said the decline was driven by replacing a high-cost item in their materials and supplies in 2023 and 2024, and then not having that cost in 2025.

Agencies responding to our survey reported using different approaches to generate projected PTC O&M costs for fiscal years 2023–2025. For example, several agencies stated that they had contracts that specified the cost increases from year to year. In other cases, agencies told us that they had analyzed historical data on various types of PTC O&M costs to project what those costs might be in the future.

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## Agency Comments

We provided a draft of this report to the Department of Transportation for review and comment. DOT provided technical comments, which we incorporated, as appropriate.

We are sending copies of this report to the appropriate congressional committees, the Secretary of Transportation, and other interested parties. In addition, the report is available at no charge on the GAO website at <https://www.gao.gov>. If you and your staff have any questions about this report, please contact me at (202) 512-2834 or [repkoe@gao.gov](mailto:repkoe@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.

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<sup>35</sup>We did not look at what factors (e.g. ridership or route miles as noted above) were associated with larger increases in projections because projections are generally less reliable than past-year estimates.

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Letter

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A handwritten signature in black ink, appearing to read "Elizabeth Repko", followed by a long horizontal flourish line extending to the right.

Elizabeth Repko  
Director  
Physical Infrastructure Issues

# Appendix I: Objectives, Scope and Methodology

This report examines (1) challenges, if any, that commuter rail agencies reported facing in determining their annual positive train control (PTC) operations and maintenance (O&M) costs from fiscal year 2020 through fiscal year 2025, and the extent to which they were able to estimate these costs, and (2) the annual PTC O&M costs from fiscal years 2020 through fiscal year 2025 estimated by commuter rail agencies. We limited the scope of our review to the 29 public commuter rail agencies in the U.S. required by federal law to implement PTC.<sup>1</sup>

To learn about any challenges the agencies face in producing estimates, as well as collect these commuter rail agencies' PTC O&M cost estimates, we conducted a web-based survey of the 29 agencies from May 10, 2023 through June 21, 2023. Twenty-six agencies completed the online questionnaire. The 29 agencies who received the questionnaire are listed in Table 1.

**Table 2: Commuter Rail Agencies and Associated Commuter Rail Service, State, and PTC System Type**

Count	Agency	Commuter Rail Service	State	PTC Type
1	Alaska Railroad Corporation	Alaska Railroad (ARR)	AK	I-ETMS
2	Capital Metropolitan Transportation Authority	MetroRail	TX	E-ATC
3	Central Puget Sound Regional Transit Authority	Sounder	WA	I-ETMS
4	Connecticut Department of Transportation	Shore Line East	CT	ACSES II
5	Dallas Area Rapid Transit	Trinity Railway Express (TRE)	TX	I-ETMS
6	Denton County Transportation Authority	A-train	TX	E-ATC
7	Denver Regional Transportation District	Denver RTD	CO	I-ETMS

<sup>1</sup>Rail Safety Improvement Act of 2008, Pub. L. No. 110-432, § 104(a), 122 Stat. 4848, 4856-57 (2008) (codified as amended at 49 U.S.C. § 20157). We define commuter rail agencies as public agencies with passenger rail service between an urban area and the surrounding suburban communities. Intercity passenger rail such as Amtrak and Brightline are excluded from this review as they are operated as for-profit companies, rather than as public authorities. The WeGo Star, previously the Music City Star, a commuter rail service running between Nashville and Lebanon, Tennessee, is also excluded because it was exempted from the requirement to install PTC.



**Appendix I: Objectives, Scope and Methodology**

8	Florida Department of Transportation	SunRail	FL	I-ETMS
9	Fort Worth Transportation Authority	TEXRail	TX	I-ETMS
10	Maryland Transit Administration	Maryland Area Regional Commuter (MARC) Train	MD	ACSES II & I-ETMS
11	Massachusetts Bay Transportation Authority (MBTA)	Massachusetts Bay Transportation Authority (MBTA)	MA	ACSES II
12	Metro Transit	Northstar	MN	I-ETMS
13	Metropolitan Transportation Authority (MTA)	Long Island Rail Road (LIRR)	NY	ACSES II
14	Metropolitan Transportation Authority (MTA)	Metro-North	NY/CT	ACSES II
15	New Jersey Transit Corporation	NJ TRANSIT	NJ/NY	ACSES II & I-ETMS
16	North County Transit District	COASTER	CA	I-ETMS
17	Northeast Illinois Regional Commuter Railroad Corporation	Metra	IL	I-ETMS
18	Northern Indiana Commuter Transportation District	South Shore Line	IN/IL	I-ETMS
19	Peninsula Corridor Joint Powers Board	Caltrain	CA	I-ETMS
20	Port Authority Trans-Hudson Corporation	PATH	NY/NJ	CBTC
21	Rio Metro Regional Transit District	Rail Runner Express	NM	I-ETMS
22	San Joaquin Regional Rail Commission (SJRRRC)	Altamont Corridor Express (ACE)	CA	I-ETMS
23	Sonoma-Marina Area Rail Transit District	Sonoma-Marina Area Rail Transit (SMART)	CA	E-ATC
24	South Florida Regional Transportation Authority	Tri-Rail	FL	I-ETMS
25	Southeastern Pennsylvania Transportation Authority (SEPTA)	Southeastern Pennsylvania Transportation Authority (SEPTA)	PA	ACSES II & I-ETMS
26	Southern California Regional Rail Authority	Metrolink	CA	I-ETMS
27	Tri-County Metropolitan Transportation District of Oregon	Westside Express Service (WES)	OR	E-ATC
28	Utah Transit Authority	FrontRunner	UT	E-ATC

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29	Virginia Railway Express (VRE)	Virginia Railway Express (VRE)	VA/DC I-ETMS
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Source: GAO analysis of Commuter Rail Information. | GAO-24-106329

Note: The three primary PTC system types are (1) Interoperable Electronic Train Management System (I-ETMS), (2) Advanced Civil Speed Enforcement System II (ACSES II), or (3) Enhanced Automatic Train Control (E-ATC).

Before drafting our survey, we held a discussion group with representatives of eight commuter rail agencies to help us understand the types of PTC O&M costs and how these costs may be categorized for a systematic data collection effort. We selected the discussion group participants to reflect a range of commuter rail system size (based on ridership) and type of PTC system. Based on this discussion group, our review of the National Transit Database's (NTD) cost categorization system, and consultation with Federal Transit Administration (FTA) officials, we developed a list of PTC O&M cost categories. Our survey collected PTC O&M cost information for five cost categories:<sup>2</sup>

1. **Materials and Supplies.** The portion of non-capital material and supply costs, such as hardware, software, and other equipment attributable to operating and maintaining PTC.
2. **Contracts and Agreements.** If an agency contracts with other companies or railroads for maintenance, technical support, or back office, the portion of those contract costs attributable to operating and maintaining PTC.
3. **In-House Labor.** The fully burdened cost of in-house labor hours spent operating and maintaining PTC for both dedicated and partially dedicated PTC staff.
4. **Utilities:** Portion of utilities directly attributable to PTC, such as for cell service or fiber networks needed to operate PTC.
5. **Miscellaneous:** Portion of quantifiable non-capital costs not covered under Materials/Supplies, Contracts, Utilities, or In-House Labor that are directly attributable to operating and maintaining PTC.<sup>3</sup>

To minimize errors arising from differences in how questions might be interpreted and to reduce variability in responses due to misinterpretation,

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<sup>2</sup>Our full survey can be found in appendix II.

<sup>3</sup>Although our survey collected information for 5 cost categories, we are only reporting estimated total costs, as agencies did not consistently report costs at the category level.

we conducted pretests with officials from five commuter rail agencies. We selected the pretest participants to reflect a range of commuter rail system sizes, and to include commuter rail agencies that do and do not contract out their PTC operations and maintenance. We revised our survey based on feedback we obtained during these discussions.

To reduce nonresponse bias, we followed up by phone and/or e-mail with commuter rail agencies who had not responded to the survey to encourage them to complete it. After closing the web survey, we reviewed the 26 completed questionnaires to check for data entry errors, missing values, and unclear responses. Based on this review, we conducted further follow-up with respondents to clarify their responses and increase the quality of the survey data. Based on our analysis of the submitted cost data, we determined that we received full-year, complete estimates from 15 agencies for fiscal year 2020, 14 agencies for fiscal year 2021, and 17 agencies for fiscal years 2022–2025. We determined this by ensuring that the estimates provided were (1) for a full fiscal year of costs and (2) included all cost categories or sufficient reasons as to why a category was not included (e.g., these costs were included in another category).<sup>4</sup>

Our survey contained a mixture of open- and closed-ended questions. The survey design ensured agencies only responded to questions applicable to their situations. As a result, the number of responses for each question varied; we accounted for this in our analysis of the survey responses. We conducted quantitative analysis of the cost data provided and developed descriptive statistics for the ranges of costs in total. We compared the costs to the size of the agency using ridership and route miles in PTC operation as proxies, and to its total O&M costs as reported in the NTD. The distributions of fiscal year 2022 costs, calendar year 2022 ridership, and route miles in PTC operation as of 2020 were heavily skewed due to several extreme outliers representing large commuter rail systems. To account for these outliers in our analysis, we rescaled each variable by applying natural log transformations to the variables to make the relationship linear before calculating Pearson correlation and ordinary least squares regression coefficients. The re-scaled variables help illustrate the tendency of costs to increase as ridership or route miles in PTC operation increased.

We conducted a content analysis of the survey responses to selected open-ended questions, and we reviewed the responses to the other open-

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<sup>4</sup>There were instances in which an agency did not provide an actual cost or estimated cost for a category but had a complete estimate. Specifically, an agency might not have provided costs for a category because it had provided this cost within another category. For example, contracts and agreements sometimes included materials and supplies costs.

ended questions to identify illustrative examples. To conduct the content analysis, one analyst reviewed the responses and categorized them, and a second analyst reviewed these categorizations. When the second analyst disagreed with the first analyst's categorization, the two analysts discussed the discrepancy and resolved it.

To obtain general information on commuter railroads, PTC, and PTC O&M costs, we reviewed previous GAO reports. We also reviewed applicable statutes and regulations to identify any O&M funding available to commuter railroads for operating and maintaining PTC; any data collection and reporting requirements related to PTC; and the Federal Railroad Administration's (FRA) and FTA's roles in data collection and reporting of PTC costs. Further, we conducted an analysis of commuter rail agencies' public financial documents to determine if any commuter rail agencies publicly reported PTC O&M costs. Finally, we searched publication databases for relevant literature.

To gather general information about operating and maintaining PTC systems—and the associated costs—we interviewed Department of Transportation (DOT) officials from FRA and FTA, five selected commuter rail agencies, a private company that provides PTC services to commuter rail agencies, and other stakeholders such as the American Public Transportation Association and the Commuter Rail Coalition. We selected these five commuter rail agencies to obtain a mixture of geographic location, agency size, and type of PTC system used. We also considered the recommendations of stakeholders when selecting these agencies for interviews.

We conducted this performance audit from October 2022 to January 2024 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.

# Appendix II: Survey Questions Distributed to Commuter Rail Agencies

*For reference only – please complete and submit web questionnaire for this survey*

## Positive Train Control Costs

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1. Agency Information (p. 2)  
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4. Contracts / Agreements (p. 6)  
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End of Survey

### INTRODUCTION

The Infrastructure Investment and Jobs Act included a provision directing the Government Accountability Office (GAO) to issue a report including commuter railroads' estimated annual positive train control (PTC) operation and maintenance (O&M) costs. The purpose of this survey is to collect (1) commuter railroads' estimated PTC O&M costs, (2) commuter railroads' data sources and methodologies used to produce their estimates, and (3) any challenges associated with estimating PTC O&M costs.

Thank you in advance for your help and cooperation.

If you have questions or need more information, please contact Sarah Jones at 202-512-4842 or [JonesSR@gao.gov](mailto:JonesSR@gao.gov).

Please navigate this survey using the forward and back buttons when possible to ensure you do not miss any questions.

Some questions will be hidden or displayed depending on your answers to earlier questions.

**Appendix II: Survey Questions Distributed to Commuter Rail Agencies**

*For reference only – please complete and submit web questionnaire for this survey*

**1. AGENCY INFORMATION**

Q1.1. This survey asks you to provide information about the following commuter rail agency: *agency name*.

Who is the person primarily responsible for completing this questionnaire, whom we can contact in case we need to clarify a response?

Name \_\_\_\_\_  
Email \_\_\_\_\_  
Phone \_\_\_\_\_

Q1.2. What is your agency's fiscal year? (MM/DD - MM/DD)

	Start of Fiscal Year		End of Fiscal Year	
	Month (##)	Day (##)	Month (##)	Day (##)
Please enter dates (##)				

Q1.3. Does your agency publicly report or make publicly available any PTC O&M costs, separate from total O&M costs?

- Yes, we report **all** PTC O&M costs separately from total O&M costs
- Yes, we report **some** separate PTC O&M costs, but not all
- No
- Other (please specify): \_\_\_\_\_

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## Appendix II: Survey Questions Distributed to Commuter Rail Agencies

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*For reference only – please complete and submit web questionnaire for this survey*

### 2. INSTRUCTIONS

#### PTC O&M COSTS

In sections 3-8, we are asking you to provide your actual and/or estimated annual Positive Train Control (PTC) Operation and Maintenance (O&M) costs from FY2020 to FY2022, as well as projected PTC O&M costs for FY2023 to FY2025. We know some commuter rail agencies do not track PTC O&M costs separately from overall O&M, so completing this survey may require you to compile or estimate these costs.

To facilitate our data collection, we have selected PTC-related expense categories that link to NTD object classes from the Operating Expenses portion of FTA's Uniform System of Accounts (USOA) that your agency already uses when reporting to the National Transit Database (NTD). You should distinguish PTC O&M costs from capital costs using the same criteria that the USOA uses to distinguish Operating Expenses from Capital Expenses.

Please provide PTC O&M costs for the following categories:

1. **Materials and Supplies** – Portion of non-capital material and supply costs, such as hardware, software, and other equipment attributable to operating and maintaining PTC.
2. **Contracts and Agreements** – If your agency contracts with other companies or railroads for maintenance, technical support, or back office, this is the portion of those contract costs attributable to operating and maintaining PTC.
3. **In-House Labor** – Fully-burdened cost of in-house labor hours spent operating and maintaining PTC for both dedicated and partially dedicated PTC staff.
4. **Utilities** – Portion of utilities directly attributable to PTC, such as for cell service or fiber networks needed to operate PTC.
5. **Miscellaneous** – Portion of quantifiable non-capital costs not covered under Materials/Supplies, Contracts, or In-House Labor that are directly attributable to operating and maintaining PTC.  
You will find the definitions of each expense category on the following pages as well as examples of the PTC O&M-related costs they may include. For more information on the expense category and the USOA generally, visit <https://www.transit.dot.gov/ntd/ntd-uniform-system-accounts>.

#### DATA ENTRY INSTRUCTIONS

For each category:

1. Only include a cost once. Do not report it under multiple categories.
2. For each reported total amount, please indicate whether that amount covers the full fiscal year, a partial fiscal year (for example, if PTC was not fully implemented at the beginning of the year), or whether there were no PTC O&M costs associated with that fiscal year (for example, if PTC was not fully implemented at any point during the year.)
3. Contracted labor should be reported under the contracts and agreements category, not in-house labor.
4. The total amounts should be reported in whole dollars.
5. For estimates, the methodology description may include, but not be limited to, the data source, estimating methodology, assumptions, and inflation index.
6. Do not include costs or expenses that are capitalized.
7. Projections for FY23 – 25 should be in budget year dollars, meaning that the data are adjusted for inflation, so, for example, all data is in FY23 dollars.

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**Appendix II: Survey Questions Distributed to Commuter Rail Agencies**

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**3. MATERIALS AND SUPPLIES**

**Definition:** The portion of non-capital material and supply costs attributable to operating and/or maintaining PTC. The expenses in this category are for products obtained from outside suppliers or those manufactured internally for the purpose of operating or maintaining PTC. The total reported costs should include shipping costs, purchase discounts, cash discounts, sales taxes, and excise taxes.

**Examples:** Acquisition costs for hardware repair parts for PTC onboard computer, software, PTC-related wayside equipment that are not capitalized. This might include non-capitalized software updates, upgrades, and license fees not included in other categories.

**NTD Object Class:** 5039

Q3.1. Can your agency provide actual PTC O&M costs for the **Materials and Supplies** category for any of the fiscal years 2020-2022?

- Yes, we can provide **actual** costs [Continue with Q3.2](#)
- No, we cannot provide actual costs, but we can provide **estimated costs** at a moderate or high level of confidence. [Skip to Q3.4](#)
- No, we cannot provide either actual costs or estimated costs at a moderate or high level of confidence. [Skip to Q3.6](#)

*Display This Question If: Q3.1 = Yes, we can provide actual costs:*

Q3.2. Please provide the total PTC O&M costs for the **Materials and Supplies** category for each fiscal year in the table below.

	Total amount (\$)	Coverage		
		Full year	Partial year	No costs associated with this FY
FY20		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
FY21		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
FY22		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

*Display This Question If: Q3.1 = Yes, we can provide actual costs:*

Q3.3. Could you please describe the data sources you used to determine the total PTC O&M costs for the **Materials and Supplies** category (e.g. your financial system, invoices, other documents, etc.)?

\_\_\_\_\_



**Appendix II: Survey Questions Distributed to Commuter Rail Agencies**

*For reference only – please complete and submit web questionnaire for this survey*

*Display This Question If: Q3.1 = No, we cannot provide actual costs, but we can provide estimated costs at a moderate or high level of confidence:*

Q3.4. Please provide the estimated PTC O&M costs for the **Materials and Supplies** category for each fiscal year in the table below. You may provide this estimate as a single dollar amount or as a range that you are at least moderately confident contains the actual dollar amount.

	Total amount (\$) or range (\$-\$)	Coverage		
		Full year	Partial year	No costs associated with this FY
FY20				
FY21				
FY22				

*Display This Question If: Q3.1 = No, we cannot provide actual costs, but we can provide estimated costs at a moderate or high level of confidence:*

Q3.5. Please provide a description of the methodology you used to develop the reported estimated amounts for the **Materials and Supplies** category, including any limitations we should consider when using these estimates in our analysis.

\_\_\_\_\_

*Display This Question If: Q3.1 = No, we cannot provide either actual costs or estimated costs at a moderate or high level of confidence:*

Q3.6. Please explain why not:

\_\_\_\_\_

Q3.7. Are you able to provide **projected costs** or a range of projected costs for the **Materials and Supplies** category for fiscal years 2023-2025 with moderate to high confidence?

- Yes, we can provide projected costs or a range of projected costs. [Continue with Q3.8](#)
- No, we cannot provide either projected costs or a range of projected costs. [Skip to Q3.10](#)

*Display This Question If: Q3.7 = Yes, we can provide projected costs or a range of projected costs:*

Q3.8. Please provide the total projected PTC O&M costs for the **Materials and Supplies** category for FY23-25 in the table below. You may provide this estimate as a single dollar amount or as a range that you are at least moderately confident contains the actual dollar amount.

	Total amount (\$) or range (\$-\$)
FY23	
FY24	
FY25	

**Appendix II: Survey Questions Distributed to Commuter Rail Agencies**

*For reference only – please complete and submit web questionnaire for this survey*

*Display This Question If: Q3.7 = Yes, we can provide projected costs or a range of projected costs.*

Q3.9. Please describe how your agency developed these projections:

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*Display This Question If: Q3.7 = No, we cannot provide either projected costs or a range of projected costs.*

Q3.10. Please explain why not:

---

**4. CONTRACTS/AGREEMENTS**

**Definition:** The portion of costs for contracts and/or agreements with other entities to provide services that involve operating and/or maintaining PTC. This consists of the labor and other work provided by outside organizations for fees and related expenses.

**Examples:** PTC portion of a maintenance contract, PTC service contracts, the PTC portions of a host-tenant agreement, PTC consultants and engineering services contracts.

**NTD Object Class:** 5020

Q4.1. Can your agency provide actual PTC O&M costs for the **Contracts/Agreements** category for any of the fiscal years 2020-2022?

- Yes, we can provide **actual costs**. [Continue with Q4.2](#)
- No, we cannot provide actual costs, but we can provide **estimated costs** at a moderate or high level of confidence. [Skip to Q4.4](#)
- No, we cannot provide either actual costs or estimated costs at a moderate or high level of confidence. [Skip to Q4.6](#)

*Display This Question If: Q4.1 = Yes, we can provide actual costs*

Q4.2. Please provide the total PTC O&M costs for the **Contracts/Agreements** category for each fiscal year in the table below.

	Total amount (\$)	Coverage		
		Full year	Partial year	No costs associated with this FY
FY20		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
FY21		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
FY22		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**Appendix II: Survey Questions Distributed to Commuter Rail Agencies**

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*Display This Question If: Q4.1 = Yes, we can provide actual costs.*

Q4.3. Could you please describe the data sources you used to determine the total PTC O&M costs for the **Contracts/Agreement** category (e.g. your financial system, invoices, other documents, etc.)?

\_\_\_\_\_

*Display This Question If: Q4.1 = No, we cannot provide actual costs, but we can provide estimated costs at a moderate or high level of confidence.*

Q4.4. Please provide the estimated PTC O&M costs for the **Contracts/Agreements** category for each fiscal year in the table below. You may provide this estimate as a single dollar amount or as a range that you are at least moderately confident contains the actual dollar amount.

	Total amount (\$) or range (\$-\$)	Coverage		
		Full year	Partial year	No costs associated with this FY
FY20		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
FY21		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
FY22		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

*Display This Question If: Q4.1 = No, we cannot provide actual costs, but we can provide estimated costs at a moderate or high level of confidence.*

Q4.5. Please provide a description of the methodology you used to develop the reported estimated amounts for the **Contracts/Agreements** category, including any limitations we should consider when using these estimates in our analysis.

\_\_\_\_\_

*Display This Question If: Q4.1 = No, we cannot provide either actual costs or estimated costs at a moderate or high level of confidence.*

Q4.6. Please explain why not:

\_\_\_\_\_

Q4.7. Can your agency provide **projected costs** or a range of projected costs for the **Contracts/Agreements** category for fiscal years 2023-2025 with moderate to high confidence?

- Yes, we can provide projected costs or a range of projected costs. [Continue with Q4.8](#)
- No, we cannot provide either projected costs or a range of projected costs. [Skip to Q4.10](#)

**Appendix II: Survey Questions Distributed to Commuter Rail Agencies**

*For reference only – please complete and submit web questionnaire for this survey*

*Display This Question If: Q4.7 = Yes, we can provide projected costs or a range of projected costs.*

Q4.8. Please provide the total projected PTC O&M costs for the **Contracts/Agreements** category for FY23-25 in the table below. You may provide this estimate as a single dollar amount or as a range that you are at least moderately confident contains the actual dollar amount.

	Total amount (\$) or range (\$-\$)
FY23	
FY24	
FY25	

*Display This Question If: Q4.7 = Yes, we can provide projected costs or a range of projected costs.*

Q.4.9. Please describe how your agency developed these projections:

\_\_\_\_\_

*Display This Question If: Q4.7 = No, we cannot provide either projected costs or a range of projected costs.*

Q.4.10. Please explain why not:

\_\_\_\_\_

**5. IN-HOUSE LABOR**

In this section we will first ask you to provide cost information for staff **dedicated full-time** to PTC operations and/or maintenance.

Next, we will ask you to provide cost information for staff who spend **only part of their time** on PTC operations and/or maintenance.

**Definition:** Fully-burdened (i.e. includes pay, paid absences, and benefits) cost of in-house labor hours attributable to operating and maintaining PTC.

**Example:** A full-time dedicated PTC staff member may work at the PTC support desk. A partially dedicated staff member may maintain signaling systems, which sometimes includes maintenance of PTC components.

**NTD Object Classes:** 5013, 5014, & 5015

Q5.1. Does your agency employ any staff whose roles are **entirely or almost entirely dedicated** to operating and/or maintaining your PTC system, for example, someone who works in the PTC support desk or is responsible for overseeing PTC for the agency?

Yes

No [Skip to Q5.12](#)

**Appendix II: Survey Questions Distributed to Commuter Rail Agencies**

*For reference only – please complete and submit web questionnaire for this survey*

Q5.2. Can your agency provide actual fully-burdened costs related to PTC O&M for these **dedicated staff** for any of the fiscal years 2020-2022?

- Yes, we can provide actual costs. [Continue with Q5.3](#)
- No, we cannot provide actual costs, but we can provide estimated costs at a moderate or high level of confidence. [Skip to Q5.5](#)
- No, we cannot provide either actual costs or estimated costs at a moderate or high level of confidence. [Skip to Q5.7](#)

*Display This Question If: Q5.2 = Yes, we can provide actual costs*

Q5.3. Please provide the total fully burdened PTC O&M costs for **PTC-dedicated staff** for each fiscal year in the table below.

	Total amount (\$)	Coverage		
		Full year	Partial year	No costs associated with this FY
FY20		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
FY21		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
FY22		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

*Display This Question If: Q5.2 = Yes, we can provide actual costs*

Q.5.4. Could you please describe the data sources you used to determine the total actual costs for **PTC-dedicated staff** (e.g. your financial system, invoices, other documents, etc.)?

\_\_\_\_\_

**Appendix II: Survey Questions Distributed to Commuter Rail Agencies**

*For reference only – please complete and submit web questionnaire for this survey*

*Display This Question If: Q5.2 = No, we cannot provide actual costs, but we can provide estimated costs at a moderate or high level of confidence.*

Q.5.5. Please provide the estimated fully burdened PTC O&M costs for **PTC-dedicated staff** for each fiscal year in the table below. You may provide this estimate as a single dollar amount or as a range that you are at least moderately confident contains the actual dollar amount.

	Total amount (\$) or range (\$-\$)	Coverage		
		Full year	Partial year	No costs associated with this FY
FY20		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
FY21		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
FY22		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

*Display This Question If: Q5.2 = No, we cannot provide actual costs, but we can provide estimated costs at a moderate or high level of confidence.*

Q5.6. Please provide a description of the methodology you used to develop the reported estimated amounts, including any limitations we should consider when using these estimates in our analysis.

\_\_\_\_\_

*Display This Question If: Q5.2 = No, we cannot provide either actual costs or estimated costs at a moderate or high level of confidence.*

Q5.7. Please explain why not:

\_\_\_\_\_

Q5.8. Can your agency provide projected PTC O&M fully-burdened costs for these **PTC-dedicated staff** for fiscal years 2023-2025 with moderate or high confidence?

- Yes, we can provide projected costs or a range of projected costs. [Continue with Q5.9](#)
- No, we cannot provide either projected costs or a range of projected costs. [Skip to Q5.11](#)

*Display This Question If: Q5.8 = Yes, we can provide projected costs or a range of projected costs.*

Q5.9. Please provide the total projected fully-burdened PTC O&M costs for **PTC-dedicated staff** for FY23-25 in the table below. You may provide this estimate as a single dollar amount or as a range that you are at least moderately confident contains the actual dollar amount.

	Total amount (\$) or range (\$-\$)
FY23	
FY24	
FY25	

**Appendix II: Survey Questions Distributed to Commuter Rail Agencies**

*For reference only – please complete and submit web questionnaire for this survey*

*Display This Question If: Q5.8 = Yes, we can provide projected costs or a range of projected costs.*

Q5.10. Please describe how your agency developed these projections:

\_\_\_\_\_

*Display This Question If: Q5.8 = No, we cannot provide either projected costs or a range of projected costs.*

Q5.11. Please explain why not:

\_\_\_\_\_

Q5.12. Does your agency employ any in-house staff whose roles are **not dedicated full-time** to PTC, but who do spend at least **some of their time** operating and/or maintaining your PTC system?

- Yes *Continue with Q5.13*
- No *Skip to Section 6*

*Display This Question If: Q5.12 = Yes*

Q5.13. Can your agency provide actual fully-burdened costs related to PTC O&M for the hours these staff spend operating and/or maintaining PTC for any of the fiscal years 2020-2022?

Note: This question refers specifically to staff who spend **only some of their time** on PTC O&M operation and maintenance.

- Yes, we can provide **actual costs**. *Continue with Q5.14*
- No, we cannot provide actual costs, but we can provide **estimated costs** at a moderate or high level of confidence. *Skip to Q5.16*
- No, we cannot provide either actual costs or estimated costs at a moderate or high level of confidence. *Skip to Q5.18*

**Appendix II: Survey Questions Distributed to Commuter Rail Agencies**

*For reference only – please complete and submit web questionnaire for this survey*

*Display This Question If: Q5.13 = Yes, we can provide actual costs*

Q5.14. Please provide the total fully-burdened PTC O&M costs for staff who spend **only some of their time** dedicated to PTC O&M for each fiscal year in the table below.

	Total amount (\$)	Coverage		
		Full year	Partial year	No costs associated with this FY
FY20		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
FY21		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
FY22		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

*Display This Question If: Q5.13 = Yes, we can provide actual costs*

Q.5.15. Could you please describe the data sources you used to determine the total actual costs for staff who spend **only some of their time** dedicated to PTC O&M (e.g. your financial system, invoices, other documents, etc.)?

\_\_\_\_\_

*Display This Question If: Q5.13 = No, we cannot provide actual costs, but we can provide estimated costs at a moderate or high level of confidence.*

Q5.16. Please provide the estimated fully-burdened PTC O&M costs for staff who spend **only some of their time** dedicated to PTC O&M for each fiscal year in the table below. You may provide this estimate as a single dollar amount or as a range that you are at least moderately confident contains the actual dollar amount.

	Total amount (\$) or range (\$-\$)	Coverage		
		Full year	Partial year	No costs associated with this FY
FY20				
FY21				
FY22				

*Display This Question If: Q5.13 = No, we cannot provide actual costs, but we can provide estimated costs at a moderate or high level of confidence.*

Q5.17. Please provide a description of the methodology you used to develop the reported estimated amounts, including any limitations we should consider when using these estimates in our analysis.

\_\_\_\_\_

*Display This Question If: Q5.13 = No, we cannot provide either actual costs or estimated costs at a moderate or high level of confidence.*

Q5.18. Please explain why not:

\_\_\_\_\_



**Appendix II: Survey Questions Distributed to Commuter Rail Agencies**

*For reference only – please complete and submit web questionnaire for this survey*

Q5.19. Are you able to provide **projected PTC O&M fully-burdened costs** for staff who spend at **only some of their time** dedicated to PTC O&M for fiscal years 2023-2025 with moderate or high confidence?

- Yes, we can provide projected costs or a range of projected costs. [Continue with Q5.20](#)
- No, we cannot provide either projected costs or a range of projected costs. [Skip to Q5.22](#)

*Display This Question If: Q5.19 = Yes, we can provide projected costs or a range of projected costs.*

Q5.20. Please provide the total **projected fully burdened PTC O&M costs** for staff who spend **only some of their time** dedicated to PTC O&M for FY23-25 in the table below. You may provide this estimate as a single dollar amount or as a range that you are at least moderately confident contains the actual dollar amount.

	Total amount (\$) or range (\$-\$)
FY23	
FY24	
FY25	

*Display This Question If: Q5.19 = Yes, we can provide projected costs or a range of projected costs.*

Q5.21. Please describe how your agency developed these projections:

\_\_\_\_\_

*Display This Question If: Q5.19 = No, we cannot provide either projected costs or a range of projected costs.*

Q5.22. Please explain why not:

\_\_\_\_\_

**Appendix II: Survey Questions Distributed to Commuter Rail Agencies**

*For reference only – please complete and submit web questionnaire for this survey*

**6. UTILITIES**

**Definition:** Utilities include expenses for telephone and internet.

**Example:** Internet service for back-office computers dedicated to PTC, cell service, fiber internet service, or spectrum license for PTC signaling

**NTD Object Class:** 5040

Q6.1. Can your agency provide actual PTC O&M costs for the **Utilities** category for any of the fiscal years 2020-2022?

- Yes, we can provide **actual costs**. [Continue with Q6.2](#)
- No, we cannot provide actual costs, but we can provide **estimated costs** at a moderate or high level of confidence. [Skip to Q6.4](#)
- No, we cannot provide either actual costs or estimated costs at a moderate or high level of confidence. [Skip to Q6.6](#)

*Display This Question If: Q6.1 = Yes, we can provide actual costs*

Q6.2. Please provide the total PTC O&M costs for the **Utilities** category for each fiscal year in the table below.

	Total amount (\$)	Coverage		
		Full year	Partial year	No costs associated with this FY
FY20		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
FY21		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
FY22		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

*Display This Question If: Q6.1 = Yes, we can provide actual costs*

Q6.3. Could you please describe the data sources you used to determine the total PTC O&M costs for the **Utilities** category (e.g. your financial system, invoices, other documents, etc.)?

\_\_\_\_\_

**Appendix II: Survey Questions Distributed to Commuter Rail Agencies**

*For reference only – please complete and submit web questionnaire for this survey*

*Display This Question If: Q6.1 = No, we cannot provide actual costs, but we can provide estimated costs at a moderate or high level of confidence.*

Q6.4. Please provide the estimated PTC O&M costs for the **Utilities** category for each fiscal year in the table below. You may provide this estimate as a single dollar amount or as a range that you are at least moderately confident contains the actual dollar amount.

	Total amount (\$) or range (\$-\$)	Coverage		
		Full year	Partial year	No costs associated with this FY
FY20				
FY21				
FY22				

*Display This Question If: Q6.1 = No, we cannot provide actual costs, but we can provide estimated costs at a moderate or high level of confidence.*

Q6.5. Please provide a description of the methodology you used to develop the reported estimated amounts, including any limitations we should consider when using these estimates in our analysis.

\_\_\_\_\_

*Display This Question If: Q6.1 = No, we cannot provide either actual costs or estimated costs at a moderate or high level of confidence.*

Q6.6. Please explain why not:

\_\_\_\_\_

Q6.7. Are you able to provide **projected costs** or a range of projected costs for the **Utilities** category for fiscal years 2023-2025 with moderate to high confidence?

- Yes, we can provide projected costs or a range of projected costs. [Continue with Q6.8](#)
- No, we cannot provide either projected costs or a range of projected costs. [Skip to Q6.10](#)

*Display This Question If: Q6.7 = Yes, we can provide projected costs or a range of projected costs.*

Q6.8. Please provide the total projected PTC O&M costs for the **Utilities** category for FY23-25 in the table below. You may provide this estimate as a single dollar amount or as a range that you are at least moderately confident contains the actual dollar amount.

	Total amount (\$) or range (\$-\$)
FY23	
FY24	
FY25	

*Display This Question If: Q6.7 = Yes, we can provide projected costs or a range of projected costs.*

Q6.9. Please describe how your agency developed these projections:

\_\_\_\_\_

**Appendix II: Survey Questions Distributed to Commuter Rail Agencies**

*For reference only – please complete and submit web questionnaire for this survey*

*Display This Question If: Q6.7 = No, we cannot provide either projected costs or a range of projected costs.*

Q6.10. Please explain why not:

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**7. MISCELLANEOUS**

**Definition:** Portion of quantifiable non-capital costs not covered under Materials/Supplies, Contracts, In-House Labor, or Utilities that are directly attributable to operating and maintaining PTC.

**NTD Object Class:** 5090

Q7.1. Does your agency have any quantifiable costs directly related to operating and/or maintaining PTC that you have not already reported on in this survey?

- Yes [Continue with Q7.2](#)
- No [Skip to Section 8](#)

*Display This Question If: Q7.1 = Yes*

Q7.2. Please list and briefly describe up to three of the largest types of quantifiable costs directly related to operating and/or maintaining PTC that you have not already reported on in this survey.

	Brief Description	Type of cost
1.		
2.		
3.		

*Display This Question If: Q7.2 = at least one brief description of other costs*

Q7.3. Can your agency provide actual PTC O&M costs for any of the fiscal years 2020-2022 for the *first type* of additional cost that you listed: **Brief Description #1**

- Yes, we can provide **actual costs**. [Continue with Q7.4](#)
- No, we cannot provide actual costs, but we can provide **estimated costs** at a moderate or high level of confidence. [Skip to Q7.6](#)
- No, we cannot provide either actual costs or estimated costs at a moderate or high level of confidence. [Skip to Q7.8](#)

**Appendix II: Survey Questions Distributed to Commuter Rail Agencies**

*For reference only – please complete and submit web questionnaire for this survey*

*Display This Question If: Q7.3 = Yes, we can provide actual costs*

**Q7.4.** Please provide the total PTC O&M costs for each fiscal year in the table below for the *first type* of additional cost that you listed: **Brief Description #1**

	Total amount (\$)	Coverage		
		Full year	Partial year	No costs associated with this FY
FY20		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
FY21		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
FY22		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

*Display This Question If: Q7.3 = Yes, we can provide actual costs*

**Q7.5.** Could you please describe the data sources (e.g. your financial system, invoices, other documents, etc.) that you used to determine the total PTC O&M costs for the *first type* of additional cost that you listed: **Brief Description #1**

\_\_\_\_\_

*Display This Question If: Q7.3 = No, we cannot provide actual costs, but we can provide estimated costs at a moderate or high level of confidence.*

**Q7.6.** In the table below, please provide the estimated PTC O&M costs for each fiscal year for the *first type* of additional cost that you provided: **Brief Description #1**

You may provide this estimate as a single dollar amount or as a range that you are at least moderately confident contains the actual dollar amount.

	Total amount (\$) or range (\$-\$)	Coverage		
		Full year	Partial year	No costs associated with this FY
FY20				
FY21				
FY22				

*Display This Question If: Q7.3 = No, we cannot provide actual costs, but we can provide estimated costs at a moderate or high level of confidence.*

**Q7.7.** Please provide a description of the methodology you used to develop the reported estimated amounts, including any limitations we should consider when using these estimates in our analysis.

\_\_\_\_\_

*Display This Question If: Q7.3 = No, we cannot provide either actual costs or estimated costs at a moderate or high level of confidence.*

**Q7.8.** Please explain why not:

\_\_\_\_\_

**Appendix II: Survey Questions Distributed to Commuter Rail Agencies**

*For reference only – please complete and submit web questionnaire for this survey*

*Display This Question If: Q7.2 = at least one brief description of other costs*

Q7.9. Are you able to provide **projected costs** or a range of projected costs for fiscal years 2023-2025 with moderate to high confidence for the *first type* of additional cost that you provided: **Brief Description #1**?

- Yes, we can provide projected costs or a range of projected costs. [Continue with Q7.10](#)
- No, we cannot provide either projected costs or a range of projected costs. [Skip to Q7.12](#)

*Display This Question If: Q7.9 = Yes, we can provide projected costs or a range of projected costs.*

Q7.10. In the table below, please provide the total projected PTC O&M costs for each fiscal year for the *first type* of additional cost that you provided: **Brief Description #1**

You may provide this estimate as a single dollar amount or as a range that you are at least moderately confident contains the actual dollar amount.

	Total amount (\$) or range (\$-\$)
FY23	
FY24	
FY25	

*Display This Question If: Q7.9 = Yes, we can provide projected costs or a range of projected costs.*

Q7.11. Please describe how your agency developed these projections:

\_\_\_\_\_

*Display This Question If: Q7.9 = No, we cannot provide either projected costs or a range of projected costs.*

Q7.12. Please explain why not:

\_\_\_\_\_

*Display This Question If: Q7.2 = at least a 2nd brief description of other costs*

Q7.13. Can your agency provide actual PTC O&M costs for any of the fiscal years 2020-2022 for the *second type* of additional cost that you listed: **Brief Description #2**

- Yes, we can provide **actual costs**. [Continue with Q7.14](#)
- No, we cannot provide actual costs, but we can provide **estimated costs** at a moderate or high level of confidence. [Skip to Q7.16](#)
- No, we cannot provide either actual costs or estimated costs at a moderate or high level of confidence. [Skip to Q7.18](#)

**Appendix II: Survey Questions Distributed to Commuter Rail Agencies**

*For reference only – please complete and submit web questionnaire for this survey*

*Display This Question If: Q7.13 = Yes, we can provide actual costs*

Q7.14. Please provide the total PTC O&M costs for each fiscal year in the table below for the *second type* of additional cost that you listed: **Brief Description #2**

	Total amount (\$)	Coverage		
		Full year	Partial year	No costs associated with this FY
FY20		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
FY21		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
FY22		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

*Display This Question If: Q7.13 = Yes, we can provide actual costs*

Q7.15. Could you please describe the data sources (e.g. your financial system, invoices, other documents, etc.) that you used to determine the total PTC O&M costs for the *second type* of additional cost that you listed: **Brief Description #2**

\_\_\_\_\_

*Display This Question If: Q7.13 = No, we cannot provide actual costs, but we can provide estimated costs at a moderate or high level of confidence.*

Q7.16. In the table below, please provide the estimated PTC O&M costs for each fiscal year for the *second type* of additional cost that you provided: **Brief Description #2**

You may provide this estimate as a single dollar amount or as a range that you are at least moderately confident contains the actual dollar amount.

	Total amount (\$) or range (\$-\$)	Coverage		
		Full year	Partial year	No costs associated with this FY
FY20				
FY21				
FY22				

*Display This Question If: Q7.13 = No, we cannot provide actual costs, but we can provide estimated costs at a moderate or high level of confidence.*

Q7.17. Please provide a description of the methodology you used to develop the reported estimated amounts, including any limitations we should consider when using these estimates in our analysis.

\_\_\_\_\_

**Appendix II: Survey Questions Distributed to Commuter Rail Agencies**

*For reference only – please complete and submit web questionnaire for this survey*

*Display This Question If: Q7.13 = No, we cannot provide either actual costs or estimated costs at a moderate or high level of confidence.*

Q7.18. Please explain why not:

\_\_\_\_\_

*Display This Question If: Q7.2 = at least a 2nd brief description of other costs*

Q7.19. Are you able to provide **projected costs** or a range of projected costs for fiscal years 2023-2025 with moderate to high confidence for the *second type* of additional cost that you provided: **Brief Description #2**

- Yes, we can provide projected costs or a range of projected costs. [Continue with Q7.20](#)
- No, we cannot provide either projected costs or a range of projected costs. [Skip to Q7.22](#)

*Display This Question If: Q7.19 = Yes, we can provide projected costs or a range of projected costs.*

Q7.20. In the table below, please provide the total projected PTC O&M costs for each fiscal year for the *second type* of additional cost that you provided: **Brief Description #2**

You may provide this estimate as a single dollar amount or as a range that you are at least moderately confident contains the actual dollar amount.

	Total amount (\$) or range (\$-\$)
FY23	
FY24	
FY25	

*Display This Question If: Q7.19 = Yes, we can provide projected costs or a range of projected costs.*

Q7.21. Please describe how your agency developed these projections:

\_\_\_\_\_

*Display This Question If: Q7.19 = No, we cannot provide either projected costs or a range of projected costs.*

Q7.22. Please explain why not:

\_\_\_\_\_



**Appendix II: Survey Questions Distributed to Commuter Rail Agencies**

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*Display This Question If: Q7.2 = a 3rd brief description of other costs*

Q7.23. Can your agency provide actual PTC O&M costs for any of the fiscal years 2020-2022 for the *third* type of additional cost that you listed: **Brief Description #3**

- Yes, we can provide **actual costs**. [Continue with Q7.24](#)
- No, we cannot provide actual costs, but we can provide **estimated costs** at a moderate or high level of confidence. [Skip to Q7.26](#)
- No, we cannot provide either actual costs or estimated costs at a moderate or high level of confidence. [Skip to Q7.28](#)

*Display This Question If: Q7.23 = Yes, we can provide actual costs*

Q7.24. Please provide the total PTC O&M costs for each fiscal year in the table below for the *third* type of additional cost that you listed: **Brief Description #3**

	Total amount (\$)	Coverage		
		Full year	Partial year	No costs associated with this FY
FY20		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
FY21		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
FY22		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

*Display This Question If: Q7.23 = Yes, we can provide actual costs*

Q7.25. Could you please describe the data sources (e.g. your financial system, invoices, other documents, etc.) that you used to determine the total PTC O&M costs for the *third* type of additional cost that you listed: **Brief Description #3**

\_\_\_\_\_

*Display This Question If: Q7.23 = No, we cannot provide actual costs, but we can provide estimated costs at a moderate or high level of confidence.*

Q7.26. In the table below, please provide the estimated PTC O&M costs for each fiscal year for the *third* type of additional cost that you provided: **Brief Description #3**

You may provide this estimate as a single dollar amount or as a range that you are at least moderately confident contains the actual dollar amount.

	Total amount (\$) or range (\$-\$)	Coverage		
		Full year	Partial year	No costs associated with this FY
FY20				
FY21				
FY22				

**Appendix II: Survey Questions Distributed to Commuter Rail Agencies**

*For reference only – please complete and submit web questionnaire for this survey*

*Display This Question If: Q7.23 = No, we cannot provide actual costs, but we can provide estimated costs at a moderate or high level of confidence.*

Q7.27. Please provide a description of the methodology you used to develop the reported estimated amounts, including any limitations we should consider when using these estimates in our analysis.

\_\_\_\_\_

*Display This Question If: Q7.23 = No, we cannot provide either actual costs or estimated costs at a moderate or high level of confidence.*

Q7.28. Please explain why not:

\_\_\_\_\_

*Display This Question If: Q7.2 = a 3rd brief description of other costs*

Q7.29. Are you able to provide **projected costs** or a range of projected costs for fiscal years 2023-2025 with moderate to high confidence for the *third type* of additional cost that you provided: **Brief Description #3**

- Yes, we can provide projected costs or a range of projected costs. [Continue with Q7.30](#)
- No, we cannot provide either projected costs or a range of projected costs. [Skip to Q7.32](#)

*Display This Question If: Q7.29 = Yes, we can provide projected costs or a range of projected costs.*

Q7.30. In the table below, please provide the total projected PTC O&M costs for each fiscal year for the *third type* of additional cost that you provided: **Brief Description #3**

You may provide this estimate as a single dollar amount or as a range that you are at least moderately confident contains the actual dollar amount.

	Total amount (\$) or range (\$-\$)
FY23	
FY24	
FY25	

*Display This Question If: Q7.29 = Yes, we can provide projected costs or a range of projected costs.*

Q7.31. Please describe how your agency developed these projections:

\_\_\_\_\_

*Display This Question If: Q7.29 = No, we cannot provide either projected costs or a range of projected costs.*

Q7.32. Please explain why not:

\_\_\_\_\_

**Appendix II: Survey Questions Distributed to Commuter Rail Agencies**

*For reference only – please complete and submit web questionnaire for this survey*

**8. ADDITIONAL COST-RELATED QUESTIONS**

You have finished entering your agency's quantifiable costs directly related to PTC O&M. The following sections ask for **narrative answers** regarding your agency's non-quantifiable costs and your agency's total O&M costs.

Q8.1. Thinking of your agency's total annual O&M costs for a given year, what would you estimate as the percentage attributable to PTC O&M?

\_\_\_\_\_

Q8.2. Please describe any **non-quantifiable cost drivers** for operating and maintaining your PTC systems. In your description, please describe the cost driver and the extent your agency believes they affect your annual PTC O&M costs.

\_\_\_\_\_

Q8.3. GAO plans to determine the percentage of each commuter rail agency's overall operating expenses that are attributable to PTC O&M by comparing each commuter rail agency's total operating expenses reported to the NTD in a given fiscal year to the total PTC-related operating expenses reported in this survey.

In your view, are there any limitations to this approach, and if so, what are they?

\_\_\_\_\_

Q8.4. How, if at all, did your agency verify the accuracy and completeness of any estimated actual and projected costs you have reported in this survey?

\_\_\_\_\_

**Appendix II: Survey Questions Distributed to Commuter Rail Agencies**

*For reference only – please complete and submit web questionnaire for this survey*

**9. CHALLENGES OF ESTIMATING COSTS**

For the next set of questions, we would like to collect your opinions on how challenging certain agreements or other circumstances make estimating annual PTC O&M costs. None of these questions require any actual or estimated costs, just your opinion.

Q9.1. Is your agency a tenant on another entity's tracks?

- Yes *Continue with Q9.2*
- No *Skip to Q9.3*

*Display This Question If: Q9.1 = Yes*

Q9.2. Does the host-tenant contract(s) regarding your agency's tenancy on another entity's tracks include a breakdown of PTC O&M costs?

- Yes
- No

*Display This Question If: Q9.2 = No*

Q9.3. How much of a challenge is it to compile past year PTC O&M costs due to the lack of PTC O&M cost breakdown in this/these host-tenant contracts?

- Extremely challenging
- Very challenging
- Moderately challenging
- Slightly challenging
- Not challenging at all

Q9.4. Is your agency a host to other railroads?

- Yes *Continue with Q9.5*
- No *Skip to Q9.7*

*Display This Question If: Q9.4 = Yes*

Q9.5. Does the host-tenant contract(s) regarding the tenancy of other agency/ies on your tracks include a breakdown of PTC O&M costs?

- Yes *Skip to Q9.7*
- No *Continue with Q9.6*

**Appendix II: Survey Questions Distributed to Commuter Rail Agencies**

*For reference only – please complete and submit web questionnaire for this survey*

*Display This Question If: Q9.5 = No*

Q9.6. How much of a challenge is it to compile past year PTC O&M costs due to the lack of PTC O&M cost breakdown in this/these host-tenant contract(s)?

- Extremely challenging
- Very challenging
- Moderately challenging
- Slightly challenging
- Not challenging at all

Q9.7. Does your agency contract out any of the following activities related to PTC O&M?

	Yes	No
PTC engineering services	<input type="radio"/>	<input type="radio"/>
PTC maintenance equipment and labor	<input type="radio"/>	<input type="radio"/>
Commuter rail service operations including PTC O&M	<input type="radio"/>	<input type="radio"/>
PTC Back Office Services	<input type="radio"/>	<input type="radio"/>
Other (please specify):	<input type="radio"/>	<input type="radio"/>

*Display This Question If: Q9.7 Has any "Yes" answers*

Q9.8. Do any of the PTC O&M services you contract out include a separate PTC O&M cost breakdown?

- Yes [Skip to Q9.10](#)
- No [Continue with Q9.9](#)

**Appendix II: Survey Questions Distributed to Commuter Rail Agencies**

*For reference only – please complete and submit web questionnaire for this survey*

*Display This Question If: Q9.8 = No*

Q9.9. How much of a challenge is it to compile past year PTC O&M costs due to the lack of PTC O&M cost breakdown in the contract(s)?

- Extremely challenging
- Very challenging
- Moderately challenging
- Slightly challenging
- Not challenging at all

Q9.10. Do your agency's in-house labor time codes include any specification for PTC-related tasks?

- Yes [Skip to Q9.12](#)
- No [Continue with Q9.11](#)

*Display This Question If: Q9.10 = No*

Q9.11. How much of a challenge is it to compile past year PTC O&M costs due to the lack of specific PTC-related tasks in your in-house labor time codes?

- Extremely challenging
- Very challenging
- Moderately challenging
- Slightly challenging
- Not challenging at all

**Appendix II: Survey Questions Distributed to Commuter Rail Agencies**

*For reference only – please complete and submit web questionnaire for this survey*

Q9.12. Is your agency's PTC technology integrated/overlaid with existing signaling systems?

- Yes *Continue with Q9.13*
- No *Skip to Q9.14*

*Display This Question If: Q9.12 = Yes*

Q9.13. How much of a challenge is it to compile past year PTC O&M costs due to this integration/overlay?

- Extremely challenging
- Very challenging
- Moderately challenging
- Slightly challenging
- Not challenging at all

Q9.14. Are there any additional challenges your agency encountered in reporting PTC O&M costs for previous years? If so, please specify:

\_\_\_\_\_

Q9.15. How much of a challenge is it for your agency to **project future PTC O&M costs** due to the following factors?

	Extremely challenging	Very challenging	Moderately challenging	Slightly challenging	Not at all challenging
Future upgrades and/or interoperability costs	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Predicting future software and/or hardware obsolescence	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Single vendor markets	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other (please specify):	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q9.16. Are there any other thoughts you'd like GAO to know regarding your annual PTC O&M costs?

\_\_\_\_\_

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**Appendix II: Survey Questions Distributed to Commuter Rail Agencies**

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**END OF SURVEY**

Are you finished answering this questionnaire? Selecting "Yes" below and clicking the Submit & Close button tells GAO that your answers are final. After you Submit and Close, you will not be able to return to your questionnaire unless you ask us to reopen it.

You will see a copy of your answers and be able to save a PDF copy of the completed questionnaire after you Submit & Close.

Yes, finished answering

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## Appendix III: GAO Contact and Staff Acknowledgments

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### GAO Contact

Elizabeth Repko, (202) 512-2834 or [repkoe@gao.gov](mailto:repkoe@gao.gov)

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### Staff Acknowledgments

In addition to the contact named above, Sarah Farkas (Assistant Director), Sarah Jones (Analyst-in-Charge), Ned Malone (Senior Analyst), Madeline Barch, Melanie Diemel, Richard Jorgenson, Rebecca Morrow, Bryan Prince, Carl Ramirez, Jason Rodriguez, Michelle Weathers, Elizabeth Wood, and Matthew Zaun made key contributions to this report.

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