

**GAO**

Report to the Committee on Banking,  
Housing, and Urban Affairs, U.S. Senate

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June 2010

# TRANSIT RAIL

## Potential Rail Car Cost-Saving Strategies Exist



**GAO**

Accountability \* Integrity \* Reliability

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Highlights of [GAO-10-730](#), a report to the Committee on Banking, Housing, and Urban Affairs, U.S. Senate

## Why GAO Did This Study

Rail transit offers society a number of benefits, including reduced congestion and pollution and increased mobility. However, rail systems and cars are costly: Transit agencies can pay more than \$3 million per car, often using federal funds. As requested, this report describes (1) characteristics of the U.S. market for transit rail cars, (2) the federal government's role in funding and setting standards for transit rail cars, and (3) challenges transit agencies face when procuring rail cars. GAO analyzed U.S. and worldwide rail car market data for commuter, heavy, and light rail systems and interviewed Department of Transportation (DOT) officials and domestic and international industry stakeholders, including the American Public Transportation Association (APTA).

## What GAO Recommends

GAO recommends that the Secretary of Transportation direct DOT to work with APTA to (1) develop a process to systematically identify and communicate opportunities for transit agencies with similar needs to participate in joint procurement and (2) identify additional opportunities for standardization, especially for new systems. DOT reviewed a draft of this report, generally concurred with its contents, and agreed to consider the recommendations.

View [GAO-10-730](#) or [key components](#). For more information, contact David J. Wise at (202) 512-2834 or [wised@gao.gov](mailto:wised@gao.gov).

## TRANSIT RAIL

### Potential Rail Car Cost-Saving Strategies Exist

#### What GAO Found

U.S. demand for transit rail cars is limited and erratic and orders tend to be for customized cars. Transit rail cars in the U.S. comprise about 5 percent of the worldwide fleet. Transit agencies' purchases vary considerably over time: A large transit agency may replace its entire fleet in 1 year, contributing to a spike in the market, whereas in other years, there may be only a fraction of that demand for the U.S. market. Transit agencies often request custom car designs to address not only legacy infrastructure requirements and interoperability issues with existing fleets, but also preferences. Rail car orders of small size and demand for customized cars can increase the price per car by, for example, concentrating design costs among fewer cars.

The federal government provides some funding for transit rail cars and has varying levels of involvement in setting design standards for transit rail cars. More than half of the transit agencies GAO interviewed purchased rail cars with some type of federal funding, such as formula or discretionary capital funds. When transit agencies use federal funds to purchase rail cars, certain requirements apply, such as "Buy America"—which requires, among other things, that rail cars be assembled in the United States. The Federal Transit Administration (FTA) ensures that these requirements are met by overseeing new transit projects and through periodic reviews. The federal government's role in setting design standards for transit cars depends on the type of rail. For commuter rail, the Federal Railroad Administration has established safety standards that must be met, since these cars are intended to run on the same tracks as freight rail traffic. For other rail transit, FTA provided funds to help APTA—the standard-setting industry group—develop voluntary standards, including those for safety. However, the Secretary of Transportation proposed legislation in December 2009, which was introduced in Congress in February 2010, to give FTA more regulatory authority in relation to safety.

Transit agency officials identified several challenges in procuring rail cars, including securing funding, given all of their competing needs. Manufacturers and transit agencies also face legal and regulatory requirements, such as "Buy America" requirements, but have generally adapted to challenges posed by them. However, market challenges still exist, including the small size of many orders that may affect price. Joint procurements, whereby transit agencies combine orders, can help them increase their order sizes; however, they can only combine orders if a design exists that meets both agencies' needs. While a few transit agencies have become aware of opportunities to jointly procure rail cars through informal mechanisms, such as industry meetings, there is currently no formal mechanism to identify mutually beneficial opportunities for joint procurement. As FTA helps fund many procurements, it may be in the best position to help transit agencies identify joint procurement opportunities. Furthermore, FTA and APTA have efforts under way to standardize light rail cars to make rail car procurement more efficient and cost-effective. Standards also might be beneficial for other types of systems, such as streetcars, particularly for those without existing infrastructure limitations.

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## Abbreviations

ADA	Americans with Disabilities Act of 1990
AMT	Agence Métropolitaine de Transport
APTA	American Public Transportation Association
CTA	Chicago Transit Authority
DOT	Department of Transportation
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
MBTA	Massachusetts Bay Transportation Authority
MTA	Metropolitan Transportation Authority
OMB	Office of Management and Budget
PCC	Presidents' Conference Committee
PRIA	Passenger Rail Investment and Improvement Act of 2008
RFP	Request for Proposals
VRE	Virginia Railway Express
WMATA	Washington Metropolitan Area Transit Authority

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United States Government Accountability Office  
Washington, DC 20548

June 30, 2010

The Honorable Christopher J. Dodd  
Chairman  
The Honorable Richard C. Shelby  
Ranking Member  
Committee on Banking, Housing, and Urban Affairs  
United States Senate

Rail transit offers passengers and society a number of benefits, including reduced congestion and pollution, and increased mobility. However, these systems are costly and challenging to build and maintain. In particular, the cost of individual rail cars—which transit agencies purchase to equip new systems and replace existing fleets—can be high, typically \$1.5 million to \$3.4 million per car for recent procurements, depending on the number and type of cars purchased. In 2008, U.S. transit agencies spent over \$2.3 billion on rail cars. Transit rail cars can vary substantially in design across systems and, sometimes even within systems, requiring manufacturers to build customized cars, which can drive up the cost of procurement. In fact, procuring standardized vehicles could reduce costs per car up to 20 percent, according to a recent Department of Transportation (DOT) report to Congress.<sup>1</sup> This issue affects not only the 54 U.S. transit agencies operating at least one rail transit line as of the end of 2008, but will affect new rail systems, including new streetcar systems.<sup>2</sup> Since most transit agencies we contacted use Federal Transit Administration (FTA)-administered grant funds to purchase rail cars, reducing the cost of rail cars would allow for more efficient use of federal funds. The Federal Railroad Administration (FRA) typically does not fund transit rail cars, but the agency does oversee commuter rail safety.<sup>3</sup>

In response to your request, we addressed the following objectives:  
(1) What are the key characteristics of the U.S. market for transit rail cars, and how do they compare with international markets? (2) What is the

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<sup>1</sup>Federal Transit Administration, *Report to Congress on Incentives in Federal Transit Formula Grant Programs: Report of the Secretary of Transportation to the United States Congress Pursuant to 49 U.S.C. 5336(c)* (August 2008).

<sup>2</sup>There were 54 transit agencies operating at least one rail transit line in the United States in 2008, according to our analysis of FTA's National Transit Database.

<sup>3</sup>Both FTA and FRA are administrations within DOT.

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federal government's role in funding and setting standards for transit rail car procurement and design? (3) What challenges, if any, do transit agencies face when procuring transit rail cars, and what actions have they and other stakeholders taken to help address them?

To determine the characteristics of the U.S. market for transit rail cars, we reviewed two databases—the FTA's National Transit Database and the American Public Transportation Association's (APTA) transit database—to determine the number and types of passenger transit rail cars in the United States. We also interviewed officials from 23 of the 54 U.S. rail transit agencies as of 2008. We judgmentally selected these agencies on the basis of their size; rail transit modes (commuter rail, heavy rail, and light rail); and geographic distribution. These transit agencies were operating 33 systems among the major transit rail modes, compared with 68 systems operated by all U.S. transit agencies. The results of our work are not generalizable to all transit agencies. Furthermore, we interviewed officials from existing and potential transit rail car manufacturers, transit agency consultants, FTA, and APTA. To determine how the U.S. market for transit rail cars compares with international markets, we obtained worldwide rail car data from SCI Verkehr in Cologne, Germany, and interviewed rail car manufacturers; transit officials from Canada, Japan, New Zealand, and Portugal; and European railway associations. To assess the reliability of data from FTA's National Transit Database, APTA's 2009 Public Transportation Vehicle Database (APTA's transit database), and SCI Verkehr, we spoke with officials from each organization about data quality control procedures and reviewed relevant documentation. For each data set, we determined that the data were sufficiently reliable for the purposes of this report. To determine the federal government's role in funding and setting standards, we reviewed applicable federal law, regulations, and grant documents and interviewed FTA officials. Finally, to identify any challenges transit agencies face when procuring transit rail cars, we met with transit agency officials representing 33 transit systems across the country, transit rail car manufacturers, transit agency consultants, and FTA and APTA officials. Appendix I contains additional information about our scope and methodology, including lists of the organizations we contacted.


We conducted this performance audit from September 2009 through June 2010 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.

## Background

The U.S. rail transit system consists of the following three primary modes: commuter rail, heavy rail transit, and light rail transit (see figs. 1 to 3). The numbers in figures 1 through 3 are based on National Transit Database information, current for 2008, adjusted by GAO for two systems and for a reporting error.<sup>4</sup>


**Figure 1: Description of Commuter Rail Cars and a Photograph of a Commuter Train in Los Angeles, CA**

	Transit rail mode	Number of systems	Fleet size (percentage of total rail car fleet)	General characteristics
	Commuter rail	24	6,208 (31.3%)	Commuter rail refers to trains, other than intercity passenger trains, that operate on existing rail rights-of-way, the majority of which are owned by freight railroads. These systems are often powered by diesel-electric engines. In general, commuter rail systems provide service from outlying suburbs and small cities to a central downtown area, with one or two stops in the central downtown area.

Sources: GAO (photograph); FTA's National Transit Database; and DOT's document entitled *2008 Status of the Nation's Highways, Bridges, and Transit: Conditions and Performance*.

<sup>4</sup>The National Transit Database lists the Port Authority Trans Hudson as a heavy rail system. The Port Authority Trans Hudson operates similarly to a heavy rail system, and we count that system as heavy rail in figure 2. However, under federal law, this system is a commuter rail system and, thus, is subject to FRA regulations.


**Figure 2: Description of Heavy Rail Cars and a Photograph of Heavy Rail Cars in Chicago, IL**

	Transit rail mode	Number of systems	Fleet size (percentage of total rail car fleet)	General characteristics
	Heavy rail	15	11,570 (58.3%)	These systems, which include subways, operate on exclusive tracks. Heavy rail systems are electric railways, typically drawing power from a third rail. Trains may be four or more cars long.

Sources: GAO (photograph); FTA's National Transit Database; and DOT's document entitled *2008 Status of the Nation's Highways, Bridges, and Transit: Conditions and Performance*.



**Figure 3: Description of Light Rail Cars and a Photograph of a Light Rail Car in San Diego, CA**

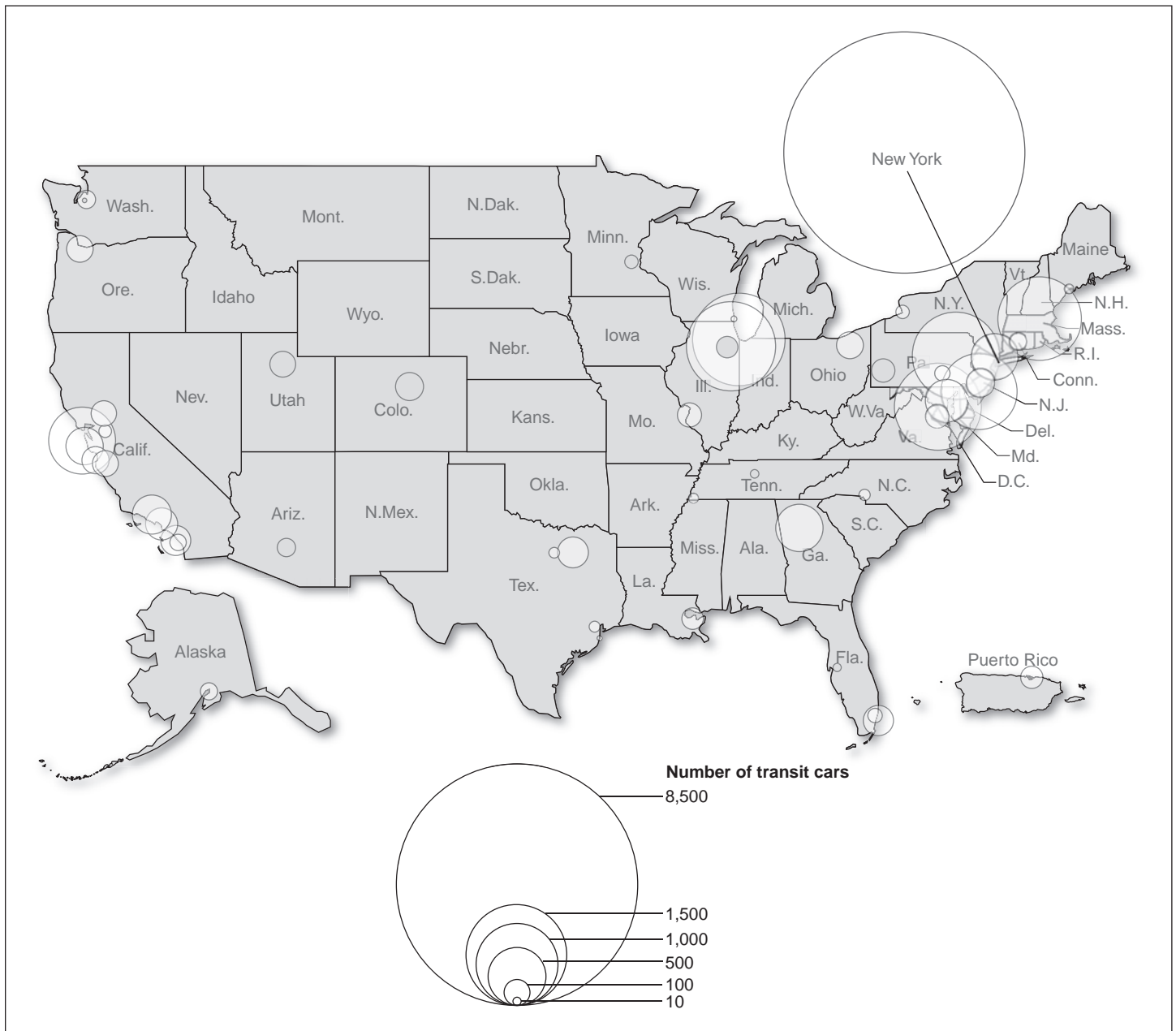
	Transit rail mode	Number of systems	Fleet size (percentage of total rail car fleet)	General characteristics
	Light rail	29	2,063 (10.4%)	Light rail refers to trains that may operate on exclusive tracks or on tracks in the street on the same level with pedestrians and car traffic. Light rail systems are typically electric railways that draw power from overhead wires. Trains can operate as single cars. This category includes streetcars and trolleys.

Sources: GAO (photograph); FTA's National Transit Database; and DOT's document entitled *2008 Status of the Nation's Highways, Bridges, and Transit: Conditions and Performance*.

Current FTA data include streetcars as part of light rail, but streetcars can be distinguished from other light rail cars because they are usually smaller and designed for shorter routes, more frequent stops, and lower travel speeds.

Transit agencies in six large cities—New York; Chicago; Washington, D.C.; Boston; Philadelphia; and San Francisco—own the majority of passenger transit rail cars in the United States. (See fig. 4.) Agencies in these six cities manage over 16,000 rail cars, or more than 80 percent of all the active U.S. transit rail cars.

**Figure 4: Size of U.S. Transit Rail System Based on the Number of Cars for All Commuter Rail, Heavy Rail, and Light Rail**



Sources: GAO and DOT.

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Note: This figure represents transit agencies that reported to the National Transit Database in 2008. Some agencies may not be included because they were created recently, or are not required to report and have not reported voluntarily. For example, the figure does not show the New Mexico Rail Runner Express, which was not required to report to the National Transit Database and had not reported voluntarily. We added the Valley Metro in Phoenix, Arizona, which opened late in 2008 and had not yet appeared in the National Transit Database but was reported in APTA's 2009 Public Transportation Vehicle Database.

The number of transit systems is increasing beyond the large metropolitan areas that currently dominate the market, although new systems tend to be small. For example, the Utah Transit Authority began operating a 45-car commuter rail system for Salt Lake City in April 2008. The Puerto Rico Highway and Transportation Authority began operating a 74-car heavy rail system in San Juan in December 2004. The Valley Metro in Phoenix began operating a 50-car light rail system in December 2008. In addition, several new streetcar systems have opened within the last decade in cities such as Portland, Oregon; Tampa, Florida; and Little Rock, Arkansas. Furthermore, additional cities—such as Oklahoma City, Oklahoma; Boise, Idaho; and Cincinnati, Ohio—have plans for transit-oriented development that include new streetcar lines.<sup>5</sup>

Rail car procurements generally take years to complete and can involve many technical experts, including consultants. A time frame of 3 to 4 years is considered quick for a complete procurement, and many take much longer. For example, according to officials at one transit agency, it can take about 8 years from design to final acceptance for heavy rail cars. The procurement process is lengthy because it involves four phases: the transit agency's initial design; advertising, communication, and contract award; the manufacturer's detailed car design, prototype development, and testing; and production. (See table 1.)

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<sup>5</sup>GAO has recent work concerning public transportation investments and economic development. See GAO, *Affordable Housing in Transit-Oriented Development: Key Practices Could Enhance Recent Collaboration Efforts between DOT-FTA and HUD*, [GAO-09-871](#) (Washington, D.C.: Sept. 9, 2009).

**Table 1: Phases of the Transit Rail Car Procurement Process**

<b>Procurement phase</b>	<b>Description</b>	<b>Approximate time frame</b>
Transit agency's initial design	During the initial design period, the transit agency, usually with a consultant's help, prepares performance specifications describing how it needs its new cars to perform or technical specifications directing how the car should be built.	1 year
Advertising, communication, and contract award	The transit agency notifies potential bidders through a Request for Proposals (RFP) that it intends to seek bids on new cars described in the RFP. The transit agency invites potential bidders to meetings where they can ask questions about the specifications and suggest ways to improve the design. At the end of this process, the bidders are asked to submit proposals. The transit agency awards the contract to the car builder who submits the lowest bid, whose bid offers the "best value," or who submits the lowest bid from a group of builders who all submitted acceptable proposals.	1 year
Manufacturer's detailed car design, prototype development, and testing	The car builder prepares detailed engineering designs for the new car based on the specifications in the RFP. The manufacturer builds and tests pilot cars representing each car to be produced. This phase can take up to 3 years, but could take less time if the car manufacturer can start with an existing design and use test results from a similar car built previously.	Up to 3 years
Production	Production times vary with car builder capacity and competing orders. Larger plants in the United States can build 200 to 300 cars per year. This means that for large orders, it may take years to complete production. Furthermore, production on a particular transit agency's order may not begin until the car builder finishes work on previous orders.	Varies by order size and sequencing, but can take 4 years or more.

Source: GAO.

Foreign-based companies supply most of the U.S. market for passenger rail transit cars. Over the last decade, foreign-based companies, with U.S. plants, have produced almost all of the more than 8,000 new rail cars purchased by U.S. transit agencies. For example, Bombardier (Canada) has been a major builder of commuter cars for U.S. transit agencies. Alstom (France) and Kawasaki (Japan) have been major suppliers of

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heavy rail cars, and Siemens (Germany) and Kinki Sharyo (Japan) have been major suppliers of light rail cars. U.S.-based rail car manufacturers serve niche markets for streetcars or unconventional commuter rail cars, with typically sporadic and small orders—fewer than 20 cars.

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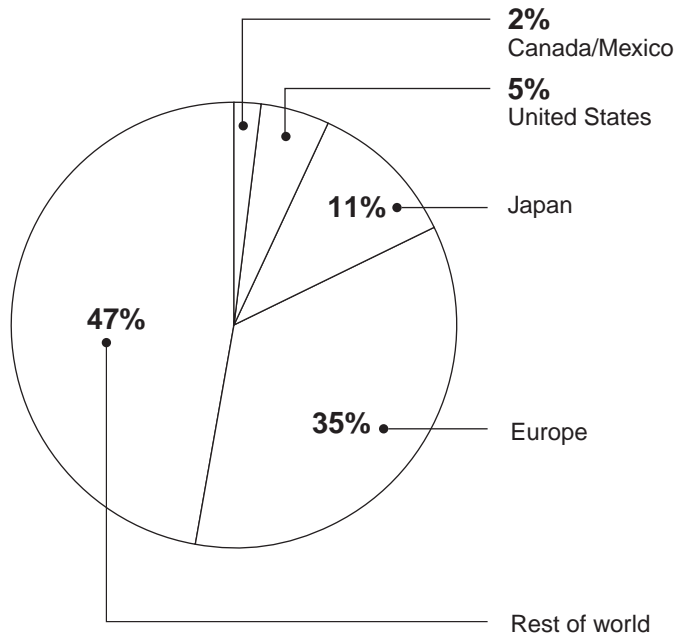
## Characteristics of the U.S. Transit Rail Car Market May Have Implications for Car Procurement

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### U.S. Transit Rail Car Demand Is Small and Erratic over Time

The U.S. rail car market is a small percentage of the world market for rail cars. In particular, the U.S. transit rail car fleet constitutes about 5 percent of the worldwide total. Other countries, such as Japan and Germany, which have smaller populations than the United States, account for a larger percentage of the world transit rail car fleet. Officials from rail car manufacturers said that these countries have relatively more resources invested in public transit infrastructure compared with the United States. The small fleet size of the United States also correlates with a small share of the annual world demand for newly manufactured cars by U.S. transit agencies due to the limited extent of our transit rail systems, relative to other countries. See figure 5 for percentages of the worldwide transit rail car fleet in different locations.

**Figure 5: Worldwide Transit Rail Car Fleet Totals by Location, as of April 2010**

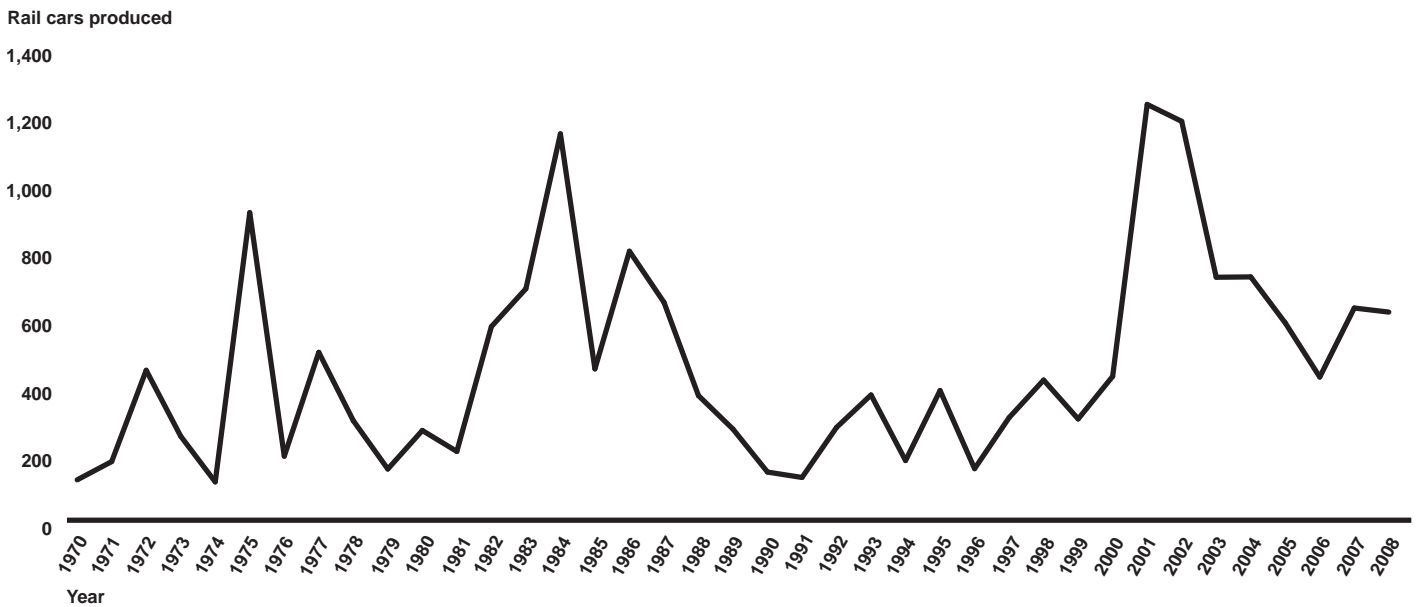


Source: SCI Verkehr.

In addition to the relatively small overall demand for rail cars in the United States, individual rail car orders are often small. Almost half of the transit agencies we interviewed procure rail cars in relatively small quantities. For example, United Streetcar, a streetcar producer, told us that it expects orders of just three to six cars at a time.

The level of U.S. rail car purchases is also uneven over time. See figure 6 for the number of rail cars produced per year for U.S. transit agencies from 1970 through 2008.

**Figure 6: Rail Cars Produced for the U.S. Transit Agencies, 1970 through 2008**



Sources: FTA's National Transit Database and the Metropolitan Transportation Authority New York City Transit.

Note: National Transit Database data for New York City's transit rail car procurements may have been inaccurately reported. To correct this, we used data from New York City Transit in conjunction with National Transit Database data, for the years 2000 through 2008.

The erratic nature of the U.S. market is primarily due to the following reasons:

- Large transit agencies, such as the Metropolitan Transportation Authority (MTA) New York City Transit, procuring cars in large orders that cause spikes in the market. For example, over half of the cars built in 2001 and 2002 were for a MTA New York City Transit procurement of over 1,600 cars.
- Replacements of existing fleets, which are dependent upon the life cycle of the fleets. Transit agencies generally do not procure rail cars on an annual basis, and transit rail cars typically last 25 years or more with a midlife overhaul, depending upon the materials used and the car design. Some individual transit agencies may replace their fleets of rail cars at the same time. For example, the Bay Area Rapid Transit is in the process of purchasing 775 cars to replace and expand its entire fleet of 669 cars.

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## U.S. Rail Car Designs Have a Great Deal of Customization

U.S. rail car designs have a great deal of customization that differs among transit agencies due to legacy infrastructure design, interoperability concerns with existing fleets, and local preferences. In particular, many heavy rail transit agencies have systems that require rail cars with customized designs, rather than standard designs. Most of these systems were built long ago, and their designs have unique characteristics, such as tunnel size, curve radii, and the ability to support rail car weight. The unique features of many systems can limit the ability of a car manufacturer to produce cars for more than one agency from one car design. For example, the Washington Metropolitan Area Transit Authority (WMATA) could not purchase the Chicago Transit Authority's (CTA) cars because they were too tall for WMATA's tunnels, and CTA could not purchase WMATA's cars because they were too long to make the sharp turns of the Chicago system, according to officials from both agencies. Furthermore, when procuring rail cars for existing transit systems, agency officials generally must include specifications to ensure that the new cars will be interoperable with their existing fleets. In addition to design features based on infrastructure requirements, transit agencies may also request other local preferences, such as rail car compatibility with platform heights, door requirements, and certain safety features. This level of specificity in transit rail car design is more common in the U.S. market than it is in other countries' markets. Transit agency, transit association, and manufacturing officials said that rail car designs tend to be more similar among transit agencies in Western Europe and within some Asian countries, in part, because some countries have established standard performance specifications or designs that manufacturers must follow prior to building systems.

While rail car manufacturer and transit agency officials said that unique infrastructure requirements are most prevalent in heavy rail systems, light rail and streetcar systems can also have unique requirements. For example, transit agency officials said that differences, such as the length of the city blocks where the cars travel, may influence the car length and overall design for light rail and streetcars. Furthermore, although officials from almost half of the commuter rail agencies we interviewed said they either had borrowed rail cars from another commuter rail agency or had jointly purchased cars with another commuter agency, other officials described unique infrastructure requirements, such as tunnel size, that necessitate customized designs.



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## Characteristics of U.S. Transit Agencies' Rail Car Orders Have Implications for the Price of Rail Cars

According to rail car manufacturer and transit agency officials, certain characteristics of U.S. transit agencies' rail car orders have implications for the per-car prices that transit agencies pay for their cars. Manufacturers said that certain fixed costs related to manufacturing start-up and rail car design are key factors in the per-car price of an order. Rail car manufacturer officials said that the order size necessary to capitalize on economies of scale varies from a few cars to over 100 cars, depending upon the transit mode, the degree of customization of the car design, and certain production costs. In general, as manufacturers and component suppliers—such as door manufacturers—produce more cars using the same design and production line, the cost per car is reduced due to the manufacturers' ability to spread the design and other fixed production costs over a larger number of cars. Additionally, if more units are purchased, component costs are usually lower on a per-unit basis because suppliers are also able to capture greater economies of scale in component production. As a result, transit agencies with large orders, such as the MTA New York City Transit, have been able to get relatively low per-car prices. However, certain characteristics of other U.S. transit agencies' demand for rail cars may prevent manufacturers and suppliers from capitalizing on these benefits.

These characteristics include the following:

- *Small orders and customized designs:* U.S. rail car orders tend to be small and customized, which results in higher per-car costs. First, officials from all four of the major manufacturers<sup>6</sup> we interviewed said that the cost to design cars for a particular procurement is a significant up-front cost, and that it is important to be able to spread design costs over a number of cars to obtain economies of scale. Officials from several manufacturers said that designing a rail car on the basis of unique specifications can add from \$20 million to \$100 million to the cost of the order. However, the degree of design specificity is also a factor. If the design is fairly standard, the design costs will be lower, enabling the efficient production of a smaller order of cars. However, if the design is highly customized, design costs are greater, and it may be very expensive to produce a small order. Second, to build customized cars, manufacturers may have to retool their production lines for each procurement. This retooling results in start-up costs that are embedded in the price per car. Manufacturers said that once there is a break in production, expenses are incurred because manufacturers and

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<sup>6</sup>“Major manufacturers” are one of the top five producers in at least one of the three transit modes.

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component suppliers may need to reconfigure or retool their production line before they can begin producing rail cars and their component parts. For example, officials from the Virginia Railway Express (VRE), a commuter rail system, said that when they purchased one set of cars in 2006, they were able to obtain a price of approximately \$1.6 million per car, which was considered to be a favorable price, because the manufacturer had recently finished production of similar cars for Chicago's Metra. However, in a later procurement in 2010, VRE paid approximately \$2.2 million per car, which was significantly higher, in part because the manufacturer had to restart the production line for this car design.<sup>7</sup> The impact of design and start-up costs are exacerbated by the small order sizes that are typical in the United States.

- *Erratic nature of transit agencies' procurements:* The uneven nature of the U.S. transit agencies' procurements also impacts the price of rail cars. Officials from five of the six manufacturers we interviewed said that the erratic nature of U.S. rail car demand reduced their ability to maintain continuous production, which likely results in higher production costs per rail car. Because transit agencies in the United States may procure many cars in some years but few in others, manufacturers and component suppliers may have to close production facilities or produce other goods during the years that fewer cars are procured. Therefore, as we have previously mentioned, they may have additional start-up costs when demand recovers, and they increase their rail car production capacity to meet this demand. In contrast, rail car manufacturers said that in other markets (e.g., Europe), there may be a more stable demand, which allows them to maintain more consistent operations and avoid the costs of increasing and decreasing capacity. For example, according to a transit association official who we interviewed, there is a large tramway system in Düsseldorf, Germany, that orders about 15 to 20 cars per year. Although this is not a large order, it is continuous and helps the manufacturer maintain consistent operations.

Because of the lengthy rail car procurement and manufacturing process, manufacturers also face financial risks from the volatile nature of the prices of the commodities used to manufacture rail cars; and rail car prices reflect these risks. Officials from one transit agency said that it can take a transit agency up to 8 years from when the decision is made to purchase new cars to when the cars are delivered. However, in the United

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<sup>7</sup>Other factors, such as the price of commodities, exchange rates, and inflation, may have also contributed to the higher price of the rail cars in the second procurement.

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States, contracts for rail cars are usually negotiated as a fixed price—meaning that manufacturers bid on a price for a set of cars that remains the same, even if certain costs of producing the cars change during the lengthy production.<sup>8</sup> Rail car manufacturers estimate future prices of key commodities, such as copper and steel, when entering a proposal to build rail cars, but they maintain risk that these commodity prices could change in ways they did not expect. Officials from all six of the manufacturers and almost half of the transit agencies we interviewed said that manufacturers face significant risk related to variable prices for commodities such as steel. For example, on the MTA New York City Transit’s current heavy rail car procurement, the recent fluctuation in commodity prices for copper and steel surprised one manufacturer. The manufacturer had locked in to a price for the cars in the base contract, so the price fluctuations caused the order to be less profitable. While manufacturers said that they may engage in hedging strategies—such as buying futures contracts on commodities—to mitigate these risks, they also said that adequately hedging these risks can be difficult.

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<sup>8</sup>Although most contracts are fixed price for the initial procurement of rail cars, many contracts do include options that agencies can exercise for additional procurement of cars. It is common for terms in the options contracts to be adjustable for certain factors, such as commodities prices and general inflation.

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## Federal Government Is Involved to Varying Degrees in Funding and Setting Design Standards for Transit Rail Car Procurement

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### Federal Government Funds Pay for a Portion of Most Transit Agencies' Rail Car Purchases

Most of the transit agencies we contacted used some type of federal funding, such as the New Starts program, to purchase rail cars for their systems.

- FTA's New Starts program provides federal funding for the initial rail car purchases needed to support service on a newly constructed line or extension.<sup>9</sup>
- Transit agencies can use FTA's Fixed Guideway Modernization Funds<sup>10</sup> or Section 5307 (Urbanized Area)<sup>11</sup> formula funds to purchase additional or replacement rail cars.
- More recently, transit agencies and municipalities have used funding from the American Recovery and Reinvestment Act of 2009 (Recovery Act) specifically made available for transit projects or Recovery Act Transportation Investment Generating Economic Recovery (also known as TIGER) grants.<sup>12</sup> For example, the city of Houston received a Recovery Act grant for \$87 million to expand its system and purchase additional vehicles.

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<sup>9</sup>FTA, through its New Starts program, provides state and local agencies with funding to design and construct new or extensions of fixed guideway systems that use and occupy a separate right-of-way for the exclusive use of public transportation services. These systems include fixed rail, exclusive lanes for buses and other high-occupancy vehicles, and other systems. 49 U.S.C. § 5309(b)(1).

<sup>10</sup>49 U.S.C. § 5309(b)(2).

<sup>11</sup>49 U.S.C. § 5307.

<sup>12</sup>Recovery Act, Pub. L. No. 111-5, 123 Stat. 115 (Feb. 17, 2009).

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Some of the transit agencies we contacted used state or local funds for subsequent rail car purchases, either to replace aging rail cars or to provide additional capacity to their systems. State or local governments fund rail car purchases with local revenues, state grants, or bonds—such as those that are repaid from transit agency revenues or taxes levied on real estate located in special tax districts. For example, according to transit agency officials, over a 10-year period, the MTA Long Island Rail Road and the Metro North Railroad purchased 1,172 rail cars without federal funds.

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### When Federal Funds Are Used to Purchase Rail Cars, Transit Agencies Must Comply with Federal Procurement Requirements

When transit agencies use federal funds, federal procurement requirements apply. Transit agency and FTA officials identified some of the procurement requirements that apply to transit rail car procurements. These requirements center on compliance with “Buy America” legislation and on whether contracts are awarded in a manner that promotes free and open competition. FTA relies primarily on self-certification, but also conducts triennial and periodic procurement reviews to help ensure compliance with these requirements.

The “Buy America” requirement specifies that the cost of rail car components manufactured in the United States must be more than 60 percent of the cost of all component parts, and that the rail cars themselves must be assembled in the United States. Under certain circumstances, FTA has the authority to grant waivers to transit agencies, allowing them to purchase rail cars that may not fully meet “Buy America” requirements. Specifically, a waiver can be granted if (1) a product manufactured in the United States was not available, (2) the cost of U.S.-made rail car component parts was prohibitive, or (3) FTA deems a purchase from a foreign manufacturer to be in the best interest of the public. For example, FTA granted a waiver for a transit agency to purchase diesel-powered transit cars manufactured in another country because that type of vehicle was not manufactured in the United States. In another case, FTA approved a waiver for a transit agency’s purchase of a prototype rail car made in another country because it would be used for testing the vehicle’s performance. As part of this agreement, the remainder of the cars in the order was assembled in the United States and complied with the 60 percent domestic content requirement, which is computed on the cost of components and subcomponents. According to DOT officials, these waivers are considered on a case-by-case basis.

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Transit agencies also must comply with other requirements—described in FTA guidance—when they use federal funds to purchase rail cars.<sup>13</sup> For example, Congress has placed a 5-year limit on transit agencies exercising options to purchase additional rail cars under an existing contract.<sup>14</sup> According to FTA officials, this limitation promotes free and open competition because it presents other manufacturers with the opportunity to bid on rail car purchases that would otherwise go to a single company year after year.

In addition, to assist transit agencies FTA has issued a manual—the Best Practices Procurement Manual—that describes various procurement requirements and how they can be met. For example, FTA’s guidance encourages transit agencies to jointly procure rail cars with other transit agencies in order to save money, if possible. However, there are certain limitations and procedures that must be followed. FTA’s manual provides a roadmap on how to conduct joint procurements as well as how options to purchase additional vehicles under one contract can be assigned to another agency.

Finally, for FTA New Starts and major capital projects costing over \$100 million, FTA monitors the project’s progress to determine whether a project is on time, within budget, in conformance with design criteria, constructed to approved plans and specifications, and efficiently and effectively implemented. FTA’s review of these projects includes a review of fleet management plans to ensure that transit agencies will be capable of operating and maintaining their rail cars, and that the number of rail cars to be purchased is justified by the anticipated ridership. FTA also reviews the transit agencies’ design specifications for rail cars to help ensure that the specifications are not so narrowly defined that competition would be limited to a single bidder.

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<sup>13</sup>FTA’s grant agreements with transit agencies either specifically include procurement provisions in the grant agreements or have references to legislation, such as the “Buy America” provision, or to FTA and Office of Management and Budget circulars, such as FTA’s Circular 4220.1F and OMB Circular A-119.

<sup>14</sup>49 U.S.C. § 5325(e)(1).

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## The Federal Government Has a Limited Role in Setting Design Standards for U.S. Transit Rail Cars That Varies Depending on the Type of Rail System

According to FTA officials, their input into transit rail car design is limited to ensuring that Americans with Disabilities Act of 1990 (ADA) requirements are met and does not include applying uniform design standards for commuter, heavy, or light transit rail cars. The ADA requires that transit agencies make transit systems accessible to persons with disabilities, so transit rail cars must be designed so that a disabled person can board the car without assistance. FRA sets regulations for commuter rail safety and also enforces ADA requirements.

The federal government has had a more active role in setting safety standards for some rail cars. Specifically:

- FRA has established safety standards for commuter passenger rail cars that travel on tracks that also carry freight rail traffic. FRA enlisted APTA's assistance to help develop safety standards for commuter rail cars and then expanded the effort to establish industry standards and recommended practices for commuter rail car safety. According to FRA and APTA officials, this has led to greater uniformity in the design and production of commuter rail cars. This greater uniformity could alleviate some of the market difficulties that we previously discussed resulting from customized designs. These standards and recommended practices do not apply to heavy or light rail transit systems because these transit systems do not share tracks with freight train traffic, which is generally a prerequisite for FRA oversight.
- While FRA sets safety standards for commuter rail cars, FTA has adopted APTA "industry standards" and recommendations for transit rail car safety into its safety requirements. Consequently, transit agencies are required to follow the industry standards and recommended practices for safety, but, unlike FRA, FTA does not have direct oversight of compliance or enforcement authority. Instead, FTA requires states to set up safety oversight organizations to ensure compliance.<sup>15</sup> However, in December 2009, the Secretary of Transportation proposed legislation that would give FTA the authority to establish and enforce minimum federal safety standards for rail transit systems that received federal transit funding. This authority would provide similar safety oversight for transit rail cars that FRA has for commuter rail cars sharing tracks with freight trains. In

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<sup>15</sup>GAO, *Rail Transit: Additional Federal Leadership Would Enhance FTA's State Safety Oversight Program*, [GAO-06-821](#) (Washington, D.C.: July 26, 2006).

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February 2010, legislation was introduced that would provide that authority.<sup>16</sup>

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## Although Procuring Rail Cars Can Be Challenging, Standardization and Joint Purchasing Have the Potential to Reduce Costs

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### Rail Car Purchases Compete for Existing Funding with Transit Agencies' Other Needs

Many of the transit agency officials we interviewed said that securing funding is one of the main challenges that they face when procuring transit rail cars. As we have previously described, transit agencies may use federal, state, and local funds to purchase or replace cars but must weigh these purchases against other capital and operating needs. When a new line is built, the New Starts program can provide specific funding for the purchase of rail cars. For example, in 2005, FTA awarded the city of Phoenix, Arizona, \$57 million to purchase 36 light rail vehicles as part of its full funding grant agreement for the Valley Metro light rail project.<sup>17</sup> However, once a line is built, there is no federal program that provides specific funding solely for rehabilitating or replacing transit rail cars. Transit agencies may use other sources of federal funding, such as Fixed Guideway Modernization funds or Section 5307 (Urbanized Area) formula funds, to rehabilitate rail cars but often have many other needs competing for these same funds, including the purchase of new rail cars.

Transit agency officials we interviewed also cited several challenges specifically related to using federal funds to purchase transit rail cars.

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<sup>16</sup>The Public Transportation Safety Act would amend chapter 53 of Title 49, United States Code, to establish a public transportation safety program. H.R. 4643, 111th Cong. (2010).

<sup>17</sup>A full funding grant agreement establishes the terms and conditions for federal funds available for the project, including the maximum amount of federal funds available. The total award for the full funding grant agreement was \$587 million. The local share for the rail car purchase was \$64 million.



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- Transit agencies often replace entire fleets or generations of rail cars at one time as the rail cars approach their replacement age—typically, 25 years or more.<sup>18</sup> Transit agencies receive federal funding at a relatively steady level over time, and, therefore, it can be difficult to obtain the amount of funding needed at one time to replace a fleet or generation of rail cars.
  - Transit rail car procurement can take several years. Some transit agency officials told us that they cannot rely on federal funding for these purchases because they do not know how much money they will receive that far into the future.
  - In addition, some transit agency officials told us that a federal requirement intended to encourage competition among manufacturers creates challenges. Specifically, the requirement limits agencies' ability to exercise options to a 5-year period once a contract is signed if federal funds are used. Although this requirement is in place to ensure that the rail car market is fair and open, transit agency officials report this is burdensome, because if they decide to procure new cars after the 5th year, they must initiate the procurement process—which is both lengthy and costly—all over again.

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### Legal, Regulatory, and Other Issues Also Create Challenges

Some of the transit agencies and manufacturers we interviewed identified specific legal and regulatory factors that pose challenges in the procurement process.

- Transit agency officials identified some federal requirements that impact their rail car procurements. For example, some officials told us that while they support the need for ADA requirements, these requirements can be costly to implement. Officials from one agency said that when replacing a fleet, the agency needs to buy extra rail cars to compensate for the number of seats reduced to meet ADA requirements. Nonetheless, the officials indicated they have recognized the importance of the accessible service they provide and have successfully incorporated ADA requirements into their rail designs when they have purchased new cars or rehabilitated existing fleets.

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<sup>18</sup>Under FTA guidance, transit agencies are expected to use transit rail cars for a minimum of 25 years, otherwise, transit agencies must reimburse FTA for their prorated share of the procurement costs for the remaining years.

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- Likewise, rail car manufacturers have had to adjust operations to meet federal requirements. For example, to meet “Buy America” requirements, which require final assembly in the United States, some manufacturers have decided to build permanent facilities in the United States; others have built temporary facilities in the location where the order is filled. A manufacturer’s decision to build a temporary facility can impact transit agencies if, once the cars are built, manufacturers close the facilities and transit agencies have to buy certain spare parts from overseas or order them from specialty manufacturers. Because of the unique designs of rail cars, the parts may have to be specially made for the individual car design when replacement parts are needed.
  - Some transit agency officials and manufacturers told us that they can also face difficulties when following state or local requirements. For example, a transit agency and a manufacturer said that a state law that requires full disclosure of all information, including potentially proprietary information, in the negotiation process can make it difficult to conduct negotiations and may limit the numbers of proposals received when purchasing new rail cars. Officials from another transit agency said that a state law requiring more than 9 percent sales tax on rail car purchases results in significant costs that other transit agencies do not have to pay.

Another factor that affects some transit agencies—particularly new or small agencies—is a lack of experience with the procurement process. Given the 25-year expected lifespan of most rail cars, some transit agency officials may participate in only one or two procurements in an entire career and, therefore, have limited experience and must rely on design consultants. For example, the Port Authority Trans Hudson’s consultant is heavily involved in developing specifications for the current procurement to replace its entire fleet. The last time the agency procured cars was in 1967, and the staff that worked on the procurement are no longer with the agency. Transit agency officials with limited procurement experience may not recognize opportunities for cost savings when specifying their design requirements, and it may not be in the design consultant’s best interest to identify and encourage the use of standard designs. In addition, since many transit agencies procure rail cars in relatively small quantities, these agencies may not be in a position to negotiate for rail car prices in line with those of the larger agencies.

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## Industry Stakeholders Have Identified Opportunities for Economies of Scale through Standardization and Joint Purchases

Although rail car procurement can be challenging for both manufacturers and transit agencies, industry stakeholders, manufacturers, and transit agencies have identified opportunities to reduce costs through standardization and joint purchases.

### Standardization

To a certain extent, increasing the standardization of transit rail cars could benefit transit agencies. First, it would enable manufacturers to produce rail cars for numerous agencies without incurring start-up costs resulting from breaks in the manufacturing process. Once there is a break in production, the manufacturer must arrange for rail car components to be delivered from suppliers, and some of these components have long lead times before they can be delivered. Furthermore, time is lost and expenses incurred because manufacturers need to reconfigure or retool their production line before they can begin producing a rail car. Second, standardization can benefit manufacturers and transit agencies by decreasing design costs and may enable manufacturers to take advantage of economies of scale in the manufacturing process by producing more vehicles with similar parts.

However, there are arguments against standardization. Specifically, one rail expert stated that adopting a standard design can discourage innovation and inhibit research and development.<sup>19</sup> Also, he reported that a standard design may include features that are unnecessary for all systems and could add to the price of each car. In addition, standardization is not possible for all systems. As we have previously described, many heavy rail systems have unique infrastructure designs. Transit agencies would need to make major infrastructure changes in order to use rail cars that are compatible with other agencies' cars. According to FTA officials, the cost savings associated with the use of a standard design would not offset the cost of making these system changes. There may be more opportunities to standardize light rail or streetcar systems, particularly in new systems where the infrastructure has not yet been constructed.

Although current U.S. transit rail car designs differ substantially among systems, past efforts have attempted to standardize transit car designs.

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<sup>19</sup>William D. Middleton, "Is it time to standardize?," *Railway Age* (June 1994).

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One successful effort was the Presidents' Conference Committee (PCC) streetcar, which was first built in 1934. The committee, which consisted of industry representatives, produced a standardized design that permitted the use of assembly line techniques by multiple manufacturers and allowed for wide variation to meet the needs of various transit agencies. The design was widely accepted, but U.S. manufacturers stopped producing PCC cars in the 1950s. However, a few PCC streetcars are still operating in the United States. For example, the Massachusetts Bay Transportation Authority (MBTA) and the Southeastern Pennsylvania Transportation Authority both have active PCC cars on certain lines. A later effort to create standardized transit rail car designs was less successful. In the 1970s, the Standard Light Rail Vehicle was promoted by the Urban Mass Transportation Administration, which created a committee to develop the car design. A company called Boeing Vertol started building cars of this design in 1973 for MBTA and the San Francisco Municipal Railway, but the cars were prone to problems that led to their early retirement.

Industry associations—including APTA and the Institute of Electrical and Electronics Engineers—continue to promote standardization in transit rail car procurement to make transit rail car procurement more cost-efficient. As part of its standards development program, APTA convened two working groups in 2009 to develop (1) technical standards and (2) a set of standard terms and conditions for transit agencies to use when procuring light rail vehicles. These efforts are funded through membership dues and grants from FTA, the Transit Cooperative Research Program, and the Joint Program Office of the Department of Transportation. The goal of the first working group is to produce a set of technical standards that transit agencies can use when procuring new light rail vehicles and that FTA could apply to light rail cars, rather than establish federal requirements.<sup>20</sup> These standards may result in reduced design costs for transit agencies and allow manufacturers to take advantage of economies of scale in the manufacturing process.

The goal of the second working group is to develop a set of standard terms and conditions that agencies can use when procuring light rail vehicles. One of the biggest challenges for transit agencies—particularly for

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<sup>20</sup>APTA officials said that having a set of industry standards would be preferable because changes to the standards could be made more easily than if the standards were set out in federal regulations.

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agencies with limited procurement experience—is writing a contract that makes it easy to identify its terms, including each party’s financial risks.<sup>21</sup> Currently, each agency addresses risk in its Request for Proposals (RFP) and contracts in a different format, which makes it difficult for manufacturers to identify each party’s risks and may slow down the procurement process. The standard terms and conditions document should (1) reduce ambiguities in procurement documents, (2) allow transit agencies and manufacturers to save time, and (3) reduce the need for consultants. According to APTA officials, they expect to have a draft of the standards and a draft of the contract terms and conditions guidance to industry stakeholders for their comment by late summer 2010.

In addition, there appears to be a push for standardizing high-speed intercity passenger rail cars. Specifically, the Passenger Rail Investment and Improvement Act of 2008 (PRIIA) required Amtrak to establish a committee to design, set specifications for, and procure standardized next-generation train corridor equipment—such as high speed rail.<sup>22</sup> Although this effort does not affect transit rail cars, it could reduce rail car design costs for intercity passenger rail.

Some manufacturers have also attempted to increase the standardization of rail cars, while providing flexibility to their clients. For example, officials from one manufacturer told us that their company has developed two standard designs that they believe can be customized to meet 80 percent of U.S. transit agencies’ needs for new light rail cars. One is a high-platform car and the other is a low-floor car. The design for a low-floor car can also be used for a streetcar. These basic designs can be customized by changing the components as required—for example, stronger air conditioning systems for vehicles to be used in warm weather climates. Another manufacturer has developed a basic, more affordable design for commuter rail cars that can be customized to meet transit agencies’ needs—for example, a customer can change seating and interior materials, but not the shape of the car. The manufacturer also offers custom designs, but at a higher cost. Manufacturers may have more opportunities for

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<sup>21</sup>These financial risk issues include whether the transit agency or the manufacturer should be responsible for the extra costs resulting from problems that arise during the contract. Unknowns, such as commodity prices, general inflation, and exchange rates, add risk to rail car procurement. Other cost issues, such as indemnification, bonding requirements, warranties, and car design specificity, also can add risk to a contract.

<sup>22</sup>Passenger Rail Investment and Improvement Act of 2008, Pub. L. No. 110-432, 122 Stat. 4848 (Oct. 16, 2008).

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Joint Procurement and  
“Piggybacking”

standardization if transit agencies seek bids based on performance specifications that detail agencies’ needs in terms of car performance, as opposed to design specifications that detail how a car should be built.

Transit agencies have attempted to decrease costs by jointly procuring transit rail cars or “piggybacking” on another transit agency’s contract to take advantage of economies of scale. A joint procurement means that rail cars are purchased by two or more agencies under the same contract. For example, the Miami-Dade Transit jointly purchased heavy rail cars with the Maryland Mass Transit Administration in the 1980s. “Piggybacking” means that one transit agency exercises the options on another transit agency’s contract for rail cars of the same design. For example, the Utah Transit Authority piggybacked on San Diego Metropolitan Transit System’s contract for light rail vehicles. In joint procurements, all transit agencies must be named in the original contract, and the car designs must not be substantially different. In piggybacking, all transit agencies and all potential option quantities must be named in the RFPs and again in the contract. Transit agencies can benefit from both of these options through reduced rail car costs resulting from economies of scale in the production process as well as reduced design costs per car and procurement costs.

However, transit agency and FTA officials said that the opportunities for joint procurement and piggybacking are limited by several factors:

- First, some transit agencies—particularly those with heavy rail systems—have infrastructure that requires specific rail car features that are not common in other systems. For example, officials at the Bay Area Rapid Transit in San Francisco explained that their transit rail cars must be built from aluminum to meet weight restrictions of the infrastructure, whereas most other heavy rail cars in the United States are built from stainless steel.
- Second, transit agencies may have customized design requirements based on local preferences that limit their opportunities for joint purchases. Officials from one transit agency told us that their riders were accustomed to rail cars with passenger-loading in the center of the car, and, therefore, they included this feature in their design specifications. The transit agency would not be able to jointly purchase vehicles with another agency, unless they both had the same basic design.
- Third, transit agency and FTA officials also told us that it is difficult for transit agencies to coordinate their purchases and have funding available at the same time.

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- Finally, transit agencies are not generally aware of other transit agencies' procurement plans, and there is no entity to formally help facilitate joint purchases. According to FTA officials, they are aware of two informal mechanisms for discussing the potential for joint procurement—FTA's semiannual New Starts Construction Roundtable conference and APTA meetings. For example, the Agence Métropolitaine de Transport (AMT) in Canada identified an opportunity to purchase commuter cars at a reduced price at an APTA meeting. According to AMT officials, while this was not a joint procurement, they saved money because they had a similar design to the New Jersey Transit's commuter cars that were currently under production.

## FTA Activities

FTA, recognizing the financial benefits of joint procurements, piggybacking, and standardized rail cars, has recently looked for ways to encourage these activities. FTA studied the feasibility of creating an incentive system in conjunction with Section 5307 (Urbanized Area) formula grants to encourage and reward transit agencies to take the lead on joint or piggybacked procurements for buses and rail cars. As part of this study, FTA implemented a pilot program for joint procurement of buses. Three of the five pilot projects did not result in successful joint procurements, but demonstrated some of the difficulties of joint procurement. Specifically, the study found that (1) the incentives provided must be significant, (2) it is not adequate to increase the federal matching portion of existing formula funds, and (3) and it is important to maintain continuous production without significant changes to achieve potential savings. FTA did not implement a similar pilot of rail cars as part of this study.

As a result of the study, FTA recommended to Congress, in a 2008 report,<sup>23</sup> three alternatives to provide financial incentives to and compensate agencies that jointly procure transit rail cars:

1. FTA would award incentive grants to transit agencies that lead joint procurements to cover a portion of their program management cost.
2. FTA would award additional federal funding on the basis of the percentage of the rail car's contract cost for transit agencies that participate in a joint procurement.

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<sup>23</sup>*Report to Congress on Incentives in Federal Transit Formula Grant Programs.*

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3. FTA would increase the federal match for rail cars purchased according to federally designated standard terms and specifications.<sup>24</sup>

According to FTA officials, Congress authorized a pilot program to provide incentives for joint bus procurements in the agency's annual authorization.

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## Conclusions

Rail transit offers society a number of benefits, including reduced congestion and pollution and increased mobility. The benefits are realized in many cities across the country. However, the relatively small and erratic market for transit rail cars in the United States can hamper transit agencies as they purchase rail cars for commuter, heavy, and light rail transit systems, including streetcars, by increasing the cost and difficulty of procuring transit rail cars.

Design specifications that focus on custom designs suited for single-system use have increased the amount of work and related costs needed to design and test these cars. However, efforts are under way to promote standardized design, including APTA's efforts to develop procurement standards for light rail cars and PRIIA's requirement for Amtrak to set up a committee to look into designs for high speed rail systems. DOT's support of these efforts could pay dividends into the future by making rail cars more widely available at a lower cost. In particular, systems built in the future may benefit from increased standardization if they are not limited by existing infrastructure.

Joint procurements and piggybacking also have the potential to increase the financial advantages of purchasing large numbers of cars. These advantages typically have been limited to a handful of larger transit agencies, since smaller transit agencies have not purchased a sufficient amount of cars to benefit from economies of scale. While FTA's procurement guidance encourages joint procurement, it has not established a mechanism to assist transit agencies to successfully pool their orders, and transit agencies have reported difficulties in this area. Often, transit agencies are not aware of the activities of other agencies in the procurement arena. Without a process for coordinating performance and design standards and a means of encouraging joint procurements, current practices may not substantially change. A more systematic

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<sup>24</sup>While no new money would be provided with this alternative, cost savings could be achieved through reduced procurement costs.



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approach to linking agencies with similar infrastructure and rail car needs could identify even more of these opportunities. Since FTA helps fund many procurements, it may be in the best position to help transit agencies identify joint procurement opportunities.

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## Recommendations for Executive Action

To ensure that federal funds are used efficiently when procuring transit rail cars, we recommend that the Secretary of Transportation direct the Administrator of the Federal Transit Administration to, in conjunction with the American Public Transportation Association, take the following two actions:

1. Develop a process to systematically identify and communicate opportunities for transit agencies with similar needs to participate in joint procurements of transit rail cars.
2. Identify additional opportunities for standardization, especially for new systems, such as light rail and streetcar systems.

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## Agency Comments

We provided a draft of this report to the Department of Transportation for review and comment. The department provided comments via e-mail, generally concurred with the report, and agreed to consider the recommendations. The department also provided technical comments, which we incorporated in the report as appropriate.

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We are sending copies of this report to interested congressional committees, the Secretary of Transportation, and other interested parties. In addition, this report will be available at no charge on GAO's Web site at <http://www.gao.gov>.

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If you or your staffs have any questions about this report, please contact me at (202) 512-2834 or [wised@gao.gov](mailto:wised@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 major contributions to this report are listed in appendix II.

A handwritten signature in black ink that reads "David J. Wise". The signature is written in a cursive style with a large, prominent initial "D".

David J. Wise  
Director, Physical Infrastructure Issues

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# Appendix I: Scope and Methodology

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To determine the key characteristics of the U.S. market for passenger transit rail cars, we reviewed rail car databases, interviewed transit agency officials, and spoke with officials representing

- the Federal Transit Administration (FTA),
- the American Public Transportation Association (APTA),
- existing and potential transit rail car manufacturers, and
- transit agency consultants.

We used two databases—FTA’s National Transit Database and APTA’s 2009 Public Transportation Vehicle Database (APTA’s transit database)—to determine the number and modes of passenger transit rail cars in the United States. Both data sets describe the rail cars currently owned by transit agencies as well as dates the cars were made and the companies that built them. Both data sets also include information on commuter rail locomotives, although we did not analyze locomotive data for this report because locomotives carry no passengers and differ from other passenger rail cars in terms of technology and the companies that produce them. To assess the reliability of transit rail car inventory data from the National Transit Database and APTA, we interviewed FTA and APTA officials about data quality control procedures and reviewed relevant documentation. We reviewed the data for missing information and any obvious errors. We corrected National Transit Database data for one transit agency, based on information obtained directly from that agency. We determined that the data were sufficiently reliable for the purposes of this report.

We selected 23 transit agencies to interview about topics for our three objectives. We conducted site visits at most of these transit agencies and interviewed the rest by telephone. To select them, we used the National Transit Database, which was current for U.S. transit agencies, as of 2008, according to FTA officials. We adjusted this database to include additional transit rail service reflected in APTA’s transit database. Thus, we added 1 agency, the Valley Metro Rail of Phoenix, Arizona, that started its first rail service late in 2008 with a light rail line. We also added commuter rail service, started in 2009, by the Tri-County Metropolitan Transportation District of Oregon, an agency that had previously operated light rail transit, for a total of 54 transit agencies.

From the list, we judgmentally selected transit agencies on the basis of their size, rail transit modes (commuter rail, heavy rail, and light rail), and

geographic distribution. The 23 agencies we contacted collectively managed about 17,600 rail cars (88 percent) of all 19,841 rail cars managed by U.S. transit agencies. These transit agencies represent 42 percent of the 54 transit agencies we identified through the previously mentioned transit databases. However, the results of our work are not generalizable to all transit agencies. As shown in table 2, our sample agencies managed cars that approximate the distribution of rail cars in the U.S. fleet.

**Table 2: U.S. Passenger Rail Car Fleet by Mode (Commuter Rail, Heavy Rail, Light Rail)**

Rail car mode	U.S. rail car inventory	GAO's selected transit agencies
Commuter rail	31.3%	32.2%
Heavy rail	58.3	61.4
Light rail	10.4	6.4

Sources: FTA's National Transit Database and GAO.

The 23 transit agencies we contacted, representing 33 types of transit systems, were located in 13 states and the District of Columbia and were distributed across the country, as shown in table 3.

**Table 3: Rail Transit Agencies Interviewed for GAO's Analysis**

State	City	Transit agency	Transit system		
			Commuter rail	Heavy rail	Light rail
Arizona	Phoenix	Valley Metro			X
California	Los Angeles	Los Angeles County Metropolitan Transit Authority		X	X
	Los Angeles	Southern California Regional Rail Authority	X		
	Oceanside	North County Transit District	X		X
	Sacramento	Sacramento Regional Transit District			X
	San Diego	San Diego Metropolitan Transit System			X
	San Francisco	Bay Area Rapid Transit		X	
District of Columbia	Washington	Washington Metropolitan Area Transit Authority		X	
Florida	Miami	Miami-Dade County Transit		X	
Illinois	Chicago	Chicago Transit Authority		X	
	Chicago	Metra	X		
Massachusetts	Boston	Massachusetts Bay Transportation Authority	X	X	X
Missouri	St. Louis	Bi-State Development Agency			X
New Jersey	Newark	New Jersey Transit	X		X

**Appendix I: Scope and Methodology**

State	City	Transit agency	Transit system		
			Commuter rail	Heavy rail	Light rail
New York	New York	Port Authority Trans Hudson <sup>a</sup>		X	
	New York	MTA New York City Transit		X	
	New York	MTA Metro North	X		
	New York	MTA Long Island Rail Road	X		
Oregon	Portland	Tri-County Metropolitan Transportation District of Oregon	X		X
Pennsylvania	Philadelphia	Southeastern Pennsylvania Transportation Authority	X	X	X
Utah	Salt Lake City	Utah Transit Authority	X		X
Virginia	Alexandria	Virginia Railway Express	X		
Washington	Seattle	Central Puget Sound Regional Transit Authority	X		X

Sources: GAO and FTA's National Transit Database.

<sup>a</sup>The National Transit Database lists the Port Authority Trans Hudson system as a heavy rail system, so we followed this classification in this table. However, under federal law, this system is a commuter rail system and, thus, is subject to FRA regulations.

In addition, we interviewed two consulting companies working with the transit agencies that we interviewed. One contractor, Louis T. Klauder and Associates, was serving as a car consultant for the Port Authority Trans Hudson at the time of our visit. The other contractor, Virginkar & Associates, Inc., was serving as rail car procurement contractor for the Los Angeles County Metropolitan Transit Authority at the time of our visit.

To determine how the U.S. market for transit rail cars compares with international markets for transit rail cars, we reviewed data obtained from SCI Verkehr in Cologne, Germany. To assess the reliability of transit rail car inventory data from SCI Verkehr, we interviewed a company official about data quality control procedures. We determined that the data were sufficiently reliable for purposes of this report. Furthermore, with the help of the Department of State, we contacted:

- domestic and multinational rail car manufacturers;
- Agence Métropolitaine de Transport—the commuter rail service provider for Montreal, Canada;
- rail officials from Canada, Japan, New Zealand, and Portugal;
- Korean Board of Audit and Inspection; and

- European railway associations, including the Light Rail Transit Association, headquartered in the United Kingdom; and UNIFE—the Association of the European Rail Industry.

To determine the key characteristics of the U.S. market for passenger transit rail cars and to determine how the U.S. market for transit rail cars compares with international markets for transit rail cars, we judgmentally selected six companies that are existing and potential transit rail car builders. Five companies were selected mainly due to their status as either a major producer in the U.S. transit rail car market or a U.S.-based producer. One company was selected due to the relevance of its October 2009 congressional testimony about the U.S. rail car market and rail car design standardization initiatives.<sup>1</sup> These companies were as follows:

- Alstom Transportation
- Bombardier
- Kawasaki Rail Car, Inc.
- Siemens Industry
- United Streetcar/ Oregon Iron Works
- US Railcar LLC

To determine the federal government’s role in funding and setting standards, we reviewed applicable federal law, regulations, guidance, and grants and interviewed FTA officials at headquarters and select regional offices.<sup>2</sup> We also interviewed APTA officials regarding the federal government’s role in setting design standards.

To identify any challenges that transit agencies face when procuring transit rail cars, we met with transit agencies representing 33 types of transit systems across the country, transit rail car manufacturers, transit agency consultants, and FTA and APTA officials.

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<sup>1</sup>Testimony of US Railcar LLC before the Committee on Transportation and Infrastructure, Subcommittee on Railroads, Pipelines, and Hazardous Materials, U.S. House of Representatives (Oct. 14, 2009).

<sup>2</sup>We interviewed officials from FTA Regions 3, 9, and 10—regions in which we conducted site visits.

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We conducted this performance audit from September 2009 through June 2010 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. We provided a draft of our report to the Department of Transportation and incorporated its comments in the report as appropriate.

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# Appendix II: GAO Contact and Staff Acknowledgments

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## GAO Contact

David J. Wise, (202) 512-2834 or [wised@gao.gov](mailto:wised@gao.gov)

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## Staff Acknowledgments

In addition to the contact named above, Catherine Colwell, Assistant Director; Amy Abramowitz; Richard Calhoon; Sarah Jones; Stephanie Purcell; Amy Rosewarne; Frank Taliaferro; and Crystal Wesco made important contributions to this report.



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