Policy Analysis
No. 727 June 19, 2013

"Paint Is Cheaper Than Rails"
Why Congress Should Abolish New Starts

by Randal O'Toole

Executive Summary

The New Starts program has proven a failure and gives transit agencies incentives to build overly costly systems. Congress created the program in 1991, directing the Federal Transit Administration to ensure each grant be "justified based on a comprehensive review of its mobility improvements, environmental benefits, cost effectiveness, and operating efficiencies." In 2012, Congress added "congestion relief" and "economic development effects" to this list, but dropped "operating efficiencies." By any of these criteria, the program should be abolished. Here's why:

- Many New Starts projects reduce transit mobility because transit agencies sacrifice bus service to low-income neighborhoods, where such mobility is needed, in order to deliver rail transit to middle-income neighborhoods, where such mobility is merely an amenity.
- Planning documents for many New Starts projects predict that they will increase congestion by taking up more roadway space, disrupting traffic signal coordination, or increasing queues at park-and-ride stations.
- Planning documents often admit new rail lines will use more energy and generate more air pollution than the cars they take off the road. Other plans do not account for increasing automobile energy efficiencies or the effects of congestion on energy consumption and air pollution.
- The Bush administration attempted to use the cost-effectiveness requirement to place an upper limit on project costs, but the transit lobby has persuaded the Obama administration and Congress to effectively eliminate this criterion altogether.
- Numerous projects are far from operationally efficient because they increase operating costs without improving transit service. The transit lobby persuaded Congress to drop this criterion in 2012.
- Claims that rail transit promotes economic development are contradicted by the FTA's own research.

Urban transit funds should come from local, not federal, taxpayers. Until Congress is ready to stop funding transit, it should abolish New Starts and distribute all transit funds using formulas, the way most funds for highways and buses are distributed today. This would reduce, if not eliminate, incentives for transit agencies to build high-cost systems when low-cost systems would work just as well.

Randal O'Toole is a senior fellow with the Cato Institute and author of Gridlock: Why We're Stuck in Traffic and What to Do about It.

CATO INSTITUTE

The emphasis on expensive rail systems is almost entirely due to incentives that Congress and the Federal Transit Administration give to transit agencies.

Introduction

In a 2010 speech, Federal Transit Administration (FTA) Administrator Peter Rogoff chastised transit agencies for promoting construction of so many new rail lines. On one hand, Rogoff pointed out, agencies were unable to maintain the rail lines they already had: the FTA had recently estimated that rail transit systems suffered from close to a $60 billion maintenance backlog and that the backlog was growing because of inadequate spending on maintenance. "If you can't afford to operate the system you have," Rogoff asked agencies who were applying for federal grants to build new rail lines, "why does it make sense for us to partner in your expansion?"[1]

On the other hand, Rogoff noted that, in many cases, buses work as well as trains at a far lower cost. "Paint is cheap, rail systems are extremely expensive," he said. In response to those who claim that rail cars attracted more riders than buses, Rogoff pointed out, "you can entice even diehard rail riders onto a bus, if you call it a 'special' bus and just paint it a different color than the rest of the fleet."

Despite this, Rogoff worried, too many cities were planning "shiny new rails" without being "mindful of the [maintenance] costs they are teeing up for future generations." While buses don't work in every situation, he argued, bus rapid transit "is a fine fit for a lot more communities than are seriously considering it."

What Rogoff failed to acknowledge was that the emphasis on expensive rail systems in so many cities is almost entirely due to the incentives that his own agency gives, with the complicity of Congress, to transit agencies. The FTA awards large grants to transit agencies that emphasize the most costly forms of transit and offers only tiny grants to those agencies that emphasize the most efficient forms of transit. It has built this incentive system around a program Congress created in 1991 called New Starts, which provides matching funds for new transit infrastructure such as rail lines and exclusive bus lanes.

This paper will show that New Starts has effectively given transit agencies incentives to select the costliest, rather than the most cost-effective, alternative to any transit problem. This usually means building new rail transit lines, but can also mean building exclusive bus lanes for bus rapid transit.

New Starts Nomenclature

New Starts funds can only be spent on *fixed-guideway* capital improvements. Such guideways can include streetcar lines, elevated or subway lines, and bus lanes. The Federal Transit Administration also lists "automated guideways" (sometimes called people movers), monorails, and commuter-rail lines as eligible for New Starts grants.

However, the names for some types of rail projects are confusing. For example, the FTA distinguishes between "light" and "heavy" rail, but because these two terms usually refer to weight, many people think that light rail weighs less than heavy rail. In fact, weight has nothing to do with this distinction; the rails of many light-rail systems weigh as much as those of heavy-rail lines, and light-rail vehicles can actually weigh more than heavy-rail vehicles.

Instead, light rail refers to "light-capacity" rail transit, while heavy rail refers to "heavy-capacity" rail transit. This distinction is often downplayed by transit agencies that refer to light rail, confusingly, as "high-capacity transit," because a single light-rail car can hold more people than a bus. But since buses can safely operate more frequently than rail lines, bus routes can actually have higher capacities than light rail.

For example, light-rail vehicles typically have about 70 seats, with room for another 80 people standing. The size of city blocks limits the length of light-rail trains. Most cities can accommodate three-car trains, but Portland, Oregon, can only handle two-car trains, while Salt Lake City can handle four-

Table 1
Transit Capacities in People per Hour

Type of Transit	Seats per Vehicle	Standees per Vehicle	Vehicles in Train	Frequencies per Hour	People per Hour
High-capacity rail	70	80	8 to 11	20 to 30	24,000–49,500
Low-capacity rail	70	80	2 to 4	20	6,000–12,000
Streetcar	30	70	1	20	2,000
Bus on streets	40	20	1	168	10,080
DD bus on streets	80	40	1	168	20,160
Bus on highway	40	20	1	1,100	66,000
DD bus on highway	80	40	1	1,100	132,000

Source: Calculations based on vehicles in the National Transit Database.
Notes: Buses can move more people per hour than most rail transit, plus they offer seats to a larger share of riders. "DD bus" refers to double-decker buses. These capacities are based on typical vehicles operated by American transit agencies. Most published counts of standing capacities are based on "crush capacity," which is far tighter than Americans will accept. The standee numbers here are more typical of the point at which peak-hour crowded conditions cause people to wait for the next bus or train.

car trains. For safety reasons, most light-rail systems allow no more than 20 trains per hour, so depending on train lengths, light rail can move only 6,000 to 12,000 people per hour.

Heavy rail refers to subways and elevateds that operate exclusively in their own right of way. Train cars can hold about 150 people, and platform lengths generally limit train lengths to about 8 (in Washington) to 11 (in New York City) cars. Most heavy-rail lines can safely allow about 20 trains per hour, though New York City schedules some at 30 trains per hour. At 30 trains per hour with 11-car trains, a heavy-rail line can move nearly 50,000 people per hour.

Commuter trains are highly variable, potentially having lots of seats per train but having lower safe operating frequencies than other types of rail, yielding capacities midway between light and heavy rail. Some commuter trains, which the FTA calls "hybrid rail," have capacities similar to light rail.

For comparison, researchers have found that a single bus stop can serve 42 buses an hour.[2] A single bus stop occupies less than half a city block, and since buses typically stop no more frequently than every other block, some cities, such as Portland, have staggered bus stops in downtown areas so that a two-block stretch of street accommodates four bus stops serving 168 buses per hour.

Modern double-decker buses can have 80 or more seats with room for 40 or more people standing. That gives a capacity of more than 20,000 people per hour, far more than any light-rail line. At 60 miles per hour, a single lane of a highway can accommodate more than 1,100 buses per hour with six bus-lengths between every bus, making it possible to move 132,000 people per hour in double-decker buses, which is far more than any subway or commuter-rail line.

To avoid the confusion with weight, this paper will use the terms *low-capacity rail transit* for what has previously been called light rail, and *high-capacity rail transit* for what has previously been called heavy rail. (Note that the initials, LR and HR, remain the same.) By

Modern double-decker buses can move far more people per hour than almost any rail system.

Rail lines built in the 1970s and 1980s were failures by the standards of the people who planned them, costing far more money and attracting far few riders than expected.

extension, streetcars—which can carry about 100 people and cannot be coupled together—can only move about 2,000 people per hour and could be called *super-low-capacity rail* (SR).

The History of New Starts

When Congress passed the Urban Mass Transit Act in 1964, most American transit systems were private, and most had replaced obsolete and expensive rail lines with efficient bus transit. Transit usage was declining as auto ownership grew, but no one in the transit industry believed that substituting rail lines that were expensive to build and expensive to maintain would attract enough new riders to justify the cost.

Few people thought the federal government had a role to play in mass transit until the private railroads that operated commuter trains in Boston, Chicago, New York, and Philadelphia threatened to discontinue money-losing trains. Because many of these trains crossed state lines, urban leaders from those cities persuaded Congress that the trains played an important role in interstate commerce, thus justifying federal intervention.[3] Politically, however, Congress could not give money to just a handful of urban areas, so it offered to provide funding to any public agency operating transit.

This led to a rapid public takeover of private transit companies. Like their private predecessors, these public agencies continued to dismantle expensive rail lines. It was a public agency, not some General Motors conspiracy, that replaced the last streetcars in Los Angeles with buses. When a public agency in St. Louis replaced that city's last streetcars with buses in 1966, only eight American urban areas—Boston, Chicago, Cleveland, New Orleans, New York, Philadelphia, Pittsburgh, and San Francisco—still had rail transit. Outside of Atlanta, San Francisco, and Washington, few public agencies at the time dreamed of building new rail transit lines.

That changed in 1973 when Congress passed a law allowing cities that cancelled interstate freeways to use the federal share of the estimated freeway cost (adjusted for inflation) for transit capital improvements. Cities like Portland quickly figured out that the cost of an interstate freeway could buy hundreds of new buses, but they wouldn't have enough money to operate those buses. So they chose to build low-capacity rail lines because their high capital costs would use up all of the federal funds without imposing huge operating costs on local transit agencies.

Most of those early rail lines were failures by the standards of the people who planned them, costing far more money and attracting far fewer riders than expected. For example, planners of the Washington Metro system projected that the trains would generate enough fares to cover all of the operating costs and 80 percent of the capital costs.[4] In fact, over the past two decades fares have covered only about 60 percent of operating costs and none of the capital or maintenance costs. Such overly optimistic projections were routine: a 1990 study by Don Pickrell for the Urban Mass Transit Administration of 10 new rail lines built in the 1970s and 1980s found that they cost an average of 50 percent more than projected and attracted less than 35 percent as many riders as projected.[5]

Despite these failings, the new rail lines built with interstate highway funds provided cities with eye-catching urban monuments that generated lots of free publicity. More important, perhaps, the contractor profits and construction jobs from building the lines made up for the profits and jobs lost from the freeway cancellations.

Many of these contractors, including a variety of engineering consulting firms, joined the American Public Transit Association (now the American Public Transportation Association), making that organization into one of the largest transportation lobby groups in Washington. Today, its $24 million annual budget makes it several times larger than all the highway lobby groups in the nation's capital combined.

Neither the transit agencies nor the contractors wanted to see an end to rail construction, so they lobbied Congress for more federal capital funds. They got their wish when Congress passed the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA), creating the New Starts fund for building fixed-guideway transit lines.

Most federal transportation dollars are distributed to states and metropolitan areas using formulas based on such factors as population, population densities, and the number of vehicle miles of service offered by transit agencies each year. States and metro areas may regard these funds as windfalls, but they know the funds are fixed based on the formulas, so they have no incentive to deliberately design high-cost alternatives in order to get a larger share.

Instead of using formulas, New Starts was a grantmaking program that supposedly allocated funds to the best and most deserving projects. But transit agencies soon realized that they could easily increase their share of the New Starts fund by simply planning projects that were more expensive. Effectively, New Starts was a large pot of money into which transit agencies could dip, and those that dipped the fastest got the most.

The result was that transit costs exploded with no discernible improvement in transit services. In fact, many metro areas saw transit services decline as agencies put most of their efforts into a few transit lines and neglected the rest of their customers.

When Congress passed this law, it required that program grants be "based on the results of an alternatives analysis" and "justified based on a comprehensive review of its mobility improvements, environmental benefits, cost effectiveness, and operating efficiencies."[6] The 2012 update to this law slightly revised the list of criteria used to justify New Starts projects to "the project's mobility improvements, the project's environmental benefits, congestion relief associated with the project, economic development effects associated with the project, the capacity needs of the corridor, and the project's cost-effectiveness as measured by cost per rider."[7]

Using either list, grants should favor projects that improve overall mobility, reduce congestion, protect the environment, save money on operations, promote economic development, and are cost-effective at meeting all of these goals. In implementing this law, however, the FTA has failed to ensure that agencies adequately justify projects based on these criteria. In fact, many expensive New Starts projects actually worsen mobility and air quality, do little for economic development, and are both operationally inefficient and cost-ineffective. Congress has been complicit in this, both by weakening the law and exempting particularly wasteful projects from meeting these requirements.

Mobility

When Congressional funding for public transit agencies in the 1960s led to a sweeping takeover of almost every private transit company in the United States, transit advocates argued that subsidies to transit were needed to provide mobility for people who were unable to drive or could not afford a car. But this raison d'etre for transit subsidies has all but disappeared. While large numbers of households in the 1960s still lacked cars, by 2011 only 4.5 percent of American workers lived in a household without a car. Curiously, while 41 percent (or 2.5 million) of these carless workers relied on transit, more than a fifth reported that they commuted to work by driving alone.[8]

With the decline in transit's original market, the new justification for transit has become getting people out of their cars in order to save energy and reduce air pollution. Transit advocates ignore the fact that transit in 2010 consumed 3,443 BTUs per passenger mile—just four BTUs less than the average car in 2010.[9] They further ignore the fact that automobiles are becoming more energy efficient much faster than transit.

New Starts was a large pot of money into which transit agencies could dip, and those that dipped the fastest got the most.

In order to get people out of their cars, the argument goes, a higher quality form of transit is needed than ordinary bus service. Actual data show that, as Peter Rogoff suggested, improvements in bus service can attract as many or nearly as many new transit riders at a far lower cost than expensive rail lines or dedicated lanes for bus rapid transit.

In the 21 years after Congress created New Starts, American transit agencies spent close to $200 billion inflation-adjusted dollars on rail transit capital improvements. More than a quarter of this was from the New Starts fund, and less than a quarter was from other federal funds, while the remainder was state and local funds raised to match the federal dollars in order to be eligible for "free federal money."

During that time, America's metropolitan-area population grew by more than 30 percent, but transit ridership grew by less than 19 percent, meaning per capita transit ridership declined from 42 to 38 trips per year. This indicates that transit agency efforts to get people out of their cars are failing.

One of the reasons for this is that transit agencies spurred to build expensive fixed-guideway projects ended up neglecting what was left of their core market: low-income people and others who could not drive. In a depressing pattern that has been repeated in city after city, agencies that once offered mainly low-cost bus service built expensive rail lines into middle-class neighborhoods seeking to attract people out of their cars. But the high cost of the rail lines, especially after cost overruns, forced transit agencies to raise fares and cut back on bus service to low-income neighborhoods. The result was that new rail transit led to a decline in transit's share of travel, and sometimes to an actual decline in transit ridership.

When Los Angeles began building rail transit in the late 1980s, cuts in bus service resulted in a 17 percent decline in bus ridership. The National Association for the Advancement of Colored People sued the county transit agency, charging that it had cut service to minority neighborhoods in order to build the rail lines. In a consent decree, the transit agency agreed to restore that service for 10 years, which led to a restoration of bus ridership.[10] However, when the 10 years were up, it once again cut service.[11]

In the late 1970s, Atlanta began building a high-capacity rail system. By 1985 it had 25 miles of rail lines and total transit ridership had grown to 155 million trips per year. Since then, the Atlanta urban area population has nearly tripled, and rail miles have doubled. Yet in 2012 ridership had fallen to 130 million trips per year, meaning per capita ridership had fallen by about two thirds. One reason is that, far from keeping up with population growth, bus service declined from more than 25 million vehicle miles per year in 1985 to 22 million in 2012. While rail ridership has grown, that growth has been at the expense of bus ridership.[12]

San Jose's transit agency went heavily into debt building low-capacity rail in the late 1980s and 1990s. As long as the region's economy continued to grow it was able to meet its debt obligations and maintain transit service, but when the dot-com bubble burst in 2001 it was forced to choose between defaulting on the debt or cutting service. Between 2000 and 2011 it cut bus service by 24 percent, contributing to a 34 percent decline in bus ridership.[13]

Even cities that did not see a decline in ridership saw a loss in transit's market share of commuting and travel. In 1980, Portland, Oregon's bus system carried 9.9 percent of the region's commuters to work. By 2010, Portland had built five low-capacity rail lines, a commuter-rail line, and a streetcar line, but transit's share of commuting fell to 7.1 percent.

Over the same time period, Las Vegas not only maintained per capita transit ridership, it increased it by 150 percent, while it increased transit's share of commuting by 135 percent. It did so not by building expensive transit projects, but by focusing on low-cost improvements in bus service. It saved even more money by contracting out bus services to private companies; on average, private op-

Despite spending close to $200 billion on rail transit projects, per capita transit ridership has fallen by 10 percent.

erators charge transit agencies about 60 percent as much, per bus vehicle mile, as agencies spend operating their own buses.[14]

When transit agencies apply for New Starts funds, they never foresee that the expensive projects they wish to build will force them to cut service elsewhere. Yet this pattern has been repeated so often that the FTA should be wary of granting funds to agencies that are forced to borrow large amounts to meet their local share of costs. However, the FTA continues to give money to agencies even after they have failed to maintain transit service in the past.

Congestion

Congestion in American urban areas costs the nation well over $100 billion a year.[15] New Starts projects are often sold to the public by claiming that they reduce congestion and therefore improve mobility, but this is rarely true. In fact, many New Starts projects actually make congestion worse.

One goal of a New Starts project is to attract people out of their cars and onto transit, which potentially can reduce congestion. But the transit vehicles themselves can add to congestion, often by more than the congestion-reduction benefits of the projects. There are several ways that this might take place.

Bus rapid transit (BRT) can use existing streets, but to be eligible for New Starts funds, BRT must have its own dedicated lanes for at least part of the route. Cities often create these lanes by converting existing lanes that are open to all traffic into exclusive bus lanes. Unless the BRT line carries more new transit riders than the vehicles that once used the transformed lane, the resulting loss of roadway capacity leads to increased congestion.

Streetcars and low-capacity rail lines often use city streets. Even if those lines don't completely displace cars from the lanes the railcars use, the vehicles themselves are very long—typically 66 feet for a streetcar and 100 feet for a low-capacity railcar—and the number of new transit riders they carry may be less than would have been carried by the cars they displace from the street. For example, the alternatives analysis for a proposed Anaheim streetcar found that the streetcar would take up to 287 autos off of city streets each day, but at the same time would reduce the capacity of those streets by more than 1,100 autos per day.[16]

Even when they use their own right-of-way rather than city streets, low-capacity rail and commuter trains both often cross streets. The high frequency of such trains during rush hour increases congestion as cars attempt to cross the tracks on those streets. For example, the environmental assessment for the Charlotte North Corridor commuter rail plan found that congestion created by the frequent train crossings would reduce average rush hour speeds in the corridor by 15 percent.[17]

Finally, many cities have reduced congestion by coordinating traffic signals on major routes. But the FTA requires that federally funded transit projects be given signal priority at intersections. This can severely disrupt traffic. For example, when Minneapolis opened the Hiawatha low-capacity rail, the trains altered traffic signals on streets that the line crossed, which in turn altered traffic signals where those streets crossed Hiawatha Avenue, which the low-capacity rail paralleled. The result was that peak hour travel times on parts of Hiawatha more than doubled.[18]

It is not unusual for transit agencies to claim that a goal of a New Starts project is to reduce congestion even when their own analyses show that it will make congestion worse. In the final environmental impact statement (FEIS) for Dallas's Northwest Corridor project, a subchapter "need for action" begins, "Current and projected travel patterns, levels of roadway congestion, growth in population and employment in the region and in the corridor require that the proposed project be built in order to address the need for additional capacity. . . . The project corridor parallels one of the most congested highway

Contrary to claims that rail lines reduce congestion, many New Starts projects will make congestion worse.

Maryland's proposed Purple Line would reduce average travel speeds and waste 13 million hours of travelers' time each year.

corridors in the region [and] the entire Study Area falls within a region identified for the year 2025 as an 'area of severe peak-period congestion.'"[19]

Despite the primary need for the project being a reduction in congestion, the environmental impact statement found that the project would make it worse. A standard measure of congestion is "levels of service," with A being almost no traffic and F being near gridlock. The FEIS found that, at most intersections crossed by the rail line, congestion would be worse—often, much worse—than without the project. Of the 20 intersections evaluated, 13 would see levels of service drop from A, B, or C to D, E, or F. At least one would go from A all the way to F.[20]

Similarly, the draft environmental impact statement (DEIS) for the proposed "Purple" low-capacity rail line between Bethesda and New Carrollton, Maryland, states, under "purpose and need," "Improvements to the transportation system in the corridor would address the following transportation challenges: Increasing congestion on the roadway system [and] degraded mobility and accessibility between major activity centers and residential areas."[21] Although reducing congestion is the first goal of the line, it would in fact do just the opposite.

According to a traffic analysis report for the project, if the rail line is not built, average auto travel speeds in the region in 2030 will be 24.5 miles per hour. If the line is built, average speeds will fall to 24.4 miles per hour.[22] A 0.1 mile-per-hour decline may not seem like much, but when multiplied by the millions of miles of travel in the region, it adds up to more than 13 million hours wasted in traffic each year.

Similarly, an analysis for the Baltimore Red low-capacity rail line found that, without the project, average traffic speeds in the region would be 31.4 miles per hour in 2035, but with the project they would be only 31.2 miles per hour.[23] The auto users still stuck in traffic after the line is built will end up wasting more than 320,000 hours per year.

High-capacity rail projects are completely grade separated from highways and therefore will not directly add to congestion themselves. But that doesn't mean they will relieve congestion. The final environmental analysis for the extension of the Bay Area Rapid Transit (BART) line to San Jose evaluated the effects of building the line on traffic on 95 parallel highway segments in 2030. The study found that traffic would improve on 57 of these segments but worsen on 38 of them. The average highway segment moved about 8,700 vehicles per hour without BART; building BART would reduce this by merely 57 vehicles per hour. Not one single segment saw enough of a reduction in traffic to increase average speeds by even 1 mile per hour.[24]

Although high-capacity rail will not directly increase congestion, it can indirectly increase it by adding to congestion at intersections near park-and-ride stations. The FEIS for the Honolulu rail project found that congestion would significantly worsen at six intersections near park-and-ride stations. The average amount of delay experienced by peak-period motorists at these intersections would increase by more than 2.5 minutes per intersection.[25]

This means the average motorist driving on the highway parallel to the planned rail line would expect to add 15 more minutes to their trip than if the rail line were not built. Honolulu planners proposed to mitigate some, but not all, of this delay by adding new highway lanes and traffic signals. But such measures alone could significantly relieve existing congestion without building the rail line.

These are not isolated examples. Transit planners routinely claim that expensive transit projects will reduce congestion even though their own analyses find that they increase congestion. In fact, many transit planners privately, if not publicly, believe that increased traffic congestion is a good thing because it will lead more people to take transit rather than drive. Planners "must start looking upon congestion as a friend," says Florida planner Dom Nozzi.[26]

When the Minneapolis low-capacity rail line was found to have severely increased congestion along parallel Hiawatha Avenue, a Minnesota Department of Transportation official claimed, "This is not a sinister plot to make traffic as miserable as possible and move everybody onto the train."[27] In fact, state records soon revealed that a consultant had warned that giving low-capacity rail signal priority would severely disrupt traffic. Yet the state decided to give the trains priority because, said a state engineer, "We needed to give an advantage to transit."[28]

Environmental Benefits

Although reducing air pollution and saving energy are usually secondary, and not primary, reasons given for building New Starts projects, many projects in fact produce the opposite result. Unfortunately, this is obscured because most New Starts planners make two major errors when estimating the effects of their plans on air pollution and energy consumption. First, they fail to account for the effects of traffic congestion. Congestion forces cars to idle or operate in stop-and-go traffic, which uses more energy than when they operate in free-flowing traffic. This produces more pollution, especially because catalytic converters on most cars do not work as well in traffic as they do at normal speeds.

Second, planners fail to account for technological improvements that are making autos more fuel-efficient. Under the Obama fuel-economy standards, by 2030 the average car on the road will use only about 60 percent as much energy as the average car today.[29] Such improvements are not happening as fast in the transit industry, and rail transit, in particular, locks in transit agencies to technological systems that can take decades to achieve even minor improvements in fuel economy.

"Technologies with longer life capital elements or systems elements that deter incremental change could fare more poorly in the march to energy efficiencies," says University of South Florida transit expert Steve Polzin. "Autos and buses have relatively short life cycles, modest capital costs and have autonomous vehicles independent from the guideway; thus, they can enable relatively rapid integration of state-of-the-art technologies. . . . Modes where the vehicle and guideways are integrated systems may be far more difficult or expensive to upgrade to newer, more efficient technologies."[30]

One plan that appears to have accounted for the effects of congestion on pollution is the FEIS for the Dallas Northwest Corridor, which found that the project would result in 1.3 percent more carbon monoxide in the corridor than the no-build alternative, and more hydrocarbons and nitrogen oxides as well.[31] However, this doesn't include the pollution emitted by the power plant used to generate the electricity to power the low-capacity rail line, which would almost certainly be powered by burning fossil fuels—but it isn't located in the corridor and so was ignored by the FEIS. Nor did the FEIS estimate the effects of the rail line on energy consumption, but it would likely increase, especially if the huge energy costs of construction were amortized over the 30-year life of the project.

Projects whose planners do estimate energy consumption often find that the new transit systems are projected to use more energy than the cars taken off the road. For example, the DEIS for Maryland's Purple line found that the low-capacity rail alternatives ended up using 56.6 billion BTUs of additional energy per year over the no-build alternative.[32] This doesn't count the roughly 900 billion BTUs of energy required to build the line.[33]

Similarly, the FEIS for Minneapolis's Central Corridor found that a new low-capacity rail line would, in 2030, use about 200,000 BTUs per year more than would be saved by the cars removed from the road.[34] The FEIS did not bother to estimate the energy required to build the line, but considering that the planned line is only slightly shorter than the Dallas Northwest line (15.8 miles vs. 17.6

Far from saving energy, Maryland's Purple Line would cost 900 billion BTUs of energy to build and then would increase energy consumption by 56.6 billion BTUs per year.

Even when operating new rail lines saves energy, that annual savings is often too small to ever pay back the energy costs of constructing those lines.

miles), the energy requirements will be comparable.

Because urban roads carry far more passenger miles than urban rail lines, the energy costs of road construction per passenger mile are much lower than for rail transit. A life-cycle analysis of roads and transit conducted by researchers at the University of California at Berkeley found that the total energy costs of rail transit were about 2.5 times greater than the operating costs, while the total energy costs of highway transportation (buses or cars) were only about 1.6 times the operating costs.[35]

As a result, even when projects are projected to save energy in day-to-day operations (assuming, of course, no improvements in auto fuel economy), the energy cost of construction often swamps the projected savings. For example, Seattle's North Link low-capacity transit line is projected to save about 200 billion BTUs of energy per year.[36] The energy cost of construction, however, will be 17.4 *trillion* BTUs, which means it would take 86 years of annual savings to repay the construction cost.[37] Since rail lines must be substantially rebuilt about every 30 years (which requires large amounts of energy), the construction cost, in fact, will never be paid back.

Similarly, the Honolulu rail plan projected that the transit line would save about 145 billion BTUs of energy per year, but constructing it would require 7.5 trillion BTUs, for a payback period of 52 years.[38] Again, because of the energy costs of reconstruction every 30 years or so, any payback period longer than 30 years means the construction cost will never be repaid.

Cost-Effectiveness

Cost-effectiveness and *efficiency* are often confused with one another but in fact are two different things. Efficiency is an absolute value: something is efficient if its benefits are greater than its costs. But often benefits and costs cannot both be expressed in dollars, making it difficult to determine whether benefits exceed costs. This is where cost-effectiveness analysis comes in.

When a benefit cannot be expressed in dollars, cost-effectiveness is calculated by dividing the total units of the benefit by the cost in dollars. Unlike efficiency, which is absolute, cost-effectiveness can only be relative: something is cost-effective only if its cost, per unit of output, is lower than any other alternative. This means that a cost-effectiveness analysis must compare the proposal to a wide range of alternatives.

Since Congress created the New Starts program in 1991, the FTA has required transit agencies to successively use three different measures of cost-effectiveness. Originally, agencies were to estimate the *cost per new transit rider*. To calculate this, capital costs would be amortized over the expected life of the capital improvement to get an annualized cost. This annualized capital cost would be added to the annual operating cost of the project and the sum divided by the annual number of new riders that the project would attract.

The FTA also allowed planners to do the alternatives analysis early in the planning process, which is when cost estimates tend to be highly unreliable. This analysis was done in what was originally called a *major investment study* and later called an *alternatives analysis*. This step considered a wide range of alternatives, allowing a comparison of the cost-effectiveness of each alternative.

Later in the process, after more engineering work was done and cost estimates firmed up, agencies would write an environmental impact statement. By this time, however, the FTA had allowed agencies to drop almost all alternatives from consideration. The only alternatives required in this step are a "no-build" alternative and sometimes a "transportation systems management" (TSM) alternative, which usually means improvements in bus service that don't require new infrastructure.

The problem with this process is that the engineering work done between the alterna-

tives analysis and the EIS usually resulted in a large increase in projected costs. Thus, the cost-effectiveness analysis done for the alternatives analysis would be based on misleadingly low costs.

As previously mentioned, the 1990 study by Department of Transportation policy analyst Don Pickrell found that, after adjusting for inflation, rail projects built in the late 1970s and early 1980s cost an average of about 50 percent more than projected at the time the decision was made to build the project.[39] By comparison, highway projects tend to average only about 8 percent over their original projections.[40] Pickrell pointed out that "The systematic tendency to overestimate ridership and to underestimate capital and operating costs introduces a distinct bias toward the selection of capital-intensive transit improvements such as rail lines."[41]

The transit bureaucracy has failed to correct this bias over the years. At least two recent updates have found that most projects still have significant cost overruns, though the overruns may have averaged less than 50 percent.[42] Even more recently, overruns of more than 100 percent for the Charlotte Blue line and Denver West line, along with a 60 percent overrun for Portland's commuter rail line, suggest that the problem remains uncorrected.

A variety of cost-effectiveness analyses suggest that improvements in bus service generally cost about $1 to $10 per new transit trip, while rail construction typically cost around $10 to $100 per new trip. The alternatives analyses usually found buses to be more cost-effective than rails, but transit agencies generally argued that rails had other benefits, such as that they were "operationally efficient," that is, the operating cost per transit trip was lower than for buses, even if the capital cost was higher. These arguments might make sense if the difference in cost-effectiveness between buses and rails was small, but by the time the cost projections were completed the differences were very large.

For example, the Charlotte Area Transit System (CATS) is currently planning to extend its low-capacity rail into the northeast part of the urban area. At the time it wrote the major investment study, it estimated that the line would cost $369 million (about $440 million in today's dollars). While the study found that bus rapid transit would cost $7 per new trip and low-capacity rail would cost $12 per new trip, CATS picked low-capacity rail anyway. However, by the time it wrote an environmental impact statement, seven years later, rail cost projections had risen to $823 million, or 89 percent more than the earlier projections. This means that low-capacity rail's cost per new trip would be close to double the estimated cost. But since the alternative of bus-rapid transit was not included in the EIS, the two could not be compared.

The West low-capacity rail line that Denver's Regional Transit District (RTD) has just completed provides another example. When the major investment study was done in 1997, the line was projected to cost $250 million (about $350 million in today's dollars).[43] At the time, a bus rapid-transit alternative was projected to be almost twice as cost-effective ($7.68 vs. $13.47 per hour saved). However, when the line was built, the final cost turned out to be $707 million—more than twice the projected cost. Even that cost was achieved only by single-tracking the last several miles of the route, a savings which is probably only temporary: when Baltimore built a single-track low-capacity rail line, it created enough operational problems that the city came back to the federal government several years later asking for more money to double-track that section of the line.[44]

In an effort to place some limit on the growing costs of rail construction, the Bush administration modified the definition of cost-effectiveness, replacing the cost-per-new-trip measure with a measure of cost per hour of time saved by "all travelers affected," including "transit riders, highway users and pedestrians."[45] This recognized that that transit benefits (or costs) could extend to people who don't use transit as well as transit riders.

The transit bureaucracy's failure to correct the systematic underestimation of rail construction costs biases analyses in favor of capital-intensive projects.

Thanks partly to New Starts' perverse incentives, average inflation-adjusted light-rail construction costs have risen from under $20 million per mile to more than $100 million per mile.

A second decision by the Bush administration placed a fixed limit on the cost per hour that would be accepted. Instead of comparing the cost-effectiveness of proposed projects against alternatives to those projects, the FTA simply rated projects from "high" to "low" based on the estimated dollars per hour of time saved. The costs adjust for inflation, but as of 2012 a project was rated "high" if it cost less than $12.50 per hour saved; "medium-high" if it cost $12.50 to $16.49 per hour; "medium" if it cost $16.50 to $24.99 per hour; "low-medium" if it cost $25 to $31.49 per hour; and "low" if it cost $3.50 per hour or more (all these numbers would adjust over time for inflation).[46] Under Bush administration rules any application that was rated below "medium" was automatically rejected.

This methodology is far from perfect. For one, it fails to reveal that bus alternatives to rail projects are almost always far more cost-effective than building a rail line. Second, the various transit agencies and metropolitan planning organizations use a variety of models to estimate costs and hours saved, and judging all projects based on a fixed $25 per hour threshold creates a bias against planners who use more realistic models. Even if the models were equal, a true cost-effectiveness process would fund the projects with the lowest cost first, not just rate all projects that were less than $25 per hour as acceptable. Despite these flaws, the Bush administration's rule was the first time that any limit had been placed on New Starts funding.

The Bush administration's efforts failed to prevent massive increases in New Starts project costs as cities and transit agencies attempted to outdo one another in finding ways to get a larger share of the New Starts fund. Before New Starts, rail transit had a questionable value, but transit agencies at least had incentives to contain costs.

For example, using its own funds, San Diego completed the nation's first modern low-capacity rail line in 1981 at a cost of $7 million per mile—roughly $17 million per mile in today's money. The value of this line was called into question when, in order to boost ridership, San Diego had to buy out a private bus company that was profitably competing against the subsidized rail line.

Other cities decided to build low-capacity rail using federal interstate highway funds freed up by cancelling freeways. Under the 1973 law allowing cities to apply cancelled interstate freeway funds to transit capital improvements, Portland decided to build low-capacity rail line that cost less than $15 million per mile, or under $30 million in today's dollars.

Like the San Diego line, this had questionable value: to promote ridership, TriMet had to cancel several express buses that had been faster than the low-capacity rail trains. Even then, the actual ridership of 20,000 trips per weekday was only roughly half of the projected 45,000 trips per weekday.

After Congress created the New Starts fund, Portland-area leaders argued that they had to build more low-capacity rail in order to ensure that Portland received "its share" of the fund. For example, Mike Burton, the executive director of Metro, Portland's metropolitan planning organization, warned in a letter to other officials in the region that "the region must take action to bring Oregon's fair share of federal transportation dollars back home or they will be lost to other regions of the country." The action the letter urged them to take was to endorse the construction of more low-capacity rail lines.[47]

Taking advantage of the largesse offered by the New Starts fund, Portland's second low-capacity rail line, which opened in 1998, cost $55 million per mile—nearly $80 million per mile in today's dollars. That was considered expensive in 1998, but today it is less than average.

The FTA's New Starts recommendations for 2013 include 35 different projects, 17 of which are low-capacity rail. Only one of these costs less than $60 million per mile, and the average cost is $138 million per mile. This average is inflated by three very expensive

underground projects: a three-mile low-capacity rail subway in Seattle that is projected to cost $628 million per mile; a 1.9-mile low-capacity rail subway in Los Angeles that is expected to cost $707 million per mile; and a 1.7-mile low-capacity rail subway in San Francisco that is projected to cost $928 million per mile. But even excluding these underground projects, the remaining 14 low-capacity rail projects are projected to cost nearly $110 million per mile.

Many of the other projects in the 2013 New Starts recommendations are similarly expensive. The 2013 New Starts report recommends five high-capacity rail projects costing an average of $369 million per mile. One of these is New York's Second Avenue Subway, which is expected to cost well over $2.1 billion per mile, but the other four are still expected to average $312 million per mile.

Commuter rail projects usually cost less because they tend to use existing tracks. However, the average cost of commuter rail projects in the 2013 report is tilted by New York City's construction of the Long Island Railroad's East Side line to Grand Central Station, which is costing $2.1 billion per mile. The remaining three commuter rail projects in the 2013 recommendations still cost $39 million per mile.

Were it not for New Starts, it is doubtful that cities and transit agencies would have seriously considered any of these projects or, if they had, that their costs would be so high.

Instead of recognizing that especially wasteful projects should not be built, the transit bureaucracy reacted like a spoiled child to the Bush rule eliminating projects that cost more than $25 per hour. First, it persuaded Congress to exempt some particularly outrageous projects from the cost-effectiveness rule. The first projects to be exempted were the DC-area Silver Line to Dulles Airport, an extension of the BART system to San Jose, the San Francisco Central Subway, and the Portland-area Beaverton-to-Wilsonville commuter-rail project.

The FTA originally calculated that the cost of the Portland-area commuter line would be $25.26 per hour of time saved.[48] Like most rail projects, it proved to be even less cost-effective than this original projection. It was first estimated to cost $105 million and carry 1,600 people (800 round trips) per weekday in its first year of operation.[49] Its actual cost grew to $165 million, and it carried only 300 round trips per weekday in 2009 (its first full year), which rose to 362 round trips by its third year.[50] At the 2011 ridership rate, the line is so expensive that it would cost less to give every weekday round-trip rider a new Toyota Prius every 15 months for the next 30 years.

Next, many transit agencies whose projects cost more than $25 per hour tinkered with their plans, either increasing claimed benefits or reducing costs. One popular way of increasing benefits was to improperly calculate the number of hours saved by the transit project. As previously noted, FTA rules require planners to count the hours saved (or wasted) by transit users, highway users, and pedestrians. Since far more people drive than use transit, projects that increase congestion are likely to cause more hours of delay to people in their cars than they save people who ride transit. So, in calculating the cost per hour, many transit agencies only counted the hours saved by transit riders, not the hours of delay imposed on highway users.

For example, when calculating the cost-effectiveness of the Purple Line, the Maryland Department of Transportation counted "both existing system users such as existing transit riders who might benefit from a faster trip or more convenient access to the service, as well as new transit users."[51] However, it did not count auto drivers who, as previously noted, would lose more than 13 million hours per year because of the increased congestion caused by the project. Maryland's cost-effectiveness calculations for the Baltimore Red Line made the same error. In evaluating these projects, the FTA simply ignored this violation of its own rules.

The Federal Transit Administration allowed Maryland to violate FTA rules by ignoring delays to auto travelers when calculating the cost-effectiveness of the Purple Line.

Other agencies attempted to keep projects alive by seeking 100 percent local funding. For example, CATS gave up seeking federal funds for a proposed commuter train to suburbs north of Charlotte because projected ridership was so low that the cost per hour saved would be much higher than $25. However, instead of planning buses or some other cost-effective solution, CATS asked each of the cities that would be served by the train to use tax-increment financing to subsidize construction.

Next, the transit bureaucracy persuaded the Obama administration to rewrite the rules so that they were weaker than ever. In 2010, Secretary of Transportation Ray LaHood announced that the administration would rewrite the rules to focus on "livability" rather than cost-effectiveness.[52] Draft rules issued in January, 2012, proposed to "simplify" the cost-effectiveness analysis by simply measuring costs per transit trip, not per new trip and not per hour of time saved.[53] If transportation models assume that more congestion leads to more transit riders, then under the new rules projects that increase congestion will actually be favored because they will result in more transit riders.

Under the Obama administration's cost-effectiveness rule, all a transit agency has to do to determine that a project is cost-effective is calculate the cost per trip, even if that cost is $1 million.

Finally, covering all its bases, the transit lobby convinced Congress to severely weaken the law when it passed the Moving Ahead for Progress in the 21st Century Act (MAP-21) later in 2012. First, MAP-21 agreed with the Obama administration in redefining cost-effectiveness as cost per transit trip.[54] Second, while MAP-21 requires the FTA to rate projects "on a 5-point scale (high, medium-high, medium, medium-low, or low)," it specifies that the FTA "shall not require that any single project justification criterion meet or exceed a 'medium' rating in order to advance the project from one phase to another."[55]

MAP-21 also eliminated the requirement in the original law that grants be "based on the results of an alternatives analysis," and the Obama administration's final rules therefore eliminated any mention of an alternatives analysis. Instead, under the new rules, transit agencies need only calculate the cost per trip of the proposed transit project relative to a no-action alternative. Since they need not even calculate the cost per trip of the no-action alternative, there is no way to tell if a plan is truly cost-effective. In essence, under the new rules, all a transit agency has to do to determine that a project is cost-effective is calculate the cost per trip. Even if that cost is $1 million per trip, it will by definition be cost-effective.[56]

The replacement of cost per hour with cost per trip signals that Congress thinks relieving congestion is unimportant in funding transit improvements. In fact, transit projects that increase congestion are likely to be rated higher using the cost-per-trip formula, as planning models presume that increased congestion will lead more people to ride transit.

Even more disturbing than the replacement of cost per hour saved with cost per trip is the new rules' lack of any requirement for an alternatives analysis. Supposedly, Congress eliminated this requirement because it duplicated a similar requirement in the National Environmental Policy Act, which requires the consideration of a wide range of alternatives for any "major federal action significantly affecting the human environment." But past experience has shown that agencies will often include the fewest possible alternatives in the environmental impact statements, and the new FTA rules reduce this to two: the preferred alternative and no action.

Moreover, some transit projects, such as streetcars, may be found to have no significant impact and are therefore exempted from writing environmental impact statements. For example, streetcar proposals for Dallas, Kansas City, Milwaukee, and Tucson, among others, were all found to have no significant impact.[57] Thus, such projects will not come under the NEPA requirement for a full range of alternatives.

The new law and Obama administration rules not only allow the possibility of FTA funding for rail projects that were previously rejected by the FTA, such as the CATS North

Corridor project, they open the floodgate for the funding of streetcar projects. Under the Bush administration rules, streetcar projects had to be cost-effective relative to buses, which will never happen: streetcar lines not only cost far more to build than buses that share roads and streets with other vehicles, they typically cost at least twice as much to operate as buses. Under the Small Starts program, a version of New Starts approved by Congress in 2004, the new rules allow cities to apply for $75 million in federal funds per streetcar line no matter how cost-ineffective they are.

The Obama administration has already funded streetcars in Atlanta, Cincinnati, Dallas, and Tucson using stimulus funds, which had no cost-effectiveness requirement. Secretary of Transportation Ray LaHood clearly wants to fund more streetcars, claiming they contribute to urban "livability," which he defines as living without cars. Considering that a Portland *Oregonian* reporter found that he can walk faster than the city's streetcar and that streetcar tracks are a serious danger to cycling—which LaHood also wants to promote—it is difficult to see how a streetcar truly promotes livability by any definition other than one based solely on nostalgia.[58]

Operating Efficiencies

Rail advocates sometimes excuse the high capital costs of rail construction by suggesting that rail's lower operating costs will eventually save taxpayers' money. Supposedly, because one rail vehicle can hold far more people than a bus. yet can be driven by the same driver, the operating cost per passenger mile will be lower.

What this neglects to consider is that the costs of operating and maintaining rail lines is much more than the cost of the drivers. This is most obvious in the case of streetcars, which (in the cities that have them) cost nearly three times as much to operate per vehicle mile than buses.[59] That would be fine if streetcars carried three times as many people, but most streetcar lines actually carry fewer people per vehicle mile than buses in the same city.[60]

In addition, the construction of new rail lines does not necessarily reduce the number of miles that buses must be driven. Instead, low- and high-capacity rail lines may replace through-bus services, but they must be supplemented by feeder buses that connect neighborhoods to the rail stations.

For example, the FEIS for Dallas's Northwest Corridor projected that buses would operate 5.3 percent more vehicle miles under the selected low-capacity rail alternative than under a no-build alternative.[61] Operating buses these extra miles would cost taxpayers nearly $6.9 million per year, while operating and maintaining the low-capacity rail line would cost $23.4 million per year for a total annual operating cost of more than $30 million per year.

The DEIS for the Maryland Purple Line more optimistically projected that building a low-capacity rail line would save $3.6 million per year in bus operating costs. However, the cost of operating and maintaining the rail line would be $25.8 million per year, so no operating efficiency would result.[62]

Other New Starts projects claim to have lower operating costs than buses, but this claim is often deceptive. Generally accepted accounting principles count maintenance as an operating cost.[63] But, in violation of those principles, the FTA allows transit agencies to count maintenance as a capital cost. Since maintenance costs are a much larger share of the total for rail lines and other fixed guideway systems, this biases any analyses of operating efficiencies in favor of those high-cost lines.

Maintenance becomes especially critical after fixed guideway systems reach 30 years of age and just about every part of the system—pavement, tracks, power transmission, stations, signaling—needs replacement. Though this is called "capital replacement," it is not a capital improvement, which by definition must lead to increased productivity, not just maintenance of existing productiv-

The Federal Transit Administration counts maintenance as a capital cost, not an operating cost, which biases analyses of operating efficiencies in favor of high-maintenance rail lines.

While transit agencies dedicate expensive infrastructure to small numbers of transit riders, the intercity bus industry is shedding its dedicated infrastructure.

ity. The Boston MBTA, Chicago Transit Authority, Washington Metro, and other major transit agencies are struggling with finding funding for such capital replacement, but few, if any, financial plans for New Starts projects give any hint that this will be a problem because the FTA allows agencies to look ahead only 30 years, thus missing most of this cost.

Considering that rail transit costs so much more to operate than buses—especially in the case of streetcars—it should be no surprise that the transit lobby persuaded Congress to delete this criterion from the 2012 MAP-21.

Economic Development

MAP-21 added "economic development effects associated with the project" to the list of criteria that can be used to justify New Starts projects. Some cities, led by Portland, Oregon, have claimed that new transit lines have spurred economic development, leading other cities to justify transit projects that are otherwise not cost-effective based on the economic development benefits.

In fact, as I've discussed in an earlier paper, the claims of economic development benefits are specious: other than government buildings, Portland obtained very little economic development along its rail lines unless the city provided large subsidies to the developers. Since subsidies to developers also produced economic development where there were no rail lines, it appears that the subsidies, not the rail lines, spurred most new development.[64]

A 1995 FTA-funded study found that even the busiest high-capacity rail transit lines, such as the San Francisco BART system or the Washington Metro system, do not lead to urban growth. At best, they shuffle development around from one part of an urban area to another, which means some property owners win while others lose: usually, the downtown area benefits at the expense of everyone else.[65] It is likely that low-capacity rail lines move too few people to even have this effect, but even if they did, there are far more cost-effective ways to promote such development.

This will not prevent transit agencies from claiming such an effect. As noted in my previous paper on streetcars, agency analyses in Atlanta, Cincinnati, Kansas City, St. Louis, and Tucson found that the costs of streetcars greatly exceeded their transportation benefits. But the agencies claimed hundreds of millions of dollars in economic development benefits in order to make the benefits appear to exceed the costs.[66]

Can New Starts Be Fixed?

Some people might review the data and case studies presented in this paper and conclude that New Starts could work if only Congress established firm cost-effectiveness and other requirements; the FTA strictly enforced those requirements; and transit agencies did not cook the books in order to avoid meeting those requirements. But the real lesson should be that the incentives to get federal dollars are greater than any bureaucratic safeguards or the implicit obligation for public officials to guard the public purse.

Technologically, the notion of dedicating expensive fixed guideways to small numbers of transit riders is moving in the wrong direction. The fastest-growing segment of the transportation industry is intercity bus, which is growing rapidly by shedding infrastructure such as stations and baggage-handling facilities and relying instead on shared infrastructure.[67] This, of course, was the trend in most of the transit industry before Congress started giving incentives to transit agencies to build expensive rail systems. Rather than spending large amounts of money on high-cost systems, transit agencies should experiment with shared taxis, van pooling, and similar low-cost systems.

In sum, New Starts should be abolished for four reasons.

1. It gives transit agencies incentives to choose high-cost transit systems when other systems are far more cost-effective.
2. Both the FTA and Congress have aided and abetted this waste, which suggests that it can't be fixed by tinkering with the grant standards.
3. The transit agencies themselves project that those high-cost transit systems often increase congestion, energy consumption, and air pollution, and even when they don't, there are other, more cost-effective ways of treating those problems.
4. The example of Las Vegas shows that low-cost transit systems can do far better at providing transit mobility at a far lower cost to taxpayers.

There is in fact little justification for federal funding for urban transit at all. Short of abolishing transit subsidies entirely, Congress should end New Starts and distribute all federal transportation funds on a formula basis, the way funds are currently distributed for highways and most bus transit. This will minimize the incentives to waste such funds.

Notes

1. All Rogoff quotes are from Peter Rogoff, "Next Stop: A National Summit on the Future of Transit," presentation at the Federal Reserve Bank of Boston, May 18, 2010, tinyurl.com/7v6e8aq.

2. Robert L. Bertini, *Bus Facility Capacity*, Portland State University (May 2, 2006), p. 5, tinyurl.com/cgy4u6a.

3. George M. Smerk, *The Federal Role in Urban Mass Transportation* (Bloomington, IN: Indiana University, 1991), pp. 60–61.

4. Zachary M. Schrag, *The Great Society Subway: A History of the Washington Metro* (Baltimore: Johns Hopkins University Press, 2006), pp. 53–54.

5. Don Pickrell, *Urban Rail Transit Projects: Forecast Versus Actual Ridership and Cost*, Urban Mass Transit Administration (October 1990), p. xi, tinyurl.com/copz69p.

6. Intermodal Surface Transportation Efficiency Act of 1991, section 3010(i)(1)(B).

7. 49 USC §5309(e)(2)(A)(iv).

8. Census Bureau, *2011 American Community Survey*, (2012), Table B08141.

9. Federal Transit Administration, *2010 National Transit Database* (Washington: Federal Transit Administration, 2011), "energy" and "service" spreadsheets; Stacy Davis and Jacob Ward, *Transportation Energy Data Book Edition 31* (Oak Ridge, TN: Department of Energy, 2012), Table 2-13.

10. Labor/Community Strategy Center, "Bus Riders Union," busridersunion.org.

11. *Transit Civil Rights and Economic Survival in Los Angeles: A Case for Federal Intervention in LA Metro* (Los Angeles: Bus Riders Union, 2011), pp. 3–4.

12. All ridership numbers in this section are from Federal Transit Administration, *National Transit Data Base* (Washington: Federal Transit Administration, various years), "service supplied and consumed" spreadsheets.

13. Gary Richards, "VTA Backs Major Cuts," *San Jose Mercury-News*, May 10, 2003; Federal Transit Administration, *National Transit Database* (Washington: Federal Transit Administration, various years), "service" spreadsheets.

14. Federal Transit Administration, *2011 National Transit Database* (Washington: Federal Transit Administration, 2012), "operating expense" and "service" spreadsheets.

15. David Schrank, Bill Eisele, and Tim Lomax, *TTI's 2012 Urban Mobility Report* (College Station, TX: Texas Transportation Institute, 2012), p. 1, tinyurl.com/bkwhv2q.

16. Orange County Transportation Authority, *Anaheim Rapid Connection Fixed Guideway Alternatives Analysis Report (Draft)*(October 3, 2012), pp. 3–26.

17. Charlotte Area Transit System, *North Corridor Commuter Rail Environmental Assessment* (Charlotte, CATS, April 2008), pp. 4-47–4-48.

18. Laurie Blake, "Light Rail Always Will Slow the Flow," *Minneapolis Star-Tribune*, December 12, 2004, tinyurl.com/cdkb3gc.

19. Dallas Area Rapid Transit, *Northwest Corridor Final Environmental Impact Statement* (Dallas: Dallas Area Rapid Transit, 2002), pp. 1-7–1-8.

20. Ibid., p. 4-16.

21. Maryland Department of Transportation, *Purple Line Alternatives Analysis, Draft Environmental Impact Statement* (Baltimore: Maryland Department of Transportation, 2008), p. 1-1.

22. Maryland Department of Transportation, *Purple Line: Traffic Analysis Technical Report* (Baltimore: Maryland Department of Transportation, 2008), pp. 4-1–4-2.

23. Maryland Department of Transportation, *Red Line Final Environmental Impact Statement* (Baltimore: Maryland Department of Transportation, 2012), p. 5-125.

24. Santa Clara Valley Transportation Authority, *BART Extension to Milpitas, San Jose, and Santa Clara Draft Supplemental Environmental Impact Report* (San Jose: Santa Clara Valley Transportation Authority, 2007), pp. 4-26–4-29.

25. City of Honolulu, *Honolulu High-Capacity Transit Corridor Project Environmental Impact Statement* (Honolulu: City of Honolulu, 2010), p. 3-51.

26. Dom Nozzi, "Traffic Congestion: Friend or Foe?" Citizens for Smart Growth (2004), tinyurl.com/bns7euu.

27. Laurie Blake, "Mixed Signals: Officials Try to Undo Snarls along Rail Line," *Minneapolis Star-Tribune*, June 25, 2004.

28. Blake, "Light Rail Always Will Slow the Flow."

29. Calculated based on President Obama's Corporate Average Fuel Economy standard of 54.5 miles per gallon by 2025 and assuming a straight-line trend toward that standard and the historic turnover rate of one-eighteenth of the American fleet each year. See National Highway Traffic Safety Administration, "President Obama Announces Historic 54.5 mpg Fuel Economy," July 29, 2011, tinyurl.com/43uxhjs.

30. Steve Polzin, "Energy Crisis Solved!" *Urban Transportation Monitor*, July 11, 2008, p. 8.

31. Dallas Area Rapid Transit, *Northwest Corridor Final Environmental Impact Statement*, p. 5-25.

32. Maryland Department of Transportation, *Purple Line Alternatives Analysis, Draft Environmental Impact Statement*, p. 4-87.

33. Ibid., p. 4-88.

34. Metropolitan Council, *Central Corridor LRT Project Final Environmental Impact Statement* (St. Paul, MN: Metropolitan Council, 2009), p. 4.10-1.

35. Mikhail V. Chester and Arpad Horvath, "Environmental Assessment of Passenger Transportation Should Include Infrastructure and Supply Chains," *Environmental Research Letters* 4 (2009): 1, tinyurl.com/czclacq.

36. Sound Transit, *North Link Final Supplemental Environmental Impact Statement* (Seattle: Sound Transit, 2006), p. 4-112.

37. Ibid., p. 4-216.

38. City of Honolulu, *Honolulu High-Capacity Transit Corridor Project Environmental Impact Statement*, pp. 4-125, 4-206.

39. Don Pickrell, "Urban Rail Transit Projects: Forecast Versus Actual Ridership and Cost," Urban Mass Transit Administration (October 1990), p. xi, tinyurl.com/copz69p.

40. Bent Flyvbjerg, Mette Skamris Holm, and Søren Buhl, "Underestimating Costs in Public Works Projects: Error or Lie?" *Journal of the American Planning Association* 68, no. 3: 285.

41. Pickrell, p. xvii, tinyurl.com/copz69p.

42. Nasiru A. Dantata, Ali Touran, and Donald C. Schneck, *Trends in U.S. Rail Transit Project Cost Overrun*, paper presented to the Transportation Research Board (2006), Table 2, tinyurl.com/34g9rd; Federal Transit Administration, *The Predicted and Actual Impacts of New Starts Projects—2007* (Washington: Federal Transit Administration, 2008), p. 11, tinyurl.com/8kpnyr.

43. BRW, Inc., *West Corridor Major Investment Study Final Report* (Denver: RTD, 1997), pp. 108, 110.

44. Federal Transit Administration, *Baltimore Central Light Rail Double Track* (Washington: Federal Transit Administration, November 1998), www.fta.dot.gov/12304_2822.html.

45. 40 C.F.R. 611.5.

46. Federal Transit Administration, *Capital Investment Program FY 2012 Evaluation and Rating Process* (Washington: Federal Transit Administration, 2012), p. 9, tinyurl.com/44u33d6.

47. "Memo from Mike Burton to JPACT re: South/North LRT Proposal," *Metro* (Portland, Oregon), December 11, 1996.

48. Federal Transit Administration, *Wilsonville to Beaverton Commuter Rail, Washington County, Oregon* (Washington: Federal Transit Administration, November 2005), p. 2, tinyurl.com/8vt3mb.

49. Federal Transit Administration, *Wilsonville to Beaverton Commuter Rail, Washington County,*

Oregon (Washington: Federal Transit Administration, November 2004), p. 1, tinyurl.com/cc79pd9.

50. Federal Transit Administration, *National Transit Database*, "service" spreadsheets for 2009 and 2011; "capital use" spreadsheets for 2007 through 2011.

51. Maryland Department of Transportation, *Purple Line Alternatives Analysis, Draft Environmental Impact Statement*, p. 3-7.

52. Christopher DeMorro, "DOT Signals Major Shift on Public Transportation Policy," *Gas2*, January 15, 2010, tinyurl.com/ydpmrjb.

53. 49 CFR §611, Federal Transit Administration, "Major Capital Investment Projects," *Federal Register*, January 25, 2012, pp. 3848–3909.

54. 49 USC §5309(e)(2)(A)(iv).

55. 49 USC §5309(g)(2)(A) and (C).

56. 49 CFR Part 611, Appendix A(I)(d)(1).

57. Federal Transit Administration, *Finding of No Significant Impact for Oak Cliff Dallas Streetcar* (Washington: Federal Transit Administration, July 21, 2011), tinyurl.com/cdpukvk; *Finding of No Significant Impact for Kansas City Downtown Streetcar Project* (Washington: Federal Transit Administration, October 12, 2012), tinyurl.com/bpyg9be; *Finding of No Significant Impact for the Milwaukee Streetcar Project* (Washington: Federal Transit Administration, January 25, 2012), tinyurl.com/chllvwh; *Finding of No Significant Impact for Tucson Modern Streetcar Project* (Washington: Federal Transit Administration, January 25, 2011), tiny url.com/d9xl4eq.

58. Joseph Rose, "Joseph Rose vs. the Portland Streetcar: Walking Wins in a Showdown of City's Pokey Commuting Modes," *Oregonian*, February 8, 2013.

59. Calculated from Federal Transit Administration, *2011 National Transit Database* (Washington: Federal Transit Administration, 2012), "operating expense" and "service" spreadsheets.

60. Calculated from Federal Transit Administration, *2011 National Transit Database* (Washington: Federal Transit Administration, 2012), "service" spreadsheets.

61. Dallas Area Rapid Transit, *Northwest Corridor Final Environmental Impact Statement*, p. 2-52.

62. Maryland Department of Transportation, *Purple Line Alternatives Analysis, Draft Environmental Impact Statement*, p. 5-3.

63. Congressional Research Service, *Amtrak: Overview and Options* (January 25, 2001), p. 25, tinyurl.com/92asmzc.

64. Randal O'Toole, "The Great Streetcar Conspiracy," Cato Institute Policy Analysis no. 699, June 14, 2012, pp. 5–9.

65. Robert Cervero and Samuel Seskin, *An Evaluation of the Relationship between Transit and Urban Form* (Washington: Transportation Research Board, 1995), p. 3.

66. O'Toole, "The Great Streetcar Conspiracy," p. 11.

67. Randal O'Toole, "Intercity Buses: The Forgotten Mode," Cato Institute Policy Analysis no. 680, June 29, 2011, pp. 2–3.

RELATED PUBLICATIONS FROM THE CATO INSTITUTE

Stopping the Runaway Train: The Case for Privatizing Amtrak by Randal O'Toole, Cato Institute Policy Analysis no. 712 (November 13, 2012)

The Great Streetcar Conspiracy by Randal O'Toole, Cato Institute Policy Analysis no. 699 (June 14, 2012)

Intercity Buses: The Forgotten Mode by Randal O'Toole, Cato Institute Policy Analysis no. 680 (June 29, 2011)

Fixing Transit: The Case for Privatization by Randal O'Toole, Cato Institute Policy Analysis no. 670 (November 10, 2010)

Defining Success: The Case against Rail Transit by Randal O'Toole, Cato Institute Policy Analysis no. 663 (March 24, 2010)

The Citizens' Guide to Transportation Reauthorization by Randal O'Toole, Cato Institute Briefing Paper no. 116 (December 10, 2009)

Getting What You Paid For—Paying For What You Get: Proposals for the Next Transportation Reauthorization by Randal O'Toole, Cato Institute Policy Analysis no. 644 (September 15, 2009)

Roadmap to Gridlock: The Failure of Long-Range Metropolitan Transportation Planning by Randal O'Toole, Cato Institute Policy Analysis no. 617 (May 27, 2008)

Does Rail Transit Save Energy or Reduce Greenhouse Gas Emissions? by Randal O'Toole, Cato Institute Policy Analysis no. 615 (April 14, 2008)

Do You Know the Way to L.A.? San Jose Shows How to Turn an Urban Area into Los Angeles in Three Stressful Decades by Randal O'Toole, Cato Institute Policy Analysis no. 602 (October 17, 2007)

Debunking Portland: The City That Doesn't Work by Randal O'Toole, Cato Institute Policy Analysis no. 596 (July 9, 2007)

A Desire Named Streetcar: How Federal Subsidies Encourage Wasteful Local Transit Systems by Randal O'Toole, Cato Institute Policy Analysis no. 559 (January 5, 2006)

Published by the Cato Institute, Policy Analysis is a regular series evaluating government policies and offering proposals for reform. Nothing in Policy Analysis should be construed as necessarily reflecting the views of the Cato Institute or as an attempt to aid or hinder the passage of any bill before Congress. Contact the Cato Institute for reprint permission. Additional copies of Policy Analysis are $6.00 each ($3.00 each for five or more). To order, or for a complete listing of available studies, write the Cato Institute, 1000 Massachusetts Ave., N.W., Washington, D.C. 20001 or call toll free 1-800-767-1241 (8:30-4:30 eastern time). Fax (202) 842-3490 • www.cato.org

CATO INSTITUTE