REPORT

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IS ST. LOUIS TRANSIT BUILT FOR THE 2020s OR THE 1910s?

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KEY TAKEAWAYS

- MetroLink, St. Louis's light-rail system, has failed to attract riders, ease traffic congestion, reduce pollution, or spur economic development.
- The proposed addition of 5.5 street-running miles of light rail would exacerbate existing problems and would be more dangerous to pedestrians and motorists than the current lines.
- Instead of building an expensive light-rail line, the Bi-State Development Agency should focus on redesigning the region's bus system so that it will cost-effectively serve more people.

EXECUTIVE SUMMARY

Metro, the public transit division of the Bi-State Development Agency, wants to spend hundreds of millions of dollars building 5.5 miles of street-running light-rail lines north and south of the city's center. Yet this proposal fails to acknowledge that the 46 miles of light-rail lines built to date have been a complete failure.

Total bus and light-rail ridership was lower in 2019 than it had been in 1993, the year before Metro opened St. Louis's first light-rail line. When major additions to the light-rail system were made in 2001, ridership was lower the year after these additions opened than the year before.

St. Louis has the nation's fastest light-rail trains and one of the lowest accident fatality rates because its light-rail lines don't run in streets but instead operate in their own rights-of-way. Speed and safety weren't enough to attract new riders, meaning the money spent on the system was wasted.

The street-running light-rail lines Metro is now proposing will be slow and dangerous to pedestrians, cyclists, and automobile users. Incapable of operating significantly faster than buses, they will attract few new passengers who weren't previously riding transit.

Contrary to Metro's claims, street-running light rail will not spur economic development. Instead, experiences of other cities show that much of the economic development along light-rail lines has been subsidized. If the goal is economic development, subsidies alone would stimulate such development. There is no need to burden taxpayers with another $500 million or so in costs for light rail.

Far from relieving congestion, street-running light rail will make it worse by reducing the capacity of the streets to move people in automobiles by more than the number of automobiles it takes off the road. In addition, Metro's plan to give light rail priority at traffic signals puts the needs of a few transit riders ahead of the far greater number of people crossing those roads.

Construction of new light-rail lines will harm the environment. St. Louis light rail has a long history of using more energy that comes from electrical power plants that emit more greenhouse gases per passenger-mile than the average car or even the average light truck. Metro hasn't even attempted to calculate the millions of pounds of greenhouse gases that will be emitted in construction of these light-rail lines.

Nor will light rail be socially just. Before the pandemic, just 4.4 percent of low-income people in the St. Louis urban area rode transit to work, a number that fell to 2.8 percent in 2021. Yet the other 96 to 97 percent of low-income people still must pay regressive taxes that support high-cost transit rides they don't take. This is the very definition of social injustice.

Light rail may have made sense in the 1910s, when St. Louisans lived in dense neighborhoods surrounding a downtown that concentrated a high percentage of the region's jobs. But it is simply not appropriate for the highly decentralized urban area that St. Louis has become in the 2020s. Metro has focused the light-rail system on downtown, yet less than 10 percent of the region's jobs are in downtown St. Louis.

Metro hasn't even served downtown workers very well, carrying just 10 percent of them to work before the pandemic compared with 40 percent of downtown workers in Seattle, 35 percent in Pittsburgh, 33 percent in Minneapolis, and 28 percent in Portland taking transit to work. Meanwhile, Metro carried less than 3 percent of non-downtown workers before the pandemic.

Metro's continued planning of new light-rail lines also completely ignores the devastating effects the pandemic has had on transit. Many people who once rode transit

now work at home. Downtown St. Louis is ranked 51st out the nation's 52 largest downtowns in its recovery, with only 38 percent as much economic activity in recent months as before the pandemic. Metro transit ridership has been stuck at about 55 percent of pre-pandemic levels since August 2022, and there is little reason to think it will rise much above that.

The real lesson of the pandemic is that transportation agencies need to be nimble to adapt to changes in travel patterns. Buses can be nimble; rail lines, which take years to plan and build, cannot.

Instead of spending what is likely to be well over a billion dollars on light-rail lines St. Louis doesn't need, Metro needs to reinvent itself to provide transit services that will help people throughout the region. One way to do so would be to run a trunk-line system of frequent, nonstop buses between major economic centers in the St. Louis area supplemented by local buses and bus-rapid transit lines radiating from each of those centers. Such a system would provide faster, safer service than Metro's current system and would attract far more new riders at a much lower cost than building new light-rail lines.

INTRODUCTION

The Bi-State Development Agency, also known as Metro, is planning to build a new light-rail line. The agency's latest plan calls for a 5.5-mile line that starts at Fairground Park, follows Natural Bridge Avenue to Parnell Street, then turns south on Parnell and continues on Jefferson Avenue to Chippewa Street.[1]

Considering Metro's previous experience with light rail and current transit ridership trends, this proposal is an extraordinarily bad idea. It would waste hundreds of millions of dollars to provide service that is little better than existing bus service while it diverts Metro's attention from the more important task of adapting its bus system to the needs of today's travelers. With about 500,000 households in the area served by Metro, this proposal will probably cost an average of more than $1,000 per household for a transit line that few in the region will ever use.

Light rail is not a good fit for St. Louis for two reasons. First, light rail is an obsolete form of transportation, as buses can move more people to more destinations faster at a far lower cost. Second, St. Louis has become a modern, decentralized urban area with numerous major job centers, so the one thing that light rail *can* do—move large numbers of people from point A to point B at one time—isn't needed in the region. Instead, transit needs to be able to move smaller numbers of people from hundreds of different origins to hundreds of different destinations, which light rail is not suited to do.

This report will show why light rail doesn't work for St. Louis, why proposed new light-rail lines will fail, and what Metro should be doing instead of spending large amounts of money on transit lines that will serve few travelers.

LIGHT RAIL IS OBSOLETE

Transit agencies present light rail to the public as a modern form of transportation. In fact, it is nearly as antiquated as the electric streetcars that first operated in St. Louis in 1889 and ended service in 1966.[2]

A century ago, most urban jobs were in factories and most factories were in downtown areas where they could be close to rail and water transportation bringing in raw materials and taking away finished products. Big-box transit like light rail may have made sense at that time, as it could bring large numbers of workers from dense residential neighborhoods to downtown job concentrations. In addition, bus technology was primitive, with most buses not being capable of carrying more than about 25 passengers, thus making buses more expensive to operate per seat-mile than rail transit.

In 1927, however, an Ohio company called Twin Coach developed the first bus that cost less to buy and less to operate per seat-mile than streetcars.[3] In just ten years, more than 500 American cities converted all their streetcar lines to buses, and by 1970 most of the rest had followed.[4]

"The motor coach and the private automobile have made streetcar operations obsolete in the United States," explained the president of a Portland, Oregon transit company when it shut down that city's last rail transit

line in 1958. "It is not economically possible [for rail transit] to compete with this newer and better type of transportation."[5]

This statement expressed the consensus in the transit industry up to and through the takeover of private transit companies by cities and states in the late 1960s and early 1970s. In 1973, however, Congress passed a law allowing cities to cancel planned interstate freeways and use the federal government's share of the dollars to make transit capital improvements. Buffalo, Portland, Sacramento, San Jose, and several other cities decided to cancel freeways and use these dollars to build light-rail lines.[6]

These cities didn't choose light rail because it was efficient or because it would attract more riders than buses. Instead, they picked light rail *because it was expensive* and would consume all the federal dollars that had been allocated to the freeways, something that was politically necessary to get support for canceling those roads.[7] The only real difference between light rail and streetcars was that light-rail cars could be coupled together to operate in trains while streetcars had no couplers. Despite this small difference, light rail was just as obsolete as streetcars when compared with modern versions of Twin Coach buses.

The high profit potential from constructing light-rail lines and light-rail vehicles that typically cost five times as much as buses led to the formation of a light-rail lobby seeking more funds for more lines. In 1991, Congress created a transit capital improvement fund (or "New Starts" fund) that offered to cover half the costs of new fixed-guideway lines, which usually meant rail transit. Although the act specified that projects be proven to be cost effective, the Federal Transit Administration seemed to have little regard for whether light rail was cost effective; instead, the money was handed out more or less on a first-come, first-served basis.[8]

America's biggest urban areas, including New York, Chicago, Philadelphia, and Boston, were already served by heavy rail (subway and elevated) systems, but most medium-sized urban areas had replaced all their rail lines with buses. Transit agencies in these urban areas lined up to get federal funding for new light-rail lines, not to provide better transit but to get more federal dollars. Indeed, there seemed to be a competition for who could spend the most building a mile of light-rail line, and costs per mile skyrocketed from under $50 million (in today's dollars) in the 1980s to nearly $300 million today.

Low-capacity Transit

Transit advocates often call light rail "high-capacity transit," but that is misleading. The "light" in light rail refers not to weight, but to capacity. As defined by the American Public Transit Association's *Glossary of Transit Terminology*, light rail is "an electric railway with a 'light volume' traffic capacity."[9]

Metro says that its light-rail cars have 72 seats and can carry 106 standees, for a total capacity of 178 per car. This compares with 40 seats and 39 standees in some of its 40-foot buses and 54 seats and 30 standees in its 60-foot articulated or "bendy" buses. Other transit agencies have articulated buses rated to carry more than 120 passengers, and a few can even carry more than 160 passengers, which is much more than a 40-foot bus but still less than a light-rail car.[10]

In addition, light-rail cars can be coupled together and operated as two-, three-, or four-car trains depending on the length of station platforms. In St. Louis, platforms are limited to two-car lengths, which means 356 people per train. This makes light rail "big-box transit" because a single driver can move large numbers of people from one point to another at the same time.

Light rail's limitations are due to its inflexibility. Few if any light-rail lines are built to allow trains to pass one another. For this reason, a light-rail station can only serve one train at a time in each direction. To allow time for passengers to board and deboard, and for safety reasons, light-rail stations can only serve about 20 trains per hour. Twenty trains times 356 people per train works out to 7,120 riders past a point per hour in each direction.

Though buses are smaller, they can pass one another on streets or highways and can operate far more frequently. A single bus stop can easily serve more than 40 buses per hour. On streets in high-use transit corridors, bus stops can be staggered so that four stops are located in a single long block or two short blocks, allowing the street to serve more than 160 buses per hour.[11] At 79 passengers

per bus, that works out to 12,640 people per hour. With articulated buses capable of carrying 120 passengers, buses could move 19,200 people per hour.

Dedicated busways on major highways can move even more people. Istanbul has built a 32-mile dedicated busway in the median strip of a freeway that moves more than 250 buses per hour with every bus stopping at stations located about three-quarters of a mile apart. This gives it a capacity of more than 30,000 people per hour and it routinely moves more than 20,000 people per hour.[12] Bogota, Columbia, has 71 miles of busways with even higher capacities: rated at 45,000 people per hour, they commonly move more than 30,000 people per hour in one direction past a single point.[13] In the United States, New York–New Jersey's Lincoln Tunnel Exclusive Bus Lane moves well over 450 buses per hour, albeit without any intervening transit stops.[14]

Compared to dedicated busways, then, St. Louis's light rail is a very-low-capacity transit system. Even if platforms were extended to allow for eight cars, the system's capacity would be less than a dedicated busway. While Metro could extend platforms on its existing lines, trains on the proposed street-running line would be limited by the length of St. Louis city blocks, which in many cases are barely long enough for a two-car light-rail train. Of course, the reason Metro has built two-car platforms for its light-rail system is that transit demand is so low that there is no need for longer trains, which means there is no need for trains at all, as buses can move the number of people moved on MetroLink for far less money.

The Advantage of Flexibility

Buses have several other advantages over light rail. Modern urban areas are highly dynamic, with new economic centers growing and older ones shrinking over time. As Metro admits, planning and building new light-rail lines to serve growing centers takes at least seven years and costs hundreds of millions of dollars.[15] In contrast, new bus routes can be added and bus frequencies changed to serve larger or smaller numbers of transit riders practically overnight.

For example, the recent pandemic has greatly changed transportation patterns. A few transit agencies, such as Dallas Area Rapid Transit (DART), are making significant changes in their route systems in response to these new transportation patterns. "The only thing we couldn't move was the rail tracks," a DART spokesman ruefully admitted.[16]

The Advantage of Low Costs

New light-rail lines not only cost more to start up than new bus lines, they can also cost more to operate. Nationwide, transit agencies spent $24 per revenue vehicle mile operating light rail vs. $13 per mile operating buses in 2021.[17] While light rail cars can hold more people than buses, they are rarely filled up beyond the numbers that could fit on a bus. In 2021, the average number of passengers riding a light-rail car was less than 10, and even in 2019, before the pandemic, the average was less than 16, numbers that can easily fit onto a 40-foot bus.[18]

In 2019, Metro spent $14 per mile operating light-rail cars compared with $9 per mile operating buses. When measured per passenger-mile, light rail was less expensive at $0.96 vs. $1.32 for buses. But this is because the light-rail line was built in a high-use corridor while the bus numbers are an average of high-use and low-use lines. When measured per seat-mile, buses cost $4.17 vs. $5.15 for light rail.[19] In comparable corridors, buses would be less expensive to operate by any measure.

Bus Alternatives Are Faster and Less Expensive

Bus rapid transit and express buses are lower in cost, higher in capacity, and more flexible in operation than light rail. Like light rail, rapid buses stop about once per mile and operate more frequently than local buses. They can use dedicated transit lanes or share lanes with other traffic.

Kansas City opened its first bus rapid transit line in 2005 at a cost of $3.5 million per mile, nearly half of which went into building distinctive transit stations. About half the route used exclusive bus lanes, and the other half shared lanes with other traffic. Due to increases in frequencies and speeds, ridership in the corridor immediately increased by nearly 30 percent.[20] Kansas City has since added two more bus rapid transit lines, the most

Metro's light-rail system is an expensive way of moving a relatively small number of people while the rest of the region's transit system is neglected. ***Greg Kenkel***

expensive of which cost less than $5.4 million per mile. But instead of continuing to focus on buses and bus rapid transit, Kansas City has similarly wasted its resources on a new streetcar, which has many of the same shortcomings as light rail.[21]

St. Louis's existing light-rail lines are the fastest in the nation at 23 miles per hour, but street-running light-rail lines operate much more slowly: lines in Buffalo, Houston, Minneapolis-St. Paul, Norfolk, Pittsburgh, and San Francisco all average less than 13 miles per hour, whereas St. Louis's local buses average nearly 14 miles per hour. Bus rapid transit lines in Hartford and Los Angeles average more than 15 miles per hour, and Denver has a bus rapid transit line that averages 32 miles per hour with several stops.[22]

Another alternative to light rail is express or nonstop buses, which the Federal Transit Administration describes as commuter buses. Though they may make two or more stops near the beginning and end of their routes, these buses usually spend most of their routes on freeways, sometimes in high-occupancy vehicle lanes.[23] Some express buses in New York City average more than 40 miles per hour, and at least one route averages 55 miles per hour.[24]

ST. LOUIS'S LIGHT RAIL HAS FAILED

Metro brags that it operates more miles of light rail than any urban area in the Midwest. But such numbers ignore the question of whether light rail has cost-effectively done its job of attracting new riders. For example, Boston, Houston, Minneapolis-St. Paul, Phoenix, San Francisco, and Seattle all have fewer miles of light rail yet their light-rail systems carry more passengers than St. Louis's. When it comes to passengers per mile, St. Louis's light-rail system is near the bottom of the pack, carrying less than half the national average in 2019.[25]

Declining Ridership

St. Louis transit ridership had been declining for several years when Bi-State opened the region's first, 14-mile light-rail line in July 1993.[26] At first, light rail appeared to successfully reverse those declines, as rail plus bus ridership in 1994 was 18 percent greater than in 1993. (Bi-State's fiscal year ends on June 30, so 1994 numbers represent almost a full year of light-rail operations.) The addition of three more miles of light-rail in June 1994 boosted ridership another six percent (Figure 1).[27]

Light rail, however, did little to stem long-term declines in ridership. Metro carried fewer bus and rail riders in 2001 than in 1995 and fewer in 2019 than in 2001. In May of 2001, Metro doubled the length of the St. Louis region's light-rail system from 17.1 to 34.5 miles with an extension in St. Clair County, Illinois, yet gained no new riders from

the expansion. Light rail ridership increased by about 3 percent, but bus ridership fell by 9 percent, resulting in 7 percent fewer riders in 2002 than in 2001. A 3.5-mile expansion in 2003 and an 8-mile St. Clair County expansion in 2006 produced a few new riders, but they were all lost after the 2008 financial crisis.

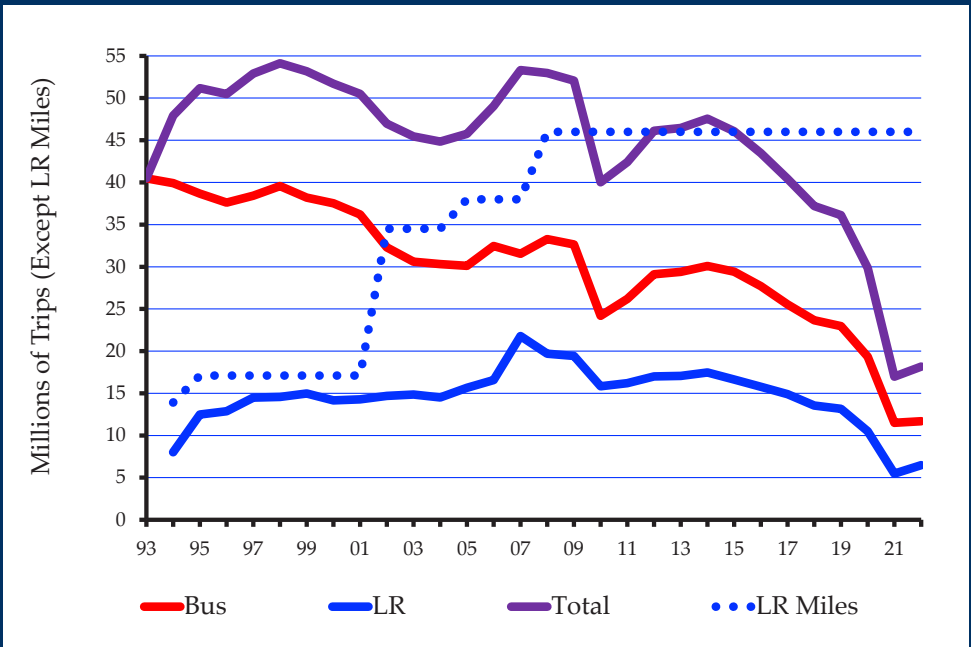
By 2014, St. Louis bus and light-rail ridership had only partially recovered from the financial crisis, and ridership in that year was still 10 percent less than it had been in 2007. Over the next five years, ridership declined by a stunning 25 percent so that 2019 ridership was 11 percent less than the historically low ridership of 1993 before any light-rail line opened. The decline in ridership after 2014 was partly due to a 40 percent drop in fuel prices between July 1 and December 31, 2014, which encouraged people to increase auto ownership rates and allowed more people to commute to work by automobile.[28] This suggests that spending hundreds of millions of dollars on light rail has less influence on transit ridership than changes in gasoline prices.

Figure 1

St. Louis Transit Ridership

Ridership in millions of trips per year compared with total route miles of light rail.

Metro made significant additions to its light-rail system in 2001 and 2008, yet total bus and light-rail ridership declined in the following years and was lower in 2019 than in 1993, before the region's first light-rail line opened.



Source: National Transit Database.

If anything, light rail exacerbated the declines in ridership after 1993. Before light rail was built, Bi-State was running buses 18.9 million vehicle-miles per year. This should have increased with the opening of light rail, which works best if it is served by frequent feeder buses. In fact, it did increase in 1994 and 1995, reaching as high as 19.3 million, which contributed to the increase in transit ridership in those years. But then, probably due to the high cost of operating light rail, bus service declined to fewer than 16.5 million vehicle-miles in 2005, when the light-rail system had been expanded to 38 miles.[29]

These declines in bus service explain why light-rail expansions were often not accompanied by increased ridership. Bus service was partly restored to 19.5 million vehicle-miles by 2019. However, once declining bus service forces riders to discover the advantages of auto ownership, it is very difficult to attract them back to transit with anything short of a spike in fuel prices.

St. Louis's light-rail system can only be regarded as a failure. At best, it may have slowed the decline of an already heavily subsidized service. But it is more likely that

Table 1: **Job Centers and Jobs by Community**

Metro's focus on downtown St. Louis ignores hundreds of thousands of workers.

Major Job Centers	Jobs
Downtown St. Louis*	58,000
Westport Plaza	64,000
St. Louis Airport Area*	63,000
Downtown Clayton*	27,000
Jobs by Community	**Jobs**
Ciy of St. Louis*	263,000
Chesterfield	48,000
Maryland Heights	43,000
Creve Coeur	42,000
St. Charles†	38,000
O'Fallon, MO†	38,000
Clayton*	31,000
St. Peters†	29,000
Belleville*	25,000
Town and Country	23,000
Bridgeton	22,000
Hazelwood	22,000
Fenton	19,000
Kirkwood	14,000
Florissant	13,000
Granite City, IL	12,000
Berkeley	12,000
Brentwood*	12,000
Arnold	11,000
Des Peres	11,000
Overland	11,000
Webster Groves	11,000
Fairview Heights, IL*	10,000
Richmond Heights*	10,000

** Indicates communities served by Metrolink light rail; † indicates communities not served by Metro at all.*

Sources: Job centers from Wendell Cox, United States Central Business Districts, 2014, pp. 4, 19, and 20; Communities from American Community Survey 2019, table B08604, five-year data. All job numbers rounded to the nearest 1,000 and are shown for communities with more than 10,000 jobs. This data is pre-pandemic, and some of these jobs are now fully or partially remote.

light rail accelerated that decline by forcing reductions in bus service. Certainly, it diverted Metro's attention away from strategies that could have better responded to the decentralization of the St. Louis urban area after World War II.

Decentralization

While streetcars and light-rail may have made sense a century ago, big-box transit makes no sense for 21st-century urban areas. St. Louis in particular has undergone major changes since 1950.

In that year, the City of St. Louis housed nearly 857,000 people, which was more than 60 percent of the 1.4 million people in the St. Louis urban area. St. Louis had more than 14,000 people per square mile, while its suburbs averaged fewer than 3,300.[30] By 2020, the area of land that the Census Bureau defined as the St. Louis urban area had quadrupled, and the urban area's population had grown to 2.2 million, but the city's population had shrunk to about 300,000 people. This decline left the city housing only 14 percent of the region's population. St. Louis's density had fallen to less than 5,200 people per square mile, and that of the overall region was less than 2,400.[31]

In short, the region has seen a massive decentralization of population from once-dense inner-city neighborhoods to low-density suburbs. This decentralization resulted from the widespread ownership and use of automobiles, which allow more people to live in the kind of housing they prefer, and that overwhelmingly means single-family homes.[32]

Jobs have also decentralized. No one has detailed records, but in 1920, it is highly likely that a very high percentage of the jobs in the St. Louis region that required commuting were in downtown St. Louis. By 2019, downtown St. Louis had fewer than 60,000 jobs.[33] This was less than 6 percent of the urban area as a whole.[34] Both the area around the St. Louis airport and the Westport Plaza-Mid County Corridor had more jobs than downtown.[35]

The region has many other areas with large concentrations of jobs. As of 2019, Chesterfield had nearly 48,000 jobs; Creve Coeur nearly 42,000; and St. Charles and O'Fallon

each had 38,000 in 2019. Belleville, Bridgeton, Clayton, Fairview Heights, Hazelwood, St. Peters, and Town and Country all had more than 20,000, and at least 11 other suburbs had more than 10,000 jobs each (Table 1).[36]

Light rail serves Clayton and Belleville but otherwise misses most of the rest of the communities listed in Table 1. In general, rail doesn't serve suburban communities very well because suburban jobs, like suburban residences, tend to be spread out at low densities so most are further away from a light-rail station than commuters would be willing to walk.

Buses can move more people to more destinations at faster speeds for far less money than light rail. ***Greg Kenkel***

Metro doesn't serve St. Charles County at all. The Census Bureau counts the portion of the county from Wentzville to St. Charles as part of the St. Louis urban area and says it has more than 130,000 jobs and 300,000 residents.[37] Voters in the county, however, rejected paying more taxes to support a transit system that is as ineffective as Metro.[38] If Metro truly wants to serve residents of the entire St. Louis urban area, it needs to develop a modern transit system that will reach the entire region, not one that is based on an expensive and obsolete technology.

Although Metro transit is focused on downtown St. Louis, it doesn't even serve downtown all that well, carrying just 10.5 percent of downtown employees to work before the pandemic. For comparison, transit's pre-pandemic share of downtown commuters was 40 percent in Seattle, 35 percent in Pittsburgh, 33 percent in Minneapolis, 28 percent in Portland, 22 percent in Denver, and 20 percent in Baltimore.[39] If Metro was poorly serving downtown commuters, it had almost completely failed workers in the rest of the region, carrying less than 3 percent of them to work before the pandemic.[40]

Even though light rail is popular with St. Louisans going to downtown sporting events, its limitations are nonetheless clear when trying to serve major event centers such as the Dome, Busch Stadium, the new soccer stadium, or Enterprise Center. Based on the number of seats in each of these venues and St. Louis's light-rail capacity of 7,120 people per hour, it would take more than six hours to fill or empty Busch Stadium and two-and-one-half hours for the Enterprise Center. This means that rail can only move a small fraction of people to those event centers, whereas buses could move far more people for far less money.

When the National Football League tried to rely on transit to bring people to and away from Super Bowl XLVIII in East Rutherford, New Jersey, it found that fans arriving and departing by train suffered serious delays while fans relying on buses had no delays at all.[41] In St. Louis, taking MetroLink to Cardinals baseball, Blues hockey, or St. Louis FC soccer games is the only time many residents use the light rail system, but buses could be a more cost-effective way of moving more people to these events than rail. For example, a private bus company has replaced public transit providers in providing rides to St. Louis Cardinals games from Madison County, Illinois.[42] Besides, people attending sporting events tend to have higher-than-average incomes, and since light rail is funded by regressive taxes, it amounts to the poor supporting the rich.[43]

Metro's failure to attract riders and serve a significant number of the region's commuters stems partly from its focus on downtown and partly from its focus on big-box transit. Neither of these make sense in the 21st century.

Transit-oriented Developments Don't Help

Instead of redesigning its transit system to better serve a 21st-century urban area, Metro and communities in the region have engaged in a futile attempt to reshape the urban area to look like the early 20th-century region that Metro is designed to serve. Metro claims that light rail transit "can spur economic development," and specifically "transit-oriented developments" (TODs), which are supposed to be mixed-use, mixed-income communities, usually in mid-rise multifamily buildings that often have shops and offices on the ground floor. But the truth is that light-rail transit doesn't stimulate such developments; instead, construction of light rail leads cities to subsidize TODs along the rail routes.

With prompting from Metro, for example, the City of St. Louis recently gave more than $14 million to a development called Expo at Forest Park. This five- to seven-story complex next to the Forest Park-DeBaliviere Transit Center has 287 apartments and 30,000 square feet of retail space. The goal, said officials, was to "add density next to a transit station."[44] Another subsidized high-density development along the light-rail line is Steelcote, a mixed-use development near the Grand light-rail station.[45]

According to the St. Louis Midtown Redevelopment Corporation, a quasi-governmental agency that coordinates many of these projects, subsidies to these kinds of developments:

> . . . include but are not limited to tax abatement as requested in this plan, state and city tax increment financing, state and federal historic tax credits, tax credit programs administered by the Missouri Development Finance Board, grant and loan programs of the Economic Development Administration of the U.S. Department of Commerce, federal New Market Tax Credits, and special district funding using a Transportation Improvement District or Community Improvement District as enabled by Missouri statutes, as well as new programs which emerge as redevelopment of the area proceeds.[46]

A detailed review of all these subsidies would itself require a full report. It suffices to say that a state audit of community-improvement districts, which hand out many of these subsidies, found that there was little public accountability or transparency in how district administrators spent public funds, that the people running the districts often had conflicts of interest in that they were the chief beneficiaries of the funds being spent, and that they often overtaxed the public to give more money to conflicted parties.[47] These kinds of redevelopment districts and the tax-increment financing that supported them were first used in California and imitated by 48 other states. But California abolished them in 2011 because they were costing the state too much money, and other states should follow this example.[48]

Not counting subsidized developments, there is little evidence that St. Louis light rail has helped revitalize any part of the region. The former AT&T building at 909 Chestnut Street is just one block from a light-rail stop, yet it has been vacant for several years and recently sold for just 2 percent of its value in 2006.[49] Light rail clearly failed to save this office building, the largest in downtown St. Louis, from abandonment.

Supposedly, the concentration of dense residences and jobs in TODs will increase transit usage and reduce auto driving. Yet there is little evidence for this belief. Advocates of TODs often point to surveys showing that people who live in such developments use transit more. But a literature review of the effects of density on driving by University of California–Irvine economist David Brownstone found that such surveys fail to account for self-selection bias; that is, people who want to drive less may tend to locate in an area near transit. After adjusting for self-selection bias, Brownstone found that the effect of density on driving and transit was "too small to be useful" in saving energy or reducing greenhouse gas emissions.[50]

Metro says, "TOD tends to attract many residents who are likely to use transit, thus increasing system ridership."[51] But if all TOD does is concentrate people who are likely to use transit, it doesn't increase overall system ridership, just ridership on the routes where such developments are located.

Moreover, the construction of a number of TODs hasn't stopped the population of the City of St. Louis from continuing its long decline. The 2020 census found that

St. Louis's population was 5.5 percent less than in 2010, and the Census Bureau's latest population estimates say that it dropped another 5.0 percent between 2020 and 2022.[52]

As in St. Louis, light-rail advocates in Portland, Oregon, claim that the city's light-rail system spurred the construction of TODs and other developments. But in 1996, ten years after Portland opened its first light-rail line and zoned the areas around light-rail stations for high-density redevelopments, planners informed the city council that "we have not seen any of the kind of development—of a mid-rise, higher-density, mixed-use, mixed-income type—that we would've liked to have seen" along the light-rail line.[53]

The city and its suburbs responded in 2000 by subsidizing TODs, and since then the region has built hundreds of such developments along light rail and major bus corridors. A study of developments along Portland's light-rail lines found that people living in them were not significantly more likely to ride transit to work than people living elsewhere.[54] Like St. Louis, Portland saw a decline in ridership between 2014 and 2019, indicating that transit-oriented developments have less of an influence on ridership than changes in fuel prices.[55]

Metro's emphasis on density is a futile attempt to overturn trends that are a century old. The vast majority of Americans want to live in single-family homes, not apartments.[56] The vast majority of Americans have access to an automobile, which has given them access to more jobs, better housing, and lower-cost consumer goods.[57] St. Louis is not going to reverse history by subsidizing a few high-density developments.

Advocates of light rail claim that it relieves congestion, reduces greenhouse gas emissions, and helps low-income people. None of these claims are valid in general, and they certainly aren't valid in St. Louis.

Light Rail Doesn't Relieve Congestion

According to the Federal Highway Administration, the St. Louis urban area saw 9,615 miles of driving per resident in 1993, the year before the first light-rail line opened.[58] In 2019, after building the largest light-rail system in the Midwest, St. Louis saw 12,150 miles of driving per resident, a 26 percent increase.[59] This is partly because transit ridership in 2019 was lower than in 1993, which in turn is partly because Metro has concentrated on building light rail rather than designing and operating a modern transit system.

During rush hours, when highways are most congested, most transit riders are commuters. According to Census Bureau data, the number of transit commuters has declined in recent years despite—or because of—construction of light rail. Between 1990 (before the first light-rail line was built) and 2019, the number of St. Louis–area transit commuters declined by 29 percent while the number driving alone to work grew by 21 percent and the total number of cars used for commuting grew by 18 percent.[60] Light rail clearly did nothing to relieve congestion during those years.

Light Rail Increases Energy Consumption and Greenhouse Gas Emissions

Not only does St. Louis light rail not save energy or reduce greenhouse gas emissions, it is a heavy net energy user and generator of greenhouse gases. In 2019, the average car used less than 2,800 British thermal units (BTUs) per passenger-mile and the average light truck (including pickups, SUVs, and vans) used less than 3,300.[61] By comparison, MetroLink light-rail consumed nearly 4,500 BTUs per passenger-mile and Metro buses used 4,900.[62]

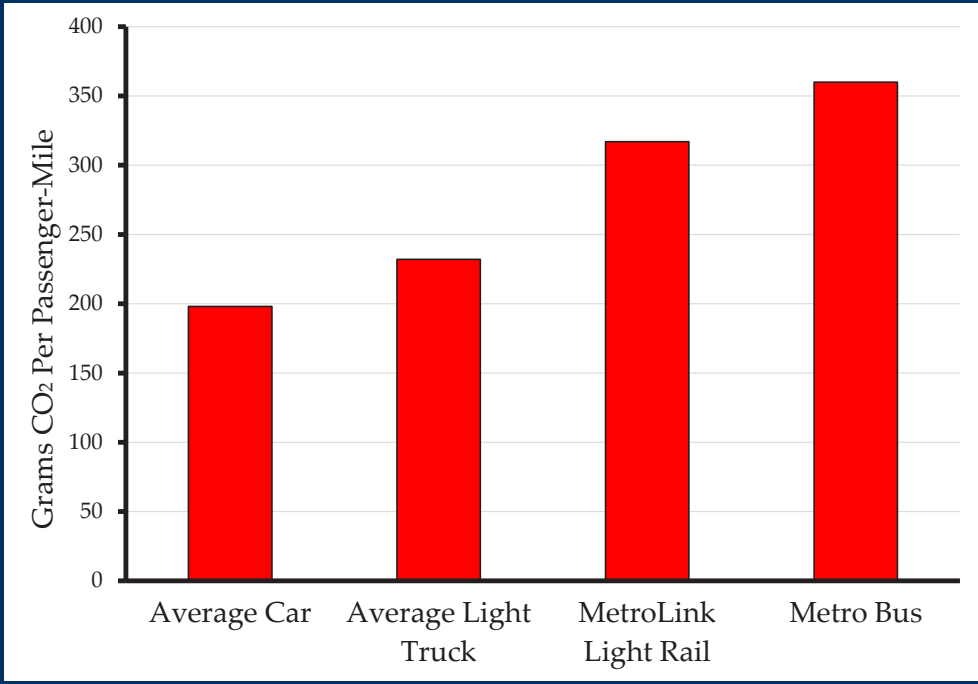
This translates into more greenhouse gas emissions from transit. According to the Energy Information Agency, Missouri electric power plants produce about twice as much greenhouse gases per megawatt-hour as the national average.[63] As a result, in 2019 generating electrical power for St. Louis light rail produced 317 grams of carbon dioxide for every passenger-mile carried, which is only a little less than St. Louis buses, which emitted 360 grams per passenger-mile (Figure 2).[64] For comparison, the average car on the road emitted fewer than 200 grams per passenger-mile while the average light truck emitted 232 grams per passenger-mile in 2019.[65]

While light-rail operations require the emission of many tons of greenhouse gases, light-rail construction produces even more, especially when tunneling is required, as has been the case in prior MetroLink extensions (but not for

Figure 2

Greenhouse Gas Emissions: 2019

Power for Metro transit operations generates far more greenhouse gases per passenger-mile than driving cars or even light trucks such as pickups, vans, and sports utility vehicles.



Sources: Auto data from Transportation Energy Databook Edition 40, table 2-14; transit from National Transit Database 2019, "Energy Consumption" and "Service" spreadsheets; calculations made using Carbon Dioxide Emissions Coefficients from the Energy Information Agency and the Missouri Electricity Profile 2019, also from the Energy Information Agency.

the extension currently under consideration). Light rail requires lots of steel and concrete, and the production of both generates lots of greenhouse gases. In addition, the construction itself requires lots of petroleum-powered vehicles. The environmental impact statement written for the St. Louis southside line completely ignores this impact.[66] While some transit agencies argue that the greenhouse gas savings from light-rail operations will repay the construction cost, St. Louis Metro can't make that argument because there are no operational savings.

Light Rail Hurts Low-income People

Light rail doesn't help low-income people, mainly because the taxes used to build and operate it are largely regressive, meaning that low-income people pay a larger proportion of their incomes for that tax than higher-income people.[67] In 2014, about 23,000 people whose incomes were below $25,000 a year commuted to work by transit, or about 6.6 percent of that income class. By 2019, the number had fallen to fewer than 13,000 people, or 4.4 percent of that income class.[68] This is a decline of 45 percent. Even in 2014, 93.4 percent of low-income workers were disproportionately paying taxes to fund transit rides they rarely if ever took.

Research by the University of Minnesota concluded that the typical resident of the St. Louis urban area could reach four times as many jobs in a 20-minute auto drive as in a 60-minute transit ride (Figure 3). In a 30-minute auto drive, they could reach 80 times as many jobs as a 30-minute transit trip. St. Louis transit is so slow that a bicycle rider can reach more jobs than a transit rider in trips of less than 50 minutes.[69]

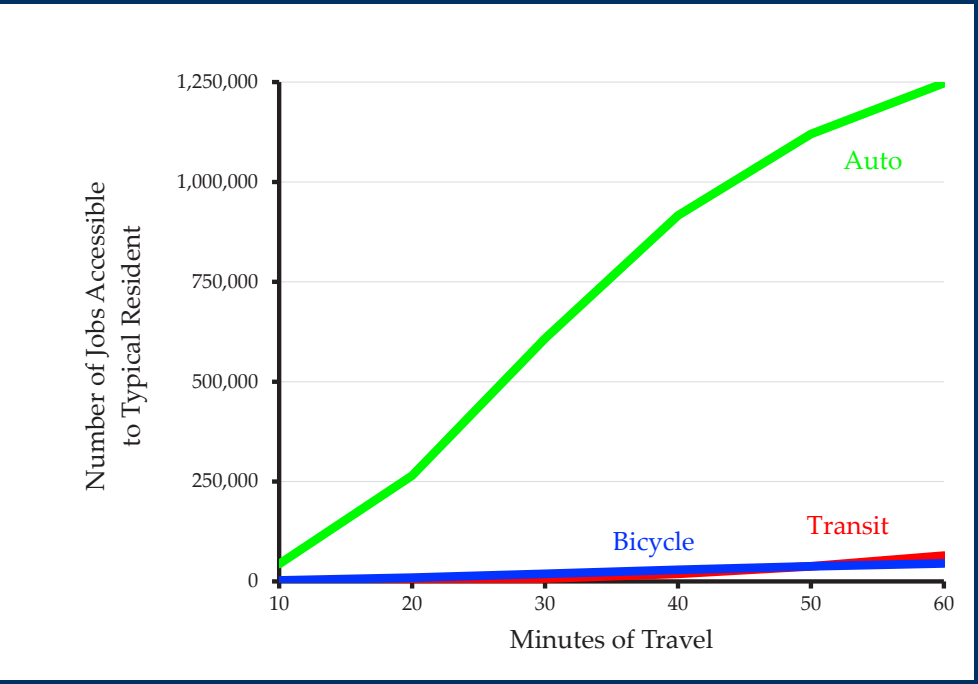
Low-income people understand this, which is why they have increased their auto ownership rates and reduced their reliance on transit. The Census Bureau reports that

in 2014, 37,359 St. Louis–area workers, or 3.6 percent of the total, lived in households with no vehicles, and 38 percent of them took transit to work. By 2019, the number of workers with no vehicles dropped to 34,351, or 3.2 percent of the total, and only 24 percent of those vehicle-less workers rode transit to work. In fact, more of them—38 percent—drove alone to work, probably in employer-supplied vehicles.[70] St. Louis transit doesn't even work for three out of four people with no vehicles.

Figure 3

Job Accessibility in the St. Louis Urban Area

St. Louisans can reach far more jobs by auto (and more jobs on a bicycle) than by transit.



Source: University of Minnesota Accessibility Observatory.

The difference between 3.6 percent and 3.2 percent may sound small, but when transit's share of travel is small, a small change in auto ownership can result in a large decline in transit ridership. In 2019, transit carried just 2.2 percent of commuters and 0.6 percent of all motorized passenger-miles in the St. Louis urban area.[71] Thus, a 0.4 percent increase in vehicle ownership could have a devastating effect on transit ridership.

Light Rail Attracts Crime

St. Louis light rail doesn't produce positive benefits in the form of reduced congestion, greenhouse gas emissions, or assistance to low-income people. But it does produce a negative effect in the form of increased crime. Light rail in general is the most crime-ridden form of urban transit in the nation, largely due to the fact that every light-rail system in the country collects fares on an honor system. Potential criminals, seeing they can get away with paying no fare, go on to commit more serious crimes. Per passenger-mile carried, light rail has almost three times as much crime as buses or heavy rail.[72]

Although transit ridership severely declined during the pandemic, transit crime declined only a small amount, and as a result crime rates per passenger-mile greatly increased. In 2021, the first full year after the pandemic began, light rail nationwide carried 38 percent as many riders but experienced 86 percent as much crime. Crime rates grew from 112 to 270 crimes per billion passenger-miles.[73]

St. Louis light rail has been safer than average, but that may be changing. In 2019, the system suffered only 67 crimes per billion passenger-miles, rising to 241 in 2021. However, not only did the rate increase in 2021, but the number of crimes grew as well, from 58 in 2019 (which was already more than any previous year going back to

2014) to 66 in 2021. Moreover, they grew by 45 percent more in 2022 to 96 crimes. This pushed crime rates up to 262 per billion passenger-miles, which was more than the national average.[74]

St. Louis's light rail is also much more susceptible to crime than its bus system. Between 2014 and 2022, light-rail passengers were 36 percent more likely to be victims of crimes than bus passengers. But safety is a concern on both buses and light rail as, on both modes, the number of crimes and crime rates have each significantly increased since the pandemic began, and this increase is deterring ridership recovery.[75]

To its credit, Bi-State has decided to address the light-rail crime issue by installing turnstiles at every station, thus forcing passengers to buy tickets or passes before boarding trains. Unfortunately, due to the glacial pace at which government agencies move, it may be a long time before such protective measures are in place. The Bi-State board agreed to spend $52 million on the project in November 2021.[76] Almost a full year later, Bi-State awarded a contract to design the turnstiles and gates for the system. This contract cost $6.2 million, which isn't included in the $52 million installation cost projection.[77] This provides one more demonstration of the problems with light rail: everything about it is expensive, and any change is time consuming.

In addition to attracting crime, light rail is known to spread crime to the communities it supposedly serves. Criminals can shoplift or burglarize a home, hop on a light-rail car, and be far from the scene of the crime in a few minutes. The city of Gresham, Portland's largest suburb, reported that 40 percent of major crimes in that city, including assaults and burglaries, took place on the 6 percent of land located within a quarter mile of a light-rail station.[78] The opening of St. Louis light rail near the Galleria resulted in "out of control shoplifting" according to merchants, with arrests nearly quadrupling from before the station opened.[79]

Light Rail Reduces Resilience

The pandemic has shown that light rail makes transit systems less resilient to economic shocks than other transportation systems. Motor vehicles and highways are the most resilient, as the roads are available when users need them. Even if revenues to highway agencies drop, requiring some deferred maintenance (which is partially offset by the reduced wear-and-tear because of less traffic), the highways are still available when needed for emergency services, commuting, or any other purpose.

Private transportation systems are less resilient than highways but can survive economic shocks by reducing their services in response to reduced demand. In particular, intercity bus companies survived both the 2008 financial shock and 2020 pandemic by cutting back on frequencies and some routes. Airlines could have done the same, and congressional funding was not truly necessary for the survival of the airlines as that funding was aimed mainly at protecting airline workers from layoffs.[80]

Transit agencies insisted on and received almost $70 billion in COVID relief funds despite the fact that ridership at its lowest point fell to less than 20 percent of pre-pandemic levels.[81] Thanks to the COVID relief funds, transit agencies continued to provide services at far higher levels than could be justified by ridership. Despite this oversupply of services, transit has been the slowest form of transportation to recover from the pandemic. St. Louis Metro, for example, never reduced service below 63 percent of 2019 levels even though ridership fell to 43 percent.

Light rail reduces the resiliency of transit systems in two ways. First, agencies such as Bi-State must borrow money to build light-rail lines and must continue to pay interest on those loans even when fares and other revenues fall. This can force agencies to respond to economic shocks by making more severe cuts in service than if they weren't so heavily indebted.

Second, major economic shocks are often accompanied by major changes in transportation patterns. Buses can easily respond to such changes, but rail transit cannot. Agencies such as Metro are therefore forced to spend a significant share of their limited resources operating transit systems that are progressively less highly valued by travelers.

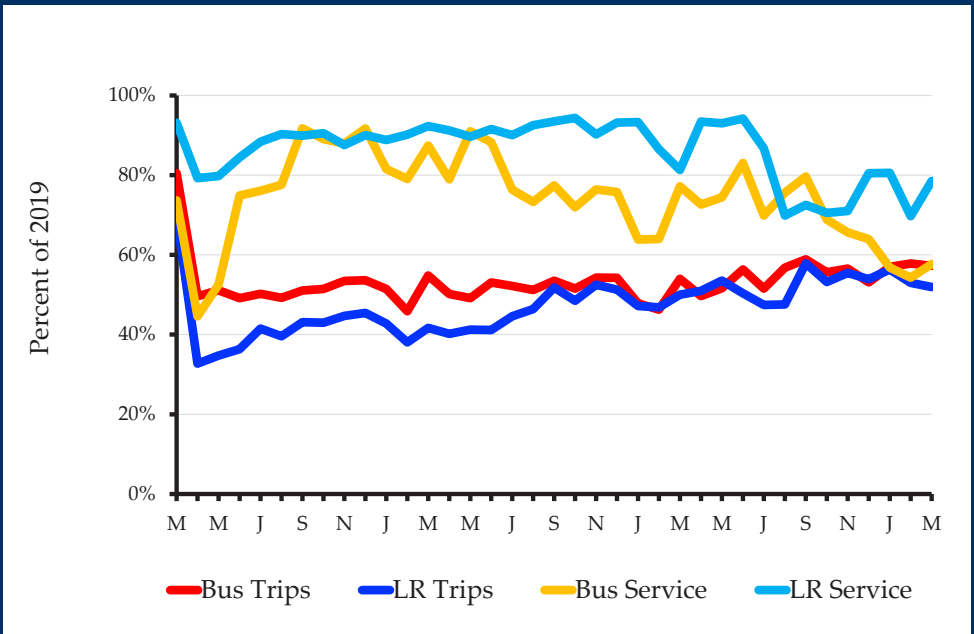
The transit industry should learn from the intercity bus industry, which underwent a revolution in the 2000s. Instead of relying on dedicated infrastructure such as bus stations, ticket offices, and baggage-handling facilities,

new bus companies such as Megabus parked their buses at curbsides, sold tickets over the internet, and let passengers and drivers handle all baggage. The main infrastructure used by the buses was highways shared with other users. This made intercity buses more competitive and led to a resurgence in ridership after more than 40 years of decline.[82] Yet at the same time transit agencies were and are fixated on building dedicated infrastructure that is expensive and poorly used.

Figure 4

St. Louis Metro after the Pandemic

Metro favored light rail during the pandemic, offering rail service (measured in vehicle revenue-miles) at much higher levels, relative to 2019, than bus service in most months. Yet bus ridership was higher, relative to 2019, than light rail in all but four of the 37 months shown.



Source: National Transit Database Complete Monthly Ridership for March 2023.

The Pandemic Made Everything Worse

Transit ridership was declining before the pandemic, but the pandemic sent it into a nosedive. Unlike driving, which has been hovering at around 100 percent of pre-pandemic levels since March 2021, transit has shown no sign of recovering to 2019 numbers. St. Louis transit ridership has not reached 60 percent of pre-pandemic numbers and has hovered around 55 percent for about a year, suggesting it is not going to increase much more than that.

Light rail has fared worse than buses during and after the pandemic, with buses carrying a higher percentage of pre-pandemic riders than light rail in all but four of the 37 months since the pandemic began (Figure 4). This is despite Metro's bias in favor of light-rail service, as it maintained at least 79 percent of 2019 rail service even though ridership fell to as low as 33 percent. Although bus ridership fell to only 50 percent of 2019 levels, Metro cut bus service to as little as 45 percent, and reductions in bus service since the fall of 2022 may be partly responsible for the inability of ridership to recover.[83]

The real problem is that, as noted previously, St. Louis's transit system is focused on downtown, and downtown employees are most likely to now be working at home. Between 2019 and 2021, the number of people working at home in the St. Louis urban area almost quadrupled. This change had a bigger impact on transit than on other forms of commuting. The number of people driving alone to work fell by 18 percent, and the number carpooling fell by 20 percent, but the number commuting by transit fell by 31 percent.[84] Building more light-rail lines near downtown is not going to attract new riders if people are no longer working downtown.

Automobile ownership also increased during the pandemic as people sought to avoid crowded places. The number of workers who live in households with no vehicles in the St. Louis urban area fell from more than 34,000 in 2019 to less than 29,000 in 2021. Of the few people who still lived in vehicle-less households, only 21 percent took transit to work while 35 percent drove alone (mainly in employer-supplied vehicles) and 13 percent carpooled.[85] Thus, transit's decline was due to the number of people working at home, especially former downtown workers, combined with the number avoiding transit because of a desire to avoid possible infections. Neither of those problems will be fixed by building more light rail.

Frequency, Speed, and Legibility

Transit riders are sensitive to frequencies, speeds, and legibility, not to whether the vehicle they ride has steel wheels or rubber tires. Where light rail has succeeded in attracting more riders than buses, it is usually because transit agencies operate rail lines more frequently and with fewer stops (thus faster average speeds) than buses. As noted above, buses can easily match and exceed light rail in both frequencies and speeds, and doing so to several bus routes would do more to enhance transit ridership—and cost far less—than building a new light-rail line.

Rail systems also tend to be more legible, mainly because in regions such as St. Louis there are few rail lines. Legibility is the ease in which people can understand a transit system and how to use it to get where they want to go. St. Louis's light rail is more legible than, say, the New York City subway system and is also more legible than St. Louis's bus system. But it does not follow that St. Louis should build more light-rail lines; instead it should find ways to make the bus system more legible, perhaps by color coding the buses. The last section of this paper will propose a way to make St. Louis's bus system far faster, more frequent, and more legible without spending new money.

PROPOSED NEW LIGHT-RAIL LINE WILL FAIL

Bi-State's proposal to build a new light-rail line from Fairground Park to Chippewa Avenue won't fix any of the problems that led to the failure of the existing light-rail system. The new line will be expensive, inflexible, slow, and unable to serve most of St. Louis's major job centers. Moreover, route plans are based on obsolete projections of both the costs and benefits of new transit lines.

The proposed route makes no sense at all, as it essentially goes from nowhere to nowhere. There are nearly no jobs at Fairground Park, few at Chippewa Avenue, and no major job centers in between. The decision to route the line straight south on Jefferson rather than go to 9th and 10th streets, as was proposed in a 2018 plan, means that riders will have to change trains to get downtown.

Most of the proposed 5.5-mile route is currently served by the 10.3-mile Metro bus route 4, which—unlike the proposed light-rail route—serves the University of Missouri–St. Louis. Considering that light rail will not be significantly faster than buses, bus riders are unlikely to get off the bus to board light rail at Fairground Park unless they are forced to do so if Metro terminates the bus at the park light-rail station.

Major Job Centers Are Not Served

Light rail only serves a small proportion of workers in the St. Louis urban area and doesn't serve them very well. While light rail reaches downtown St. Louis, the airport, Belleville, and Clayton, it doesn't reach Chesterfield, Creve Coeur, O'Fallon, St. Charles, Town and Country, or Westport Plaza. The airport and Westport Plaza areas may have more jobs than downtown St. Louis, and many of these other suburban centers have more jobs than Clayton or Belleville, yet neither the existing nor the proposed new light-rail lines reach them and some aren't even reached by Metro buses.

Even if the new line reached one of these job centers, it wouldn't attract many commuters. Aside from the fact that most of these job centers are too low in density to be adequately served by a single light-rail stop, St. Louis transit works best for downtown workers because downtown has so many lines radiating from it. Putting a suburban job center on a transit line that goes downtown means that many suburban residents who work at that center would have to take transit downtown before going to their workplace. This would significantly increase travel times and discourage transit ridership.

Street-running Light Rail Will Increase Congestion

Unlike St. Louis's previous light-rail lines, which operate in their own rights-of-way, the proposed new line will operate mostly in city streets. In most cases, that means that lanes now open to cars, trucks, and other vehicles will be closed to those vehicles and reserved exclusively for light rail. Where existing light-rail lines merely failed to relieve congestion, the proposed new lines will significantly increase it.

Dedicating lanes to transit would make sense in corridors where transit usage is high enough that transit vehicles would carry more people per hour than automobiles. That's far from true in these St. Louis corridors.

For example, traffic counts on many parts of Jefferson Avenue show that the avenue carries 10,200 to 14,400 vehicles per weekday.[86] At average occupancies of 1.67 people per vehicle, that represents 16,700 to 24,000 people per weekday. Meanwhile, the bus route 4 (which overlaps the proposed light rail line on Jefferson Ave.) carried fewer than 2,000 riders per day.[87] Even if light rail were able to double ridership and all new riders were previously in automobiles, it would take only about 10 percent of vehicles off the road.

The parts of Jefferson Avenue with the highest traffic counts have three lanes in each direction plus a center left-turn lane. If, as Metro concept drawings show, building light rail reduces the number of lanes on Jefferson Avenue by three, it loses more than a third of its traffic capacity. A 33 percent loss in capacity combined with a 10 percent decline in vehicles would significantly increase congestion.

Street-running light rail will increase congestion in another way as well. Metro wants to adjust traffic signals along the light-rail route to give priority to rail cars.[88] To the extent that signals are currently coordinated to smooth traffic flows, this will disrupt the flows for all other vehicles.

Metro's Northside-Southside web page shows photos of Portland's light-rail lines to illustrate street-running rail vehicles.[89] What the photos don't show is that, before Portland's light rail was built, it was possible to drive or bicycle the length or width downtown Portland at a constant speed without hitting a single red light. After the light-rail lines opened and were given signal priority, drivers and cyclists almost inevitably hit red lights when reaching intersections with light rail in the streets.[90] Giving signal priority to transit inconveniences far more auto users than it benefits transit riders.

Slow Trains Won't Attract Many Riders

Since they will be running in streets, average light-rail speeds on the Northside and Southside lines will be much slower than the speeds of St. Louis's existing light-rail lines. Street-running light-rail lines in other cities typically average less than 14 miles per hour and some are under 10 miles per hour, compared with 23 miles per hour for St. Louis's current lines.

For example, light rail in Boston and Philadelphia both average 8.7 miles per hour; San Francisco's is 9.6 mph; Newark's is 9.9 mph; Houston's is 12.0 mph; Pittsburgh's is 12.9 miles per hour; and Norfolk's is 13.1 mph. Portland's light rail, which operates partly in streets and partly on its own right of way, averages 14.2 mph. For comparison, Metro buses average 13.4 miles per hour.[91] The Northside-Southside light rail is likely to be no faster than buses. The only incentive transit riders may have to use it is that Metro will operate it at higher frequencies than buses, but it could easily decide to increase bus frequencies for a tiny fraction of the cost of building light rail.

As shown above, St. Louis's existing light-rail lines have not succeeded in attracting new riders in the long run despite having the highest average speeds of any light-rail system in the nation. Light-rail lines that only go about half as fast as the existing lines are not going to do any better.

Light Rail Won't Stimulate New Development

Metro justifies building a light-rail line to nowhere based on the economic development effects it is supposed to have. Metro documents claim that new light-rail lines will stimulate redevelopment of "historically underserved neighborhoods." The agency notes that other transit agencies say that their light-rail lines have catalyzed development.[92] However, these claims are completely bogus. Nearly all the developments around the country

St. Louis's MetroLink is one of the safest light-rail systems in the country because it is separated from pedestrians and autos. The street-running light-rail line Metro is proposing will be much more dangerous to pedestrians and occupants of other vehicles.

Greg Kenkel

that these agencies say were due to light rail would have been built even without the light rail. Others were subsidized in order to get new development in the light-rail corridors.

The claim that rail transit stimulates economic development was started in Portland, Oregon. However, the reality was far different. As previously noted, Portland planners admitted 10 years after its light-rail line opened that the line had not stimulated the kind of development they wanted, so the city began subsidizing it. The city shaped its urban-renewal districts, where property tax revenues were skimmed off to support new development, around its rail transit corridors. Within a few years, subsidies did stimulate lots of new development. But subsidies stimulated such development whether rail transit existed or not, while parts of the city that had rail transit but no subsidies saw almost no new redevelopment.[93]

Other transit agencies have followed Portland's example by simply claiming that any development built near their light-rail lines, subsidized or not, was a direct result of the light rail. For example, Valley Metro, Phoenix's transit agency, claimed in 2011 that light rail there stimulated $7 billion worth of development. In fact, many of the developments on Valley Metro's list were never built; they were planned at the time of light-rail construction and then the sites were left vacant for at least 10 years. If light rail really did stimulate development, someone would have bought the land and developed it. Valley Metro also counted government-funded developments including a new high school and an expansion of the city's convention center. These and others on Valley Metro's list would have happened without the light rail.[94]

In response to the revelation that Valley Metro had claimed developments that were never built, the agency released a revised list of supposed light rail–stimulated developments in 2016. The list, now totaling $11 billion, included 46 government buildings worth $2.1 billion including a new sheriff's office and a new police forensic laboratory (because light rail attracts so much crime?) and a new building for the Department of Child Safety $2.2 billion worth of new university buildings needed because of a growing student body; 42 projects worth $2.5 billion that were subsidized by a state program called Government Property Lease Excise Tax; and 33 housing projects that received low-income housing tax credits or other housing subsidies. A total of at least $2.8 billion in taxpayer dollars were used to subsidize these developments.[95]

Among private, unsubsidized developments, Valley Metro also counted a new car dealership, gasoline stations, and almost 300 parking garages and surface parking lots with more than 70,000 parking spaces. These claims included an airport parking garage that was only open to air travelers, meaning that light-rail riders couldn't use it. Valley Metro basically counted any construction that took place within a half mile of its rail line, but also included 17

projects that were more than a half mile away, and in most of these cases, more than a mile away, that clearly had nothing to do with light rail.[96]

"Urban rail transit investments rarely 'create' new growth, but more typically redistribute growth that would have taken place without the investment," concluded University of California–Berkeley planning professor Robert Cervero and Parsons Brinckerhoff consultant Samuel Seskins—both of whom favor rail transit—after reviewing the literature on rail transit lines. "With heavy and light rail systems," they added, "the greatest land-use changes have occurred downtown," not in residential neighborhoods served by the lines.[97]

If new developments are built along the Northside or Southside corridors after light rail opens, it will be because most such developments are subsidized. It is not likely that any new developments will take place solely because of light rail. At best, light rail will influence the location of new development, not the growth of the area as a whole. If the goal is to redevelop these areas, subsidizing such redevelopment without building light rail would be just as successful and would save taxpayers money.

Light Rail Doesn't Solve Environmental or Social Problems

This paper previously showed that St. Louis's existing light-rail lines produce far more greenhouse gases per passenger-mile than automobiles and are socially unjust because they are funded through regressive taxes yet aren't used by most of the low-income people who are disproportionately paying those taxes. Building more light-rail lines won't solve these problems.

In fact, the proposed new lines could exacerbate traffic and pollution problems. Whereas existing MetroLink lines are separated from streets, Bi-State is proposing to build the north and south lines in existing streets. This would reduce the number of lanes available for general traffic in those streets and increase congestion. In turn, vehicles traveling in more congested traffic would use more energy and emit more greenhouse gases.

Street-running Light Rail Will Kill More People

Measured by the number of passenger-miles carried, light rail is one of the most dangerous forms of urban transportation in the United States. Urban traffic accidents killed fewer than 5 people per billion passenger-miles in 2019.[98] Light rail, meanwhile, killed more than 11 people for every billion passenger-miles that it carried between 2014 and 2022. When suicides are added, the fatality rate rises to 24 per billion passenger-miles.[99] It is not always easy to be certain that a death classified as a suicide wasn't instead accidental, so there is reason to suspect that the rate of accidental light-rail fatalities is higher than reported. And while many highway agencies have made efforts to make bridges suicide-proof with fences and nets, transit agencies seem uninterested in running rail systems that protect against suicides.

This high fatality rate is largely attributable to street-running light-rail systems. Counting suicides, Salt Lake's mostly street-running light-rail system killed 122 people per billion passenger-miles; San Jose's killed 99; Houston's 68; Buffalo's 72; Sacramento's 50; and Charlotte's 37. St. Louis's non-street-running light-rail system is safer than average at 13 fatalities per billion passenger-miles, but if Metro builds the proposed Northside-Southside street-running light-rail lines, both fatalities and fatality rates will increase.[100]

Rails laid into streets are also dangerous to bicycle riders. A survey of Portland cyclists found that two-thirds had suffered crashes due to light-rail or streetcar tracks. Six Seattle bicycle riders sued that city's transit agency after being injured in accidents caused by dangerous streetcar tracks in the streets.[101] Numerous St. Louis cyclists have reported accidents that damaged their bicycles and even broken a few bones due to the Delmar Loop trolley, and such accidents will dramatically increase in number if Metro builds street-running light-rail lines.[102]

Transit agencies dismiss nearly all accidental deaths as the fault of the victims who, they say, shouldn't have been driving or walking across the tracks when the light-rail trains were near. But this ignores the fact that these people wouldn't have died if cities hadn't built obsolete rail systems. A two-car light-rail train weighs about 180,000 pounds. It is irresponsible to put such trains on the same streets as 3,000-pound cars and 150-pound pedestrians and cyclists.

Bus Alternatives Have Not Been Considered

Light rail's main advantage over local buses is that it operates more frequently (generally six times an hour during peak periods and four times an hour the rest of the day) and is faster because it stops only about once per mile instead of five or six times per mile. However, bus rapid transit can operate as frequently as light rail and, by stopping as infrequently as light rail, be just as fast at a far lower cost. Yet none of the planning documents prepared for the Northside-Southside lines seriously evaluated the cost-effectiveness of bus rapid transit. Instead, their authors assume rail is the preferred alternative and mainly compare alternative routes or station locations.

For example, the draft environmental impact statement for the south line included a "transportation systems management" alternative that made a few changes to bus service. However, none of the bus routes considered would operate as frequently as light rail, and most would stop much more frequently and thus would not be as fast as light rail. Not surprisingly, Metro found that this alternative would result "in only slightly higher ridership than the No-Build alternative."[103] None of the subsequent documents considered bus alternatives at all. This policy of either not considering or deliberately crippling any bus alternatives slants the analysis towards the high-cost light-rail alternative.

Metro's Plan Is Based on Obsolete Models

The documents written for the Northside-Southside light-rail plans are based on data and planning models that are obsolete today. These obsolete data were used to project construction costs and ridership; due to changes since the estimates were made, real costs will be significantly higher and ridership will be significantly lower.

Cost projections made in 2008 estimated that the north line would cost $311.5 million, the downtown portion would cost $122.1 million, and the south line would cost $537.4 million to $678.6 million, depending on the route, all in 2007 dollars.[104] Construction costs significantly rose between 2008 and 2018 as China and other countries began using more steel and concrete, pushing up the worldwide costs of construction materials.

Yet when Metro revised its cost estimates in 2018, the new estimates were 25 percent lower than in 2008. After adjusting for inflation, the 2008 estimates totaled to $1.41 billion, and the revised estimates were only $1.05 billion.[105]

Ridership projections were made in 2008 using a 2004 model that relied on 2002 survey data.[106] As with the cost estimates, these numbers were also recalculated using a simpler model in 2018 based on 2013 survey data.[107] The 2008 ridership projections were based on higher fuel prices in 2007, which planners admitted resulted in higher ridership numbers than at earlier, lower fuel prices.[108]

Fuel prices dropped dramatically in 2014, which is the main reason why transit ridership declined between 2014 and 2019. The model used for the 2018 recalculation did not consider changes in fuel prices and was based on survey data from before fuel prices dropped.[109] Any projections based on surveys made when fuel prices were high are likely to overestimate ridership.

The world changed even more after 2018 than it did between 2008 and 2018. Supply-chain problems and labor shortages have pushed construction costs even higher. Officials once bragged about how projects such as light-rail construction created jobs, but this will only make labor shortages for private construction projects even worse.

Ridership will be much lower as more people work at home, fewer work downtown, and many are less willing to ride in crowded public conveyances where they may be exposed to infectious diseases. Changes to downtown are particularly devastating for transit. According to a recent study, downtown St. Louis ranks 51st out of the nation's 52 largest downtowns in its recovery from the pandemic. As of February 2023, the study found, economic activity in downtown St. Louis was only 38 percent of pre-pandemic levels.[110]

Metro is ignoring all these changes. None of the planning documents include any sort of benefit–cost analyses. None of them compare ridership with costs to determine whether the ridership gains projected for light rail justify those costs.

Metro Failed to Test for Cost-effectiveness

The law authorizing federal funding for light rail requires that transit agencies determine that light rail is the most cost-effective mode of transportation. This law has been

in effect since 1991, but the most recent version requires that agencies evaluate "the project's cost-effectiveness as measured by cost per rider."[111] As previously shown, St. Louis buses cost less per seat-mile than light rail (and would cost less per rider on comparable routes) even when counting operating costs only. When capital costs are included, buses would be far less expensive.

Metro documents pay lip service to cost-effectiveness but don't seem to know what it means. One Metro document defines it as "What is the cost in relation to the benefits?"[112] That is not cost-effectiveness. "Cost-effectiveness" is the cost to produce a set of benefits relative to the cost of any available alternative that would yield the same benefits. Buses are almost always more cost-effective than rail transit, especially when comparing bus rapid transit with street-running light rail.

Agencies like Metro often fail to make this test even as they claim their projects are cost-effective. Without comparing bus rapid transit with light rail, Metro cannot credibly claim that rail is cost effective. It is possible that Metro is unwilling to make this comparison, even though it is required by federal law, because it knows that light rail will always lose to buses.

Plan Ignores Lessons of Pandemic

Metro officials have not expressed any concern that the industry-shattering effects of the pandemic will disturb their light-rail plans. Instead, Metro continues to base its plans on pre-pandemic data and surveys as if the pandemic had never happened.

St. Louis's light-rail system failed because light rail is unsuited to a highly decentralized area such as the St. Louis region. The pandemic discouraged transit ridership even further by increasing the number of people working at home, reducing downtown employment, and making many people reluctant to put themselves in crowded situations such as transit vehicles. None of these factors have been considered by Metro planners, who are acting as if the pandemic were simply a temporary situation that will quickly be forgotten, and that ridership will soon return as if COVID had never happened.

Table 2: **Public Transportation Tax Percentage and Revenue**

St. Louis County Sales Tax

Tax	Rate	Est. 2022 Rev (in millions)
Transportation	0.50%	98.2
Mass Transit Prop M	0.25%	50.1
Mass Transit Prop A	0.50%	100.3

St. Louis City Sales Tax

Tax	Rate	2022 Rev. (in millions)
Economic Development	0.50%	21.6
Half-cent Sales Tax	0.50%	20.1
Quarter-cent Sales Tax	0.25%	8.7
Quarter-cent "Prop M2" Sales Tax	0.25%	7.3

The real lesson of the pandemic, however, is that transportation agencies must be nimble to respond to frequent changes in transportation and social patterns. Buses can be nimble; light rail cannot.

AN ALTERNATIVE TO LIGHT RAIL

The Bi-State Development Authority was created to promote economic development in the St. Louis region. It manages St. Louis Downtown Airport, the regional freightway system, riverboats, and the Gateway Arch, but more than 92 percent of its budget is spent on urban transit.[113] With fares covering less than 15 percent of transit operating costs in 2019, and just 6.5 percent in 2021, Bi-State has a much more powerful incentive to chase after tax dollars for transit than to actually serve transit riders.[114]

Metro spends more than $200 million a year of local funds and $75 million a year of federal and state funds on transit operations.[115] That's about $175 for every resident of the region served by Metro, yet only 23,300 of those residents regularly took transit to work in 2019, declining to 16,000 in 2021.[116]

It is politically easier to get tax increases approved for light-rail expansion than for other modes of transportation such as buses—but that fact alone doesn't mean that Bi-State should expand MetroLink. Voters approved an increased sales tax in 2017, and the 2021 infrastructure bill increased the share the federal government will cover from 50 to 60 percent. Thanks to this tax increase, Bi-State collected $236.5 million in local transit taxes, compared with only $40.5 million in transit fares, in 2020 (Table 2).[117] For better or worse, Bi-State has been given an opportunity to spend a lot of money; it would be a shame, and a disservice to the public, if it squanders federal and local money on light rail rather than spending the local share of those dollars on designing and implementing a transit service that really could work for the greater St. Louis area.

A transit system for the 21st century would serve all major economic centers as well as downtown with fast, frequent, and flexible service. To design such a system, Metro should emulate the hub-and-spoke route maps used by many major airlines.

Each airline using a hub-and-spoke system has several major hubs with frequent, nonstop service between each of these hubs. Some of the airlines may also have minor hubs that connect with one or two of their major hubs but not all of them. Finally, the airlines have local planes radiating from each of the hubs to smaller communities in their regions. American, Delta, and United use this system, and although they all have different hubs they end up offering competitive service from just about any origin to any destination in the country.

Metro can imitate this system by making maximum use of St. Louis's interstate freeway system. This system includes the I-255 and I-270 beltline; seven radials: I-44 west, I-55 north and south, I-64 east and west, and I-70 east and west; plus I-170. Since the development of the Interstate Highway System, the junctions of two freeways have often been the locations for intensive economic activity. Counting downtown St. Louis, where four interstates meet, as one junction, there are at least 13 such junctions in the St. Louis area.

To make use of this system, Metro could select seven centers of economic activity located near interstate junctions and use them as *primary transit centers*. Every primary transit center would have frequent nonstop bus service to every other primary center. Seven primaries would have 21 nonstop bus routes between them.

Metro could also select several *secondary transit centers*, most of which would also be at freeway junctions, but a few, such as Belleville and possibly Alton or East Alton, would not. Each of these secondary centers would have nonstop bus service to one or two primary centers and possibly to one or two secondary centers. Finally, local buses or bus rapid transit lines should radiate away from every primary and secondary center. This would allow almost anyone in the region to reach a center after a short bus ride and then quickly travel to any other center at freeway speeds.

Figure 5 and Table 3 show one possible set of primary and secondary centers. In addition to 21 nonstop routes between primary centers, this system includes 18 nonstop routes to secondary centers. Table 2 also lists some of the local or bus rapid transit routes radiating from each of the centers. Note that many smaller suburbs have connections to more than one center, thus maximizing the utility of the entire system.

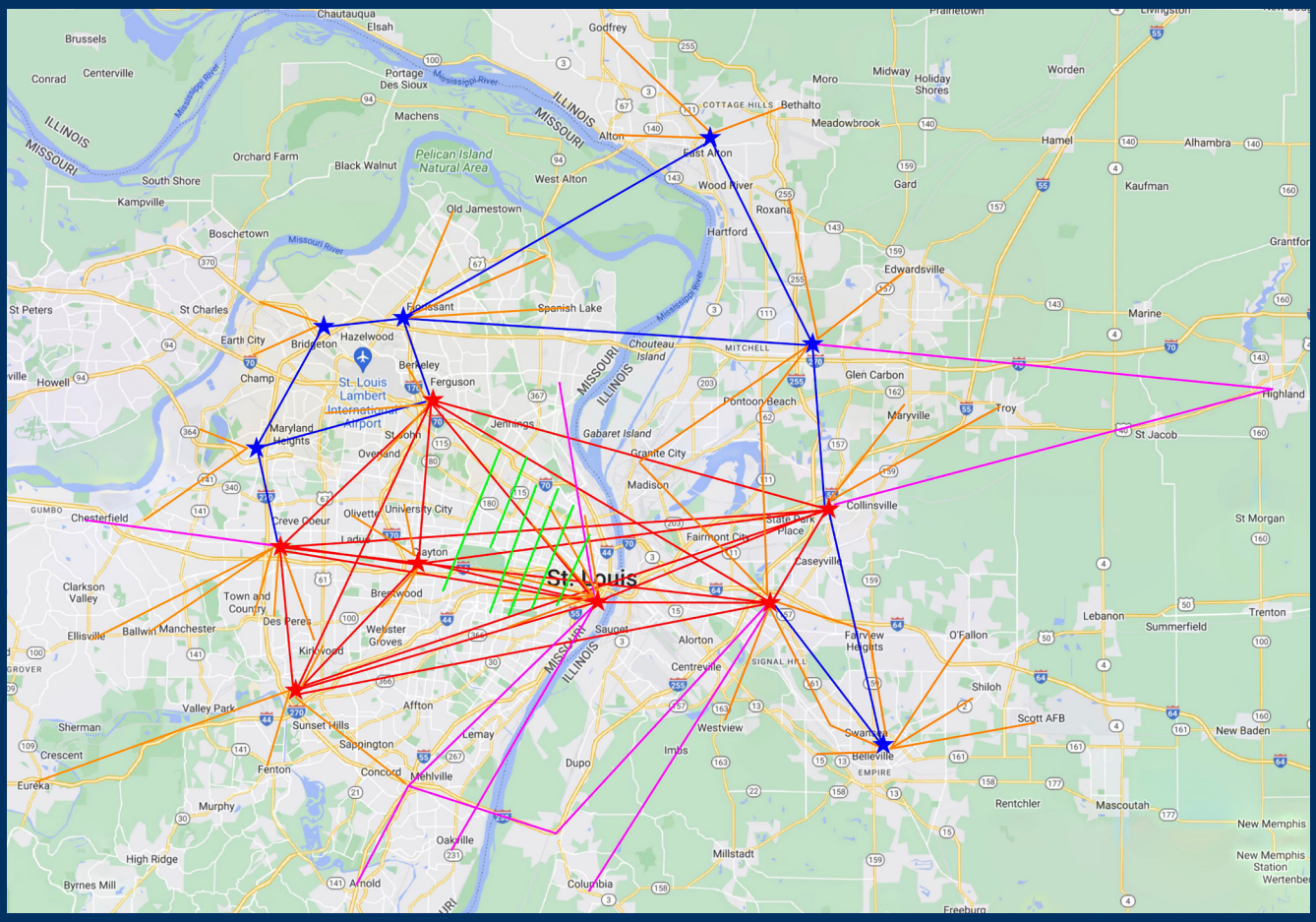
Downtown St. Louis currently has about 16 lines radiating away from it in the City of St. Louis. These would be left intact. St. Louis also has about seven north–south lines that don't go downtown. Most of these would also be left intact to provide connectivity in the central city. However, all suburban lines in the region would be replaced by the primary, secondary, and local lines listed in Table 3 or would be turned into local lines radiating from one of the primary or secondary centers.

Most buses would operate five times an hour during the busiest hours of the day, four times an hour during less busy hours, and two or three times an hour at night. This would require buses to operate far more miles per day than Metro's current bus system, but since the buses would going much faster, they would operate about the same number of vehicle-hours per day, thus keeping costs down.

Figure 5

Proposed St. Louis-area Transit System

The system includes primary transit centers (red stars) with nonstop buses to every other primary center and secondary transit centers (blue stars) with nonstop buses to selected other transit centers. Red lines are nonstop buses between primary transit centers; blue lines are nonstop buses to secondary transit centers; magenta lines are bus-rapid transit routes; orange lines are local routes radiating from each transit center that correspond to all or nearly all of Metro's current routes; green lines are north–south lines in the City of St. Louis. Lines show origins and destinations, not exact routes or intervening stops.



Source: Base map from Google maps.

Although each bus between primary centers would operate nonstop, once reaching a primary center the buses could continue to a secondary center or in local service, thus minimizing the need to change buses. For example, one bus could start in Chesterfield, operate as a bus rapid transit route to Creve Coeur, then operate nonstop to Collinsville, then continue to Glen Carbon, and finally operate as a bus rapid transit line to Alton, thus making

Table 3: **Primary and Secondary Transit Centers**

Primary Centers	Connections to Secondaries	Radial Local and Bus-Rapid Transit (BRT)
Downtown St. Louis		Throughout St. Louis, Arnold, Mehlville BRT, Oakville BRT, Riverview BRT
East St. Louis (I-64 & I-70)	Belleville	Columbus BRT, Fairview Heights, Granite City, O'Fallon, Pontoon Beach, Washington Park
I-70 & I-255 (Collinsville)	Glen Carbon, Belleville	Highland, Troy
I-64 & I-170 (Clayton)	Westport Plaza	Brentwood, Kirkwood, Overland, University Park, Webster Groves
I-70 & I-170 (Airport)	Florissant, Bridgeton	Berkeley, Ferguson, Overland
I-64 & I-270 (Creve Coeur)	Westport Plaza	Ballwin, Chesterfield BRT, Des Peres, Kirkwood, Town and Country
I-44 & I-270 (Sunset Hills)		Crestwood, Des Peres, Eureka, Fenton, Kirkwood, Mehville, Oakville
Secondary Centers	Connections to Other Centers	Radial Local and BRT
I-170 & I-270 (Florissant)	Airport, Alton, Bridgeton, Glen Carbon	Blackjack, Calverton Park, Spanish Lake
I-70 & I-270 (Bridgeton)	Airport, Westport Plaza, Florissant	Earth City, Hazelwood
I-270 & MO-364 (Westport Plaza)	Clayton, Creve Coeur, Bridgeton	Chesterfield, Overland, Westwood
I-255 & I-270 (Glen Carbon)	East Alton, Florissant	Edwardsville, Granite City, Pontoon Beach, Troy
Belleville	East St. Louis, Collinsville	O'Fallon, Scott AFB, Shiloh
East Alton	Florissant, Glen Carbon	Alton, Bethalto, Godfrey

a rapid, one-seat trip possible from one end of the urban area to the other.

Light rail can play a role in this system by substituting for buses in connecting a few centers. However, as currently designed, light rail cannot provide nonstop service from, say, Clayton to East St. Louis or the airport to Belleville, and so it would be slower than buses. In the long run, Metro should plan to replace light rail as it wears out with buses that are faster, less expensive to maintain and operate, and more flexible.

With light rail serving in the short run as the trunk lines between Clayton, Lambert Airport, the Central West End, downtown St. Louis, East St. Louis, and Belleville, this system should not cost significantly more to operate than the current system. Yet it will be faster and more frequent, thus attracting many more riders. It will also be legible, as travelers will know they can quickly get from any primary center to any other primary center and thus only need to know what local buses to take to and from the primary centers. Metro can increase legibility further by designating each of the primary and secondary transit centers with a color code and then using a colored placard on each bus heading toward that center.

In keeping with the infrastructure-lite model pioneered by Megabus and other newcomers to the intercity bus industry, the primary and secondary transit centers would not require much new construction. Some centers already exist, such as the Ballas center at the junction of I-64 and I-270. Where transit centers do not exist, they should be little more than curbside stops with room for up to four buses, a small bus shelter, and more prominent signs than normal.

Between centers, buses can operate on lanes shared with other vehicles, including high-occupancy vehicle lanes (which exist in other cities and could be built in St. Louis[118]). However, dedicated bus lanes should not be needed anywhere in the St. Louis area. If there are five buses per hour between each primary center, most of the freeways will see only five to ten buses per hour in each direction, and dedicating a whole lane to so few vehicles would be a waste.

This is just one way to reform St. Louis's transit system. This proposal would cost far less to implement than constructing a new light-rail line, yet it promises to provide much better service to people throughout the region and thus should attract far more new riders than a light-rail line. Other options could include instituting bus rapid transit, as Kansas City has done. In any case, Bi-State should immediately stop planning to build more obsolete light-rail lines and start planning a transit system that can work in the 21st century.

CONCLUSIONS

St. Louis doesn't need more light-rail lines. It especially doesn't need slow and dangerous street-running light-rail lines. What it needs is a transit system for a decentralized 21st-century urban area.

Such a transit system requires the use of a nimble, flexible technology, which means buses, not rail. While the proposal presented here may not be perfect, some major reform like it is needed if Metro is to be anything more than a construction contractor building expensive urban monuments that the region doesn't need.

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104. *Northside Study Final Report* (St. Louis: Metro, 2008), p. 336; *Southside Study Final Report* (St. Louis: Metro, 2008), p. 353.

105. *Northside-Southside Study—Detailed Evaluation of Alternatives: Tech Memo 4: Order of Magnitude Capital Costs* (St. Louis: East-West Gateway Council, 2018), table 5-2.

106. *Northside Study Final Report*, p. 407.

107. *Northside-Southside Study—Detailed Evaluation of Alternatives: Tech Memo 6: Ridership*, table 6-1.

108. *Northside Study Final Report*, p. 408.

109. *Northside-Southside Study—Detailed Evaluation of Alternatives: Tech Memo 6: Ridership*, p. 11.

110. "Downtown Recovery—Winter: December 2022–February 2023," University of Toronto School of Cities, 2023, https://downtownrecovery.com/dashboards/recovery_ranking.html.

111. 49 U.S.C. 5309(e)(2)(A)(iv).

112. "Modified City of St. Louis Alignment," Metro, 2023, https://growingmetrolink.com/city-of-st-louis/.

113. *2020 Report to the Region* (St. Louis: Bi-State Development, 2021), p. 25.

114. *National Transit Database 2019* and *2021*, "Operating Expense" and "Fare" spreadsheets.

115. *National Transit Database 2019* and *2021*, "Revenue Sources" and "Agency Information" spreadsheets.

116. *American Community Survey 2019* and *2021*, table B08301 for St. Louis urban area. The *2021 National Transit Database*, "Agency Information" spreadsheet, says that Metro serves a population of 1.566 million people.

117. *Bi-State Development 2020 Report to the Region* (St. Louis: Bi-State Development Agency, 2021), p. 14.

118. In certain cases, changes to state law may be necessary in order for HOV lanes to be designated.

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