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The Wave: An Idea Whose Time Has Gone

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A streetcar in Fort Lauderdale might have made sense a hundred years ago if the city had enough people to support one. Today, however, the proposed Wave streetcar, which Broward County wants to build in downtown Fort Lauderdale at a cost of nearly $200 million, is an obsolete technology that will be vastly more expensive than ordinary buses in the same service. Buses not only cost less, they can provide all of the benefits of a streetcar while causing less traffic congestion.

The first successful electric streetcars were developed 130 years ago, and they were such a significant improvement on previous forms of transportation that within a few years every American city of 15,000 people or more had at least one streetcar line.[1] But the streetcar boom ended in 1920 with the development of the gasoline-powered bus, as buses didn't require expensive infrastructure dedicated solely to their use. By 1930, Diesel-powered bus service cost less to start up and less to operate than streetcars, so cities such as Albuquerque and San Antonio began replacing their entire streetcar systems with buses.

Fort Lauderdale only had about 2,250 people in 1920, so it never built a streetcar line. Now Broward County proposes to build a 2.8-mile line at a cost of nearly $75 million per mile. For less than $2 million, buses costing could provide service identical to the streetcar, but the county has been persuaded that a streetcar will magically stimulate economic development.

Here are ten reasons why streetcars make no sense for Fort Lauderdale today.

1. Broward County's analysis concludes streetcars will attract no new visitors to downtown Fort Lauderdale.
2. The county's analysis also concludes the streetcar will carry very few passengers.
3. Ridership is not likely to significantly grow.
4. The county's numbers conclude that most streetcar passengers would ride transit anyway.
5. Buses cost less to buy.
6. Buses cost less to operate.
7. Buses cost less to maintain.
8. Economic development benefits are imaginary.
9. Streetcars are not green.
10. Building the streetcar requires an irretrievable commitment of funds.

1. Broward County's Analysis Concludes Streetcars Will Attract No New Visitors to Downtown Fort Lauderdale

Economic development takes place in response to new potential customers or users of that development. Yet the environmental assessment for the streetcar predicts that the streetcar will bring no new customers into downtown Fort Lauderdale.

According to Broward County's environmental assessment, if the Wave is not built, 386,488 people per day will enter or leave downtown. If the Wave is built, that number would be 386,488. If the Wave is not built but buses were used in place of streetcars, the number would be 386,488.[2] In other words, neither

streetcars nor identical service using buses would draw any new people into downtown. If no new people come to downtown, there would be no reason to expect new economic development.

2. The County's Analysis Concludes Streetcars Will Carry Few Passengers

Spending $200 million on a transit project might make sense if that project were going to carry tens or hundreds of thousands of people per day who would not be carried by a lower-cost project. Yet the county's optimistic projection is that the Wave streetcar will carry just 3,207 passengers per day in its first year.[3]

Most days, the streetcar is supposed to operate for 18.5 hours a day making eight trips an hour in each direction, or 296 total trips per day.[4] At 3,207 riders per day, this means that each trip will carry an average of 10.8 people. The environmental assessment also predicts that the streetcar will carry 3,008 passenger miles per day, which means the average ride will be 0.94 miles. Since the entire streetcar route is 2.8 miles, the average rider will just ride one-third of the route. That means that, at any given time, streetcars will carry an average of 3.6 people. To carry those people, Broward County proposes to buy streetcars with 40 seats and room for another 115 standees.[5]

Table One: Streetcar Ridership and Fares

	Route Miles	Weekday Trips	Fare/ Trip	Average Speed mph
Atlanta	1.4	1,783	0.00	3.1
Dallas	1.2	170	0.00	7.8
Dallas-McKinney	2.3	1,479	0.00	5.2
Kenosha	1.0	180	0.53	7.1
Little Rock	1.8	232	0.90	4.4
New Orleans	9.3	19,595	0.92	6.0
Portland	7.4	14,463	0.11	6.2
San Francisco	10.9	21,067	0.87	4.5
Seattle	1.3	2,082	0.75	4.9
Tacoma	1.4	3,286	0.00	7.7
Tampa	1.8	626	1.96	5.4
Tucson	2.0	3,504	0.84	7.9

Source: 2015 National Transit Database. *Route miles shown are bi-directional; generally, two miles of track (one in each direction) equals one route mile. Average speeds calculated by dividing vehicle revenue miles by vehicle revenue hours.*

The transit industry has a long history of underestimating costs and overestimating ridership of rail projects, and the Wave is likely to follow this pattern. Projected costs have already risen 37 percent.[6] Judging from the experience in other cities, the projected ridership of 3,207 trips per weekday, which is based on fares of $1 per ride, is similarly optimistic (table one). Not counting the legacy systems in New Orleans and San Francisco, the only streetcar that comes close to this number while collecting close to $1 a ride is Tucson's. Tucson's streetcar goes through the middle of the 45,000-student University of Arizona campus and most of its riders are students. The downtown campus of Broward College is on the proposed Wave line, but it has only about 2,000 students.

Atlanta's streetcar didn't manage to attract 3,000 trips per day when the rides were free, and ridership fell 58 percent when it began charging a dollar a ride.[7] Portland's carries lots of people and nominally charges $2 a ride, but due to a combination of people with monthly or annual passes and fare evasion, it only collects an average of 11 cents a ride.

There are good reasons why streetcars attract so few passengers, but one of the most important ones is that they are slow. Planners of the Wave predict the streetcars will go 222,800 miles in 21,250 hours a year, which is an average of 10.5 miles per hour.[8] But judging from other streetcar lines shown in the above table, that too is optimistic, as it is nearly a third faster than the fastest streetcar line in the country.

3. Ridership Is Not Likely to Significantly Grow

Most cities that have opened streetcar lines have learned that streetcar ridership does not significantly increase after the first year, and in fact it often declines as the novelty of the trolley car dissipates and people realize that other forms of transportation are faster or more convenient.

- The Tampa streetcar carried more than 500,000 riders when it opened in 2003. By 2015 it had fallen to 288,000.
- The Little Rock streetcar carried 154,000 riders in 2005, dwindling to 95,000 in 2015.[9]
- The Kenosha streetcar carried almost exactly the same number of riders in its first full year, 2001, as it did in 2015.
- In 2004, its first full year of operation, the Tacoma streetcar carried 795,000 riders. By 2015 this had modestly grown to 973,000 trips.
- Seattle's South Lake Union Trolley carried 413,000 people in 2008, its first full year of operation. By 2016, this modestly grew to 518,000.

Ridership has grown faster on a few streetcar lines. Memphis streetcar grew from 430,000 in 1994 to more than 2.2 million in 1999, but then shrank to 1.4 million before it closed in 2014. Portland's streetcar ridership grew from 1.4 million in 2002 to 4.0 million in 2009, but that growth was at least partly the result of several extensions to the streetcar route. After 2009, ridership was flat until the line was extended again in 2015. In most cases, however, unless cities spend hundreds of millions of dollars adding to the systems, ridership growth is small and often negative.

Streetcars are not the only kind of transit whose ridership is declining. According to the American Public Transportation Association, heavy-rail (subways and elevateds) ridership fell by 1.6 percent in 2016 and bus ridership fell by 4.1 percent.[10] Light-rail ridership grew only because of the opening of new light-rail lines. Ridership is falling partly because of lower fuel prices, but also because of the growth of ridesharing services such as Uber and Lyft. Ford Motor Company has vowed to have driverless cars in ridesharing services in American cities by 2021.[11] That will lead to a huge decline in transit ridership as the cost of these services will be competitive with transit fares.[12] When shared, driverless cars are likely to replace transit in a few years, it makes no sense to spend $200 million on inflexible transit infrastructure.

4. The County's Analysis Concludes Most Riders Would Take Transit Anyway

Although 3,207 people are predicted to ride the streetcar every day, almost all of them would ride transit without the streetcar. The environmental assessment predicts that, if the streetcar is built, the number of daily transit trips taken within downtown Fort Lauderdale would increase by 84. The same would result if buses were used in place of streetcars. Regionwide, building the streetcar or providing a similar bus service would increase transit ridership by just 329 trips per day. In other words, if the streetcar is not built, all but 3 to 10 percent, depending on which figure is used (84 or 329), of the 3,207 potential streetcar riders would use transit anyway.

5. Buses Cost Less to Buy

The environmental assessment estimated that five streetcars and spare parts would cost more than $28 million, or more than $5 million per vehicle. Buses are far less expensive. A company called Hometown

Trolley makes buses that look like streetcars. A 28-foot, 24-seat low-floor Hometown Trolley powered by gasoline costs about $140,000. Substituting biodiesel, liquid natural gas, or propone raises the cost to $180,000. An all-electric model costs $475,000. The company also makes larger trolley-styled buses. Most bus manufacturers offer significant discounts for multiple purchases.

Florida gets most of its electricity from burning natural gas, so electric-powered transit may actually generate more greenhouse gases per passenger mile than propone, biodiesel, or other clean fuels.[13] One drawback of electric power is that generation and transmission wastes a lot of energy so that three British thermal units (BTUs) of natural gas must be burned to deliver one BTU of electricity to end users. Buses using propane or biodiesel may actually use less energy and emit less pollution than electric-powered transit.

Hometown Trolley makes larger buses, but since the county's environmental assessment predicts the streetcar will carry an average of just 3.6 people at a time, a 24-passenger bus should be more than sufficient to handle fluctuations in demand. To minimize air pollution and accommodate demand during special events, Broward County could buy ten propane-powered buses for less than $2 million. Streetcars have twice the expected lifespan of buses, but over the life of five streetcars costing $28 million (not counting the tracks and other infrastructure), the buses would cost only about $4 million.

Unlike streetcars, buses don't require ugly wires cluttering up the streetscapes. At less than half the length of the streetcar, buses make a much smaller contribution to congestion. Plus, unlike streetcars, if one bus breaks down, others can simply go around it, minimizing service disruptions. In all ways, then, buses are superior to streetcars.

6. Buses Cost Less to Operate

Table 5-3 of the environmental assessment estimates that operating eight streetcars per hour an average of 18.4 hours a day would cost $2.6 million per year based on an average cost of $122 per hour. Operating buses on exactly the same schedule would cost just $2.0 million per year based on an average cost of $95 per hour.

The county's most recent estimate is that the streetcar would cost $4.9 million a year to operate.[14] Broward County spent $98 per hour operating buses in 2015, so the cost of an identical bus service is likely to be no more than $2.1 million a year.[15] In fact, Broward County could operate one bus every five minutes—a service that would require nine buses with one as a spare—for about $3.3 million per year, or two-thirds of the operating cost of the streetcars. The increased frequencies would attract more riders and make the service more valuable to the downtown area than a streetcar.

7. Buses Cost Less to Maintain

Like other forms of rail transit, streetcars have a drawback that isn't mentioned in any of the documents prepared for the Wave proposal: after 25 to 30 years, the infrastructure wears out and must be replaced. This is considered a maintenance cost because all it does is maintain the existing system, yet it isn't included in the estimates of maintenance costs done for the Wave.

According to the Federal Transit Administration, America's transit systems suffer from a $90 billion maintenance backlog, the vast majority of which is due to rail transit lines that are more than 30 years old.[16] The Boston T, Chicago Transit Authority, Washington Metro, and other rail systems each have multi-billion-dollar backlogs and no available source of funds to fix the problems. At least ten people have died on the Washington Metro system due to maintenance failures.

One streetcar operator that has learned this lesson is in Memphis, which opened a streetcar line in 1993. In 2014, after just 21 years, several incidents led the Memphis Area Transit Authority to completely shut down the system for renovations. Three years later, the system is still not operating.[17]

In building the Wave for $200 million today, Broward County can expect to have to pay roughly another $200 million in 30 years updating and rehabilitating the infrastructure. A more sensible idea would be to tear it out and replace it with buses, as more than 1,000 American cities did with their streetcars after 1910. An even more sensible idea would be to not build it in the first place, as buses cost far less to maintain.

8. Economic Development Benefits Are Imaginary

Broward County and other local governments have been sold on the idea of building streetcars not for their transportation value—which even most streetcar advocates agree is negligible—but because they supposedly stimulate economic development. The economic analysis for the Wave streetcar found that the benefits of the streetcar, not counting economic development, will be less than $40 million, or only about 20 percent of the cost. The economic development benefits are claimed to be worth $228 million, which makes the benefits appear to exceed the cost.[18]

Yet these benefits are completely fictitious. No city that has built a streetcar line has seen a significant increase in economic development unless they offered additional subsidies to the developers. Usually, those subsidies include tax-increment financing (TIF), which uses the property taxes paid by owners of new developments to subsidize those developments. Far from being "free" money, this places a burden on other taxpayers in the city to fund the urban services consumed by those new developments. In fact, at least one study has found that cities that use TIF grow slower than ones that don't because of the extra burden TIF puts on other taxpayers in the city.[19]

The myth that streetcars promote economic development was started by Portland, Oregon after it opened its first streetcar line in 2001. The line started in a new TIF district south of downtown Portland, passed through an existing TIF district in downtown, entered another new TIF district north of downtown, and then continued on outside of any TIF districts.

The TIF district south of downtown was a former industrial site. To attract development, Portland sold $140 million in TIF bonds to clear the industrial buildings and install new infrastructure for high-rise residences and offices. The city expects to sell up to $115 million more TIF bonds to complete the redevelopment of the area.[20] Offered what was essentially a greenfield at below-market rates and freed of the expense of installing their own infrastructure, as most developers do, developers were happy to build the high rises.

The city has sold a total of $112 million TIF bonds to support development in the downtown district. This included the construction of parking garages along the streetcar line. The biggest project was in the TIF district north of downtown, which was a former rail yard. The city sold $344 million in TIF bonds, and may sell another $145 million more, to clear out the rail yard, install infrastructure, and provide the land to developers. Infrastructure provided by the city included streets, sewer, water, and parking garages.[21]

After the streetcar line opened, the city made a list of all the projects built along the streetcar route and implied if not outright claimed that these projects were built because of the streetcar, not the TIF subsidies.[22] Curiously, the list included almost no new developments in the portion of the streetcar route outside of any TIF district. If the streetcar alone was sufficient to stimulate new development, then that development should take place both inside and outside of TIF districts.

Tampa's streetcar, like Portland's, passes through three TIF districts.[23] Those districts have seen some new development, but it is mainly thanks to $600 million in government-funded projects. Meanwhile, parts of the area along the streetcar route remain "largely undeveloped."[24]

Cities that haven't supported development with TIF have seen very little new development along streetcar lines. For example, neighborhoods around streetcars in Little Rock and Tacoma have seen little if any new development, while the Memphis streetcar passes numerous boarded-up buildings that are for sale and would be ripe for redevelopment if there were any demand for it.

Streetcar advocates make the curious argument that developers are more attracted to streetcar lines than bus routes because the streetcars are more permanent. This flies in the face of history: Most American cities that built streetcar lines tore them out within 30 years or so. Meanwhile, almost every city that started bus service 80 or more years ago still has that service today.

Some heavily used transit lines, such as the Washington Metro system, have stimulated economic development near rail stations. At most, however, all the rail line did was influence where the development is located. As a Federal Transit Administration-funded study looking at this question concluded, "Urban rail transit investments rarely 'create' new growth, but more typically redistribute growth that would have taken place without the investment."[25] To truly bring net benefits to a city, the rail line would have to generate development that wouldn't have taken place without that development. It is doubtful that any rail transit system built since 1970 has succeeded in doing that.

Downtown Fort Lauderdale is already undergoing a renaissance without the streetcar. According to the city of Fort Lauderdale, since 2012 the area has seen nearly 8,900 residential units, close to 900 hotel rooms, 230,000 square feet of retail space, and nearly 2 million square feet of office space completed, under construction, or approved, and applications have been submitted for even more.[26]

Thus, the supposed $228 million in economic development benefits credited to the Wave is fictitious. Numerous developments are already being built without the streetcar, and if the streetcar is built, it is unlikely that any more development would take place in the area without additional subsidies. To the extent that any development is built at all, it would have been built somewhere in the county without the streetcar, so a streetcar would not generate any net economic benefits to Broward County.

9. Streetcars Are Not Green

Wave backers call the streetcar "environmentally friendly."[27] They also frequently mention that the area to be served by the streetcar is congested and imply the streetcar will fix that. In fact, streetcars are one of the least environmentally friendly forms of transportation and they actually increase congestion.

Streetcars use far more energy, per passenger mile, than most other forms of transportation (see table two below). The Tucson streetcar, which is similar to the Wave in many respects, uses two-and-one-half times as much energy per passenger mile as a bus and three times as much as an SUV. Electric-powered streetcars in regions that get most of their electricity from hydropower or other renewable sources do not produce a lot of greenhouse gases, but ones in regions that get most electricity from fossil fuels do.

Florida Power & Light gets most of its electrical power from burning natural gas, and the Department of Energy says that burning 1 million BTUs of natural gas produces 117 pounds (53 kilograms) of carbon dioxide.[28] If the Wave requires as many BTUs per passenger mile as the Tucson streetcar and half that electricity comes from natural gas, it would generate more than 300 grams of carbon dioxide per passenger mile, about the same as a bus and more than cars or SUVs.

Cars waste energy and emit more pollution in congestion, so the Wave could offset some of its environmental costs if it reduced congestion. However, no serious analysis was done to estimate the effects of the streetcar on congestion. Instead, the streetcar is merely presented as "a rail alternative within a currently congested area."[29] In fact, any realistic analysis would show that the streetcar will make congestion worse.

Anaheim, California did a traffic analysis for a streetcar proposal there. The analysis found that the streetcar would, at most, take 287 cars per day off the streets. At the same time, the analysis showed that the 66-foot-long streetcars would reduce the capacity of the streets to move cars by more than 1,100 cars a day.[30] The result would be a net increase in congestion. The Wave streetcar has likely to have the same effect: take a few cars off the streets, but reduce street capacities by even more. The result will be more congestion, more wasted energy, and more pollution.

Table Two: Streetcar Energy Consumption and Greenhouse Gas Emissions

	BTUs Per Passenger Mile	Grams CO_2 Per Passenger Mile
Atlanta	11,123	533
Dallas	18,296	1,027
Dallas-McKinney	3,189	179
Kenosha	38,125	2,636
Little Rock	26,678	1,559
New Orleans	1,559	156
Portland	4,148	56
San Francisco	5,688	158
Seattle	9,709	100
Tacoma	4,784	49
Tampa	10,654	499
Tucson	11,333	523
Average streetcar	4,351	148
Average transit bus	4,159	314
Average SUV	3,477	247
Average car	3,122	222
Prius	1,659	118

Source: Transit data calculated from 2015 National Transit Database*, energy consumption spreadsheet; auto data from* Transportation Energy Data Book*, Department of Energy, table 2-15.*

10. Building a Streetcar Requires an Irretrievable Commitment of Funds

For less than 1 percent of the cost of a streetcar line, Broward County could provide equivalent service using buses. If bus ridership was inadequate to justify the service, the county could change routes to somewhere where they might be more heavily used or sell the buses.

Such options won't be available once a streetcar line is built. Rerouting a streetcar would be almost as expensive as building it in the first place. Cancelling the streetcar line would lead the Federal Transit Administration to demand that Broward County return a prorated share of federal streetcar grants to the federal government.

Most streetcar infrastructure has a 30-year service life. If, after five years, Broward County decides the streetcar wasn't worth it and was causing more harm than good, it could only stop running the line by returning roughly five-sixths of the federal grant. The county could recover some of those funds by selling the streetcars, but since much of the grant will be spent on immobile infrastructure, the county would not

be able to sell those parts of the system. Rather than return the funds, the county will have to continue operating the streetcar for the full 30 years.

For this reason, claims by other cities that their streetcars have been successful must be viewed with skepticism. City officials can't easily admit that they wasted taxpayers' money building a streetcar line, nor can they admit that they are wasting even more taxpayer money running nearly empty streetcars just so they don't have to repay federal grants. Thus, they claim streetcars are successful even when ridership on most streetcars isn't enough to justify operating a full-sized bus line.

Conclusions

All of the benefits of the proposed Wave streetcar could be achieved with buses at a far lower cost. Jobs created during streetcar construction could just as well be created by digging holes and filling them up, but digging and filling holes has the virtue of not leaving county taxpayers obligated to pay excessive operations and maintenance costs. The Wave streetcar would be an incredible waste of money and Broward County should immediately cancel the project.

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