Does Indianapolis Need Dedicated Bus Lanes?

by Randal O'Toole

The Indianapolis Public Transportation Corporation (IndyGo) has proposed to start a 37.5-mile bus-rapid transit service from Westfield, due north of downtown Indianapolis, to Greenwood, which is due south. Phase 1 of this route would start at 66th Street north of downtown and go to Hanna Avenue south of downtown, covering a distance of 13.6 miles. Battery-powered electric buses would operate on this route using dedicated or semi-dedicated bus lanes for a little more than half the route. These buses would be given priority over most other traffic at signals.

IndyGo's goal, it says, is "to significantly improve mobility in one of the strongest travel corridors in Central Indiana."[1] While this is a commendable aim, the agency has not made any effort to determine if this proposal is the best way to achieve it. Instead, the project is designed to make IndyGo eligible for federal funding for things that are neither cost effective nor environmentally sound.

As a result, there are several problems with the project. Transit is largely irrelevant to most Indianapolis residents, and the number of people who the new buses will attract who aren't already riding transit is trivially small. The dedicated lanes will slightly speed the buses for those few people but slow traffic for many more people who continue to travel by car. The electric buses that IndyGo proposes to buy will be expensive, oversized, and will actually do more harm to the environment than Diesel or compressed-natural-gas buses. Finally, IndyGo's proposal for cities to subsidize construction of transit-oriented developments along the bus route follows an urban-planning fad that has failed in other cities that have tried it.

Indianapolis: Not a Transit City

Transit plays an important role in a few American cities, notably New York, Chicago, San Francisco, Boston, Washington, and Philadelphia. These cities have downtowns filled with hundreds of thousands of jobs surrounded by densely packed residential neighborhoods, making it possible for transit to move large numbers of people from their homes to work. Transit carries more than a third of commuters to work in the New York urban area (which includes Long Island, northern New Jersey, and southwest Connecticut) and between 10 and 20 percent of commuters in the other five urban areas. Even in these urban areas, transit loses a lot of money, with fares typically covering only one-third to one-half of operating costs and no maintenance or capital costs.

Indianapolis is not like these cities. According to Wendell Cox's comparison of central business districts, Indianapolis has about 73,000 downtown jobs, less than a third of any of the above six cities.[2] The population density of the Indianapolis urban area is 2,100 people per square mile, just one-third of the San Francisco-Oakland urban area and less than half of the New York urban area.[3] Transit carries just 2.6 percent of downtown Indianapolis commuters to work, and less than 1.5 percent of all commuters in the urban area.[4] Bus fares cover less than 20 percent of IndyGo's operating costs.[5]

In 1990, IndyGo buses carried 12.4 million passenger trips, an average of 15.4 trips per Marion County resident. This fell to a low of 8.2 million trips in 2009, for an average of just 9.1

trips per resident. After that it grew to 10.3 million trips in 2014, or 11.0 trips per resident.[6] However, preliminary information indicates that ridership fell by 6 percent in 2015.[7] Indianapolis trips per capita are well below the national average, which in 2014 was about 42 trips per urban resident.

One reason transit is so little used is that nearly everyone in Indianapolis has access to a car. According to the Census Bureau, only about 2.5 percent of Indianapolis workers live in households without cars. Even most of those workers do not rely on transit: more than 55 percent of them get to work by car, either carpooling or borrowing a car (perhaps using an employer-supplied car), while only 20.5 percent take transit to work.[8] In all, residents of the Indianapolis urban area drive more miles every day than the number of passenger miles carried by IndyGo over the course of a year.[9] Since Department of Transportation surveys estimate that cars carry an average of 1.67 occupants, automobiles move more than 650 times as many passenger miles per year in the urban area as Indygo.[10]

Increasing Congestion Through Dedicated Transit Lanes

The idea of bus-rapid transit is basically recognition that buses can do anything that light rail can do for far less money. Light rail's main advantage over ordinary bus service is that the light-rail cars tend to stop only about once per mile, allowing higher average speeds, and operate more frequently, typically 8 times an hour during rush hour and four times an hour the rest of the day, at least twice as often as most local bus lines. However, there is no inherent reason why buses need to stop five or six times a mile and operate no more than two to four times an hour.

Aside from operating more frequently and stopping less frequently, bus-rapid transit usually involves "branding" the buses by painting them a distinctive color for easy recognition. It may also involve easily recognizable bus stops, using buses with extra-wide doors for easy loading and unloading, and possibly fare systems where people pay before boarding the bus so as not to slow the buses down during fare collection.

All of these things can be done without dedicating special lanes to buses. Dedicated lanes not only are costly to provide, they take space away from autos and other travelers, which ends up creating more congestion than the buses remove from the roads. Giving buses priority over other vehicles at traffic signals also increases overall traffic congestion while creating only a small benefit for a few people.

Dedicated lanes may be worthwhile in extremely high-use corridors. For example, Portland has dedicated lanes on two downtown streets where it has scheduled as many as 160 buses per hour in each direction. Staggered bus stops allow every bus to stop every other block, giving most passengers easy access to their destinations or to make transfers to other buses.

By comparison, IndyGo plans to run just six rapid buses and six local buses per hour on its dedicated lanes. This means the lanes will be operating at well under 90 percent of capacity, and that unused capacity will be entirely wasted. IndyGo's alternatives analysis for the Red Line considered different routes, but every alternative (other than "no build") was presumed to use dedicated bus lanes, so the agency made no attempt to determine if such dedicated lanes would be cost effective.[11]

The argument for dedicated lanes is that buses using such lanes will be faster, and faster service will attract more riders. Yet IndyGo's analysis finds that Red Line buses will average just 18.3 miles per hour. While this is an improvement over the average of 13.6 miles per hour for existing buses in the corridor, 18.3 miles per hour doesn't compete well with auto travel.[12] According to calculations based on Google traffic data, the average speed of automobiles in the city of Indianapolis is 33.7 miles per hour, nearly twice as fast as proposed Red Line buses.[13]

Without using dedicated lanes, IndyGo could speed Red Line buses by simply having them stop at fewer locations than ordinary buses. Transit riders seem to be more sensitive to frequencies than speeds, so simply running buses more frequently would attract many riders. For example, Eugene, Oregon's bus-rapid transit line increased speeds by only 4 percent over the previous bus service, yet increased frequencies and branding gained more than 100 percent new riders.[14] Since IndyGo did not consider any bus-rapid transit alternatives without dedicated lanes, it made no estimate of how fast such buses would be or how many riders they would attract. One reason why this alternative wasn't considered is that the Small Starts grant program from which IndyGo is seeking funding requires significant infrastructure improvements. Thus, Indianapolis auto drivers will face increased congestion just so IndyGo can be eligible for a particular federal grant.

The idea that faster speeds will dramatically increase transit ridership does not seem to be supported by IndyGo's own ridership projections. IndyGo says that buses in the proposed Red Line corridor currently carry 7,792 weekday riders.[15] IndyGo projects that the Red Line will carry 10,921 riders per weekday. Thus, the faster line will attract only 4,200 new transit trips, or about 2,100 round-trip passengers, per weekday. Other buses in the Red Line corridor will also gain about 600 trips per weekday even though their service will not be significantly faster than before.[16] It seems likely that most of these new riders could be attracted to the Red Line corridor without the extra expense and congestion resulting from dedicated bus lanes and signal priority systems.

An Environmental Disaster: Electric Buses

To serve the Red Line, IndyGo proposes to buy 120-passenger, 60-foot, battery-powered electric buses. The size of buses is overkill for the number of riders IndoGo projects will be carried, and electric buses will actually do more environmental harm than Diesel buses.

Most of IndyGo's current bus service uses 40-foot buses that have an average of 39 seats but carry, on average, just 5.7 passengers.[17] IndyGo projects ridership on the Red Line will be higher, but if the average bus trip is 5 miles, buses will still carry an average of fewer than 15 people.[18] Even considering variations over the course of a day, 120-passenger, 60-foot buses are simply not needed to carry this many people.

Powering such buses with batteries is supposed to appear environmentally friendly but in fact is not. Sixty-foot buses tend to weigh about 50 percent more than standard, 40-foot buses. Battery-powered buses tend to weigh about 10 percent more than standard compressed-natural-gas (CNG) or Diesel-powered buses. In total, a 60-foot battery-powered bus weighs about 65 percent more than a 40-foot Diesel bus.[19] Moving this extra weight consumes a lot of energy.

From an environmental viewpoint, electric-powered buses might make sense of all

electricity were generated by water power, wind power, or solar power. However, Indianapolis Power & Light (IPL) gets nearly all of its power by burning fossil fuels. As of 2007, 100 percent of its power came from burning fossil fuels, 79 percent of which was from coal. The company has a goal of reducing fossil fuels to 90 percent and increasing natural gas to 45 percent by 2017, but even that results in far more pollution and greenhouse gas emissions than simply powering buses with Diesel or CNG.[20]

One major problem is that two-thirds of the source energy is lost in generating and transmitting electricity.[21] Thus, to deliver 1,000 British thermal units (BTUs) of energy to IndyGo, IPL must burn 3,000 BTUs of coal, gas, or other sources of energy. This generates far more pollution and greenhouse gases than directly powering buses with Diesel fuel.

IndyGo's buses, most of which are 40-footers, currently consume an average of 37,100 BTUs per vehicle-revenue mile. Moving 60-foot, battery-powered buses that weigh 65 percent more will require about 61,400 BTUs per vehicle-revenue mile. If those buses have an average of 15 passengers on board, they will use about 4,100 BTUs per passenger mile. By comparison, the average car used about 3,144 BTUs and the average light truck (which includes pickups, sports-utility vehicles, and full-sized vans) used 3,564 BTUs per passenger mile in 2013.[22] If those same 15 people were riding ordinary 40-foot buses, they would only use 2,400 BTUs per passenger mile.

Greenhouse gas emissions from the battery-powered buses are even worse because of the two-thirds loss from power generation and transmission. If IPL meets its 2017 goal of reducing coal to 44 percent of its power sources, then generating enough power to move a 60-foot, battery-powered bus one mile would produce 12,100 grams of carbon dioxide. Divided by 15 passengers results in more than 800 grams per passenger mile. By comparison, even with only 5.7 passengers per bus, IndyGo's current fleet of buses generates about 476 grams per passenger mile, while the average light truck generates just 253 grams and the average car 223 grams per passenger mile. Operating the Red Line with standard Diesel buses would generate only about 180 grams per passenger mile.[23]

IndyGo's proposal to use 60-foot buses for a route that is projected to carry an average of just 15 people is a waste. IndyGo's proposal to use battery-powered buses is especially foolish. Even ignoring the environmental cost, the current dollar cost of 60-foot, battery-powered buses is $1.2 million each.[24] By comparison, a standard, 40-foot Diesel bus costs around $300,000.[25]

The Latest Planning Fad: Transit-Oriented Development

One of the criteria for obtaining federal funding for transit construction projects is whether a project will be accompanied by "transit-supportive economic development."[26] To improve the chances of getting federal funding for the Red Line, the Indianapolis Metropolitan Planning Organization prepared a transit-oriented development plan.[27] Typically, such transit-oriented developments are high-density, often mixed-use projects. Many are four- and five-story apartment buildings with the ground floors dedicated to small shops and restaurants.

Supposedly, encouraging people to live in such transit-oriented developments will increase transit ridership and reduce driving. In fact, there is very little evidence that this is true. Studies typically survey or monitor the transportation habits of people who live in such

developments in comparison with people who live in more typical neighborhoods of single-family homes. These surveys often find that people in the denser developments are less likely to own cars and more likely to ride transit.

The flaw in these surveys is known as *self-selection*: people who prefer not to drive tend to choose to live in higher-density areas that have better transit service. That doesn't mean that moving a family of four from a single-family home to a transit-oriented development will radically change their transportation habits. After reviewing studies that accounted for self-selection, University of California (Irvine) economist David Brownstone concluded that the effect of density and urban design on driving was "too small to be useful" in saving energy or reducing greenhouse gas emissions.[28] Thus, while some people prefer to live in such areas, additional transit-oriented housing won't have much effect on transit ridership or driving.

This can be seen in regions that have promoted such developments. Since 1990, the San Jose urban area has increased its population density by 43 percent; built more than 31 miles of new rail transit lines; and built numerous transit-oriented developments along those lines. Yet as of 2013, per capita transit ridership has declined by 20 percent and per capita driving increased by nearly 50 percent.[29]

Portland, Oregon has built scores of transit-oriented developments along its 70 miles of light-rail, commuter-rail, and streetcar lines. Before building rail transit, 9.9 percent of Portland-area commuters took transit to work.[30] As of 2014, just 8.3 percent of commuters rode transit.[31] Portland's Cascade Policy Institute has carefully monitored what means of transportation people living in many of the region's transit-oriented developments use when they leave in the morning. Overall, it found that the share using transit is not significantly different from people living in other parts of the region.[32]

Because the demand for living in small apartments on noisy streets is limited, Portland and other cities have had to subsidize such developments. When Portland opened its first light-rail line in 1986, it zoned everything near light-rail stations for high-density development. Ten years later, planners reported to the Portland city council that not a single such development had been built.[33] To encourage such development, the city decided to use a variety of subsidies, the most important of which was tax-increment financing, to dense developments along the transit lines. Overall, Portland has spent roughly $5 billion building its light-rail system and close to $2 billion subsidizing developments near rail stations.[34]

Indianapolis' transit-oriented development plan includes the use of tax-increment financing as well as a variety of other housing subsidies to promote developments along the Red Line. These include federal grants, the local Housing Trust Fund, and other sources of funding for so-called "affordable housing."[35]

Contrary to claims by urban-renewal advocates, tax-increment financing is not "free money." Any housing built in a tax-increment-subsidized development would have been built somewhere in the city, so taxes collected from that housing used to subsidize its construction are taxes that otherwise would have gone to schools, fire departments, and other property-tax-dependent entities. Not only does tax-increment financing not enhance growth, some researchers have found that it slows growth in cities that use it, probably because it imposes a higher tax burden or reduced urban services on residents and businesses.[36]

Another article of faith behind transit-oriented developments is that there is a pent-up demand for this lifestyle. "Demographic changes and shifting lifestyles are leading to greater demand for development that is walkable, higher density, mixed-use and transit-served," says the Indianapolis plan.[37] In fact, that too is mostly imaginary, which is why such developments nearly all have to be subsidized. The oft-repeated claim that Millennials prefer to live in cities rather than suburbs is belied by census data showing that the vast majority of people of all ages live in suburbs and that suburban numbers in all age classes, except the very elderly, continue to grow faster than city populations.[38]

Conclusions

IndyGo's proposed Red Line is unnecessarily expensive, will increase traffic congestion, and will produce more pollution and greenhouse gas emissions than the few cars that it takes off the road. IndyGo's failure to consider the alternative of running frequent buses on shared traffic lanes, rather than dedicated lanes, seems more oriented to making itself eligible for a federal grant than actually improving transit service. IndyGo's plan to use 120-passenger buses to carry average loads of 15 passengers is overkill. IndyGo's goal of buying expensive battery-powered buses in the name of being "green" will actually do far more harm to the environment than good.

IndyGo should experiment with bus-rapid transit using standard buses painted a special color operating frequent service that stops roughly once per mile using traffic lanes shared with cars and other vehicles. The dedicated bus lanes, transit-priority traffic signals, and giant battery-powered buses proposed for the Red Line are foolishly expensive and counterproductive to IndyGo's stated goal of improving urban mobility.

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Endnotes

1. "IndyGo Red Line Rapid Transit Small Starts Application: Project Narrative," IndyGo, Indianapolis, 2015, p. 8.

2. Wendell Cox, "United States Central Business Districts (Downtowns)," 3rd ed., Demographia.com, March 2014, Table 2.

3. "Population-Area Change Urbanized Areas" spreadsheet, Census Bureau, 2015, tinyurl.com/PopAreaChUA.

4. Cox, "United States Central Business Districts," table 3; *2014 American Community Survey*, Bureau of the Census, table B08301, "Means of Transportation to Work" for Indianapolis urbanized area.

5. *2014 National Transit Database* (Washington: Federal Transit Administration, 2016), "Service" and "Operating Expense" spreadsheets.

6. Ridership data from the Federal Transit Administration's National Transit Database "Service" spreadsheets for the indicated years; population data from the 1990, 2000, and 2010 censes and 2014 American Community Survey, with population for 2009 interpolated from 2000 and 2010 data.

7."Transit Planning—Ridership Data," IndyGo, 2016, tinyurl.com/IndyGoplanning.

8. *American Community Survey*, table B08141, "Means of Transportation to Work by Number of Vehicles in Household" for Indianapolis urbanized area, 2014, five-year data.

9. *2013 Highway Statistics* (Washington: Federal Highway Administration, 2015), table HM-72; *2014 National Transit Database* (Washington: Federal Transit Administration, 2016), "Service" spreadsheet.

10. Adella Santos, N. McGuckin, H.Y. Nakamoto, D. Gray, and S. Liss, *Summary of Travel Trends: 2009 National Household Travel Survey* (Washington: Federal Highway Administration, 2011), p. 33, tinyurl.com/09TravelTrends.

11. "Red Rapid Transit Line AA Final," Indianapolis Metropolitan Planning Organization, 2013, pp. 187–191.

12. "IndyGo BRT SS Operating Characteristics," spreadsheet prepared as a part of the Red Line Small Starts application, 2015.

13. "How Fast Is Your City?" Infinitemonkeycorps.net, 2009, tinyurl.com/CitySpeed.

14. Cheryl Thole, Alasdair Cain, and Jennifer Flynn, *The EmX Franklin Corridor BRT Project Evaluation* (Tampa: National Bus Rapid Transit Institute, 2009), p. v.

15. "IndyGo BRT SS Warrant Documentation," letter accompanying Red Line Small Starts application, 18 September 2015.

16. "STOPS Output" spreadsheet prepared for the Red Line proposal, IndyGo, 2015.

17. Calculated by dividing passenger miles by vehicle revenue miles from the 2014 *National Transit Database* (Washington: Federal Transit Administration, 2016), Service spreadsheet.

18. According to IndyGo's data, the average bus trip today is 3.9 miles. IndyGo planners have not estimated bus trip lengths for the Red Line but suspect it will be longer due to higher speeds. Email correspondence from Justin Stuerenberg, IndyGo transit planner, February 18, 2016.

19. "Xcelsior Specifications," New Flyer buses, Winnipeg, tinyurl.com/NewFlyerSpecs.

20. "Power Generation," Indianapolis Power & Light, 2011, tinyurl.com/IPLPower.

21. Stacy C. Davis, Susan W. Diegel, and Robert G. Boundy, *Transportation Energy Data Book, Edition 34* (Oak Ridge, TN: Department of Energy, 2015), p. B-7.

22. Davis, et al., *Transportation Energy Data Book*, table 2.15.

23. BTUs of energy converted to grams using "Carbon Dioxide Emissions Coefficients," Energy Information Agency, 2016, tinyurl.com/CO2coefficients.

24. Samantha Masunaga, "Metro Takes Extra-Long Electric Bus for Test Drive on the Orange Line," *Los Angeles Times*, December 28, 2014, tinyurl.com/BYDbuscost.

25. Shauna L. Hallmark, Bo Wang, Yu Qiu, and Bob Sperry, "Assessing the Cost for Hybrid versus Regular Transit Buses," Center for Transportation Research and Education, Iowa State University, 2012, tinyurl.com/Buscosts.

26. "Updated Interim Guidance on Small Starts," Federal Transit Administration, 2007, appendix A, "Transit-Supportive Land Use," tinyurl.com/SSInterim.

27. "Red Line Transit Oriented Development Strategic Plan," Indianapolis Metropolitan Planning Organization, 2015.

28. David Brownstone, "Key Relationships Between the Built Environment and VMT," Transportation Research Board, 2008, p. 7, tinyurl.com/y9mro58.

29. Numbers calculated from 1990 census and 2013 *American Community Survey*, 1990 and 2013 *National Transit Database*, and table HM72 in the 1990 and 2013 *Highway Statistics*.

30. *1980 Census—General Social and Economic Characteristics: Oregon* (Washington: Census Bureau, 1983), table 118, p. 39-109.

31. *2014 American Community Survey*, Census Bureau, table B08301 for Portland urbanized area.

32. John Charles, "The Myth of Transit-Oriented Development," presentation to the 2013 Preserving the American Dream conference, Washington, DC, October 28, 2013, tinyurl.com/TODMythPPT.

33. Videotape of October 23, 1996, city council meeting made by the city of Portland, tinyurl.com/6mfxtl9.

34. As of June 30, 2015, the city of Portland alone had outstanding tax-increment bonds of more than $1.4 billion, nearly all of which supported transit-oriented developments. This doesn't count tax-increment bonds that had already been repaid, bonds sold by Portland suburbs, or other kinds of subsidies to transit-oriented developments. "Portland Development Commission Adopted Budget FY 15-16," Portland, p. 18.

35. "Red Line Transit Oriented Development Strategic Plan," p. 37.

36. Richard Dye and David Merriman, "The Effects of Tax-Increment Financing on Economic Development," *Journal of Urban Economics*, volume 47, number 2 (March 2000), pp. 306-328.

37. "Red Line Transit Oriented Development Strategic Plan," p. 1.

38. Wendell Cox, "Dispersing Millennials," NewGeography.com, July 9, 2014, tinyurl.com/CoxDispersing.