POLICY REPORT

Should NCDOT Add More *Piedmont* Trains?

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Introduction

There has been debate in North Carolina about the wisdom of accepting grants under the federal high-speed rail program to add a third and fourth *Piedmont* train.[1] Similar controversy has erupted in other states, leading three governors to refuse high-speed rail funding (Florida, Wisconsin, and Ohio), while a legislative committee declined to include high-speed rail funding in the budget in a fourth state (Missouri).

This report outlines issues with respect to the proposed expansion of passenger rail service. Overall, it is noted that:

- There is opposition to additional public expenditures on passenger rail, both because of the potential for capital and operating costs to be higher than projected and the potential that the state would be required to pay for any cost overruns and any additional operating subsidies.
- There is also opposition to additional public expenditures on passenger rail, because of the serious financial difficultly faced by both the nation and the state of North Carolina. Specifically, there is an objection to spending on a lower priority, such as high-speed rail, while higher priority expenditures are threatened with reduction.
- The new trains would have minimal impact on traffic volumes between Charlotte and Raleigh.
- The new trains could contribute to 20 year subsidy requirements of from $250 million to $600 million or more. The subsidy levels may not be financially sustainable.
- There is a substantial risk for taxpayers. North Carolina would be required continue to operate the trains for 20 years and complete the improvements, or it would be necessary to return part or all of the grant funding to the federal government ($550 million).
- The additional passenger trains would, in the longer run, emit more greenhouse gases than the automobiles removed from freeways and would increase fossil fuel consumption.
- An alternative system of intercity buses would reduce greenhouse gas emissions and energy consumption 50 percent to 75 percent relative to the new passenger trains.
- The projected employment impact of expanding passenger train service excludes any analysis of the displacement of private sector jobs that would take place as a result of the project. Government reports have shown the employment impacts of similar infrastructure spending to be minimal.
- In the longer run, additional passenger train service on the North Carolina Railroad could diminish its value and earnings, principally because high-speed passenger trains and freight trains have materially different operating characteristics (such as speed and weight). The potential for a loss of value is especially great as the state seeks to implement the 110-mile-per-hour Southeast High Speed Rail Corridor program.

For the reasons outline above, North Carolina should return the federal high-speed rail grant funding, withdraw its pending application and seek no more funding for passenger rail.

The Context

The policy consideration of passenger rail expansion is occurring in the context of pervasive cost escalation and overly optimistic fare revenue projection and a difficult public funding environment.

Passenger Rail Cost Concerns. International research indicates that high-speed rail projects often surpass their projected capital costs.

The most comprehensive research was performed by Oxford University professor Bent Flyvbjerg, Nils Bruzelius (a Swedish transport consultant), and Werner Rottenberg (University of Karlsruhe professor and former president of the World Conference on Transport Research) examined 258 transportation infrastructure "megaprojects" covering 70 years in North America, Europe, and elsewhere. They found that capital cost escalation from the point of project

approval to completion can be as much as from 50 percent to 100 percent above projections. The researchers found particular difficulties with passenger rail systems, with an average cost overrun of 45 percent. Moreover, they found that capital cost overruns were pervasive, occurring in 9 out of 10 projects.

Just as the international research indicates costs are often understated, ridership and revenue is often overstated. Flyvbjerg's team found that projections were, on average, 65 percent higher than the eventual actual ridership. The result has been lower-than-projected fare revenues and higher-than-projected operating subsidies.

The projections were so consistently erroneous that the researchers characterized them as consisting of "strategic misrepresentation" and "lying," as project promoters sought to obtain approval for projects that might not otherwise be implemented.

There have been cases of even more substantial cost escalation. For example, a project to increase speeds on the West Coast Main Line in the United Kingdom eventually cost five times the projected amount and *failed* to deliver the promised service improvements.[2]

Public Finance Concerns. The federal government and many state governments, including North Carolina, have serious challenges in eliminating budget deficits.[3] On April 18, Standard and Poors lowered its outlook for on the debt rating of the United States from "stable" to "negative."[4] Shortly before that, the International Monetary Fund expressed the need for greater attention to reduction of the US national debt:

> *The United States needs to accelerate the adoption of credible measures to reduce debt ratios.*[5]

In this environment, questions have been raised about the appropriateness of higher general tax spending for passenger rail services. Specifically, there is an objection to spending on a lower priority, such as high-speed rail, while higher-priority expenditures are threatened with reduction. The recent 2011 federal budget agreement eliminated all spending authority ($2.5 billion) for high-speed rail in the current budget and reduced unused previous authority by $400 million.

The nation's two principal intercity transportation programs, airlines and highways are principally supported by user fees rather than general tax revenues.

Passenger Train Service Expansion

The North Carolina Department of Transportation (NCDOT) has been awarded grants totaling approximately $545 million under the federal High Speed Intercity Passenger Rail Program. The funding would be used to upgrade the state-owned North Carolina Railroad (NCRR), in order to increase speed on trains that operate between Raleigh and Charlotte, and to add a third[6] and daily Piedmont train in 2011 and a fourth[7] daily *Piedmont* train to the schedule in 2016. Currently, three daily trains serve the route each way, including the *Carolinian* and two *Piedmonts*. The *Carolinian* continues from Raleigh to Washington and the Northeast corridor, terminating in New York.

Train Schedule. The improvements will permit *Piedmont* trains to make the trip from Raleigh to Charlotte in three hours (3:00),[8] compared with the present travel time of 3:12 (toward Charlotte) or 3:13 (toward Raleigh).[9] The maximum train speed would be 90 miles per hour. This speed is well below international high-speed rail standards. Most high-speed rail services in Europe and Japan operate at 186 miles per hour or higher. Some services operate at 200 miles per hour, nearly double the speed of the proposed Southeast High-Speed Rail Corridor.[10] North Carolina is a partner in the proposed Southeast High-Speed Rail Corridor, which would provide service from Charlotte to Washington, with a maximum speed of 110 miles per hour.[11]

NCDOT projects that trains on the corridor will reach a maximum speed of 90 mph as a result of the federally funded improvements to the North Carolina Railroad. Average terminal-to-terminal speed would be 58 miles per hour, assuming on-time operation.

On-Time Performance. However, NCDOT projects on-time performance for the fourth Piedmont train to be only 80 percent, even after the one-half-billion-dollar expenditure. Based upon the estimated delay indicated in the North Carolina Department

of Transportation application,[12] the average train travel time between Raleigh and Charlotte would be approximately 3:18, which would reduce the average speed, terminal to terminal to 53 miles per hour.

This delay would amount to approximately 10.5 percent of the scheduled travel time between Raleigh and Charlotte. By comparison, the average peak period delay in traffic in the large metropolitan areas along the corridor is considerably less. According to the 2010 INRIX National Traffic Scorecard, the average peak period delay in traffic is 7.4 percent in Charlotte, 5.3 percent in Raleigh and 2.1 percent in Greensboro.[13] Thus, while delays occur along Interstates 40 and 85 between Raleigh and Charlotte, the delay from normal traffic speeds would seem likely to be less than the average delay on the train (Figure 1).

In addition to the already-awarded grants for $545 million, NCDOT has submitted a grant application for further federal high-speed rail funding in the amount of $620 million. Among other improvements, this grant anticipates the establishment service that operates at a maximum of 110 miles per hour between Raleigh and Richmond as a part of the Southeast High Speed Rail Corridor.[14]

Figure 1. Travel Delays: Train & Metropolitan
By mode: per passenger mile

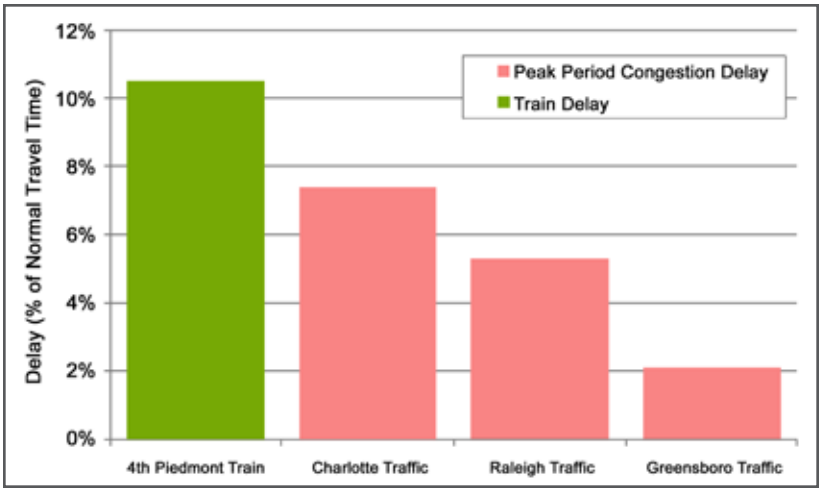
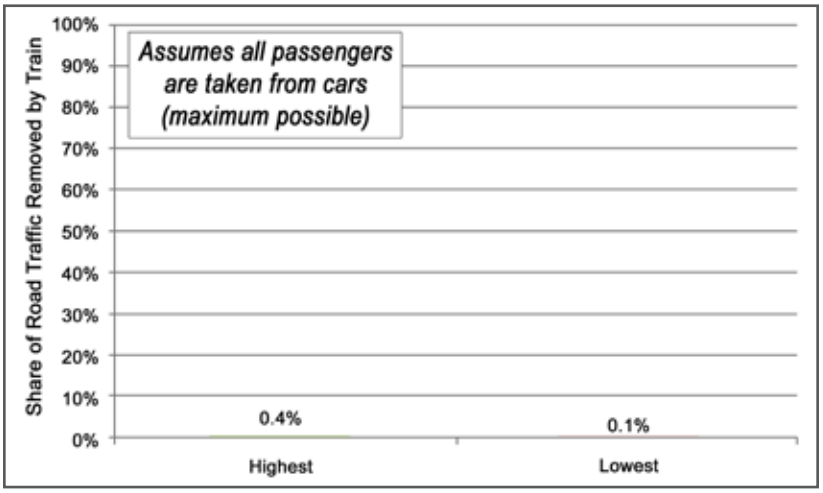


Figure 2. Train Passengers: Freeway Impact (2025)
Raleigh to Charlotte: 5 Daily Round Trip Trains



Impact on Road Traffic. NCDOT indicates that the third and fourth *Piedmont* trains would reduce traffic volumes on freeways in the corridor. The reality is that the proposed rail service would reduce traffic volumes only minimally. Even if both trains were to carry the optimistic ridership level projected for the fourth *Piedmont* train in 2025 and all ridership were to have been attracted from cars, the reduction in traffic along on the I-85 and I-40 corridor between Charlotte and Raleigh would be under 0.5 percent for the two round-trip trains, removing one out of every 200 cars (Figure 2). This reduction would not be perceivable to drivers.[15]

Financial Sustainability

The grant application for the fourth *Piedmont* train indicates that annual ridership will reach 104,500 by the 10th year of operation. This is nearly 50 percent more than the 69,000 riders who rode the first *Piedmont* train in 2009, after approximately 15 years of operation. The ridership projection could well be overly optimistic, which could increase future state subsidy requirements.

Annual Operating Costs. Based upon estimates by NCDOT for the cost of operating the first and second Piedmont trains in 2015, it is estimated that

the cost for each of the new trains would be approximately $6 million ($12 million total additional cost) per year.[16]

The capital and operating cost of adding the two trains would be substantial. The annual capital and operating costs necessary to establish the third *Piedmont* train service would be approximately $150 per round-trip per new passenger. The cost per new round-trip passenger for the fourth *Piedmont* train would be more than $550.[17]

The total cost per new passenger mile of the third *Piedmont* train would be approximately $0.50 per passenger mile, which is more than double the fully allocated cost per passenger mile of the US light vehicle fleet (car and sport utility vehicles) in 2009. The cost per new passenger mile for the fourth *Piedmont* train would be more than $1.75, more than seven times the cost per passenger mile of the US light vehicle fleet.[18]

Subsidies. Each of the *Carolinian* and *Piedmont*-trains are supported by passenger fares and payment of the operating deficit by the state of North Carolina. There are conflicting reports of subsidy levels for the *Piedmont* trains from NCDOT. NCDOT indicated that subsidies for the two initial *Piedmont* trains (the second train was added in 2010) would reach $9.5 million by 2015, after federal startup funding expires, or less than $5 million annually per train.[19]

However, the federal grant application for the third *Piedmont* train indicates that annual subsidies would be $9.3 million in 2011 and $9.8 million in 2020. Further, the federal grant application indicates that the annual operating subsidy for the fourth *Piedmont* train would be $9.8 million in 2016, but provides no subsidy information for later years.

There is also a much lower figure in another NCDOT document, which places the total state subsidy at $13 million annually in 2013, for the *Carolinian* and *Piedmont* trains, including the third and fourth *Piedmont* trains.[20]

In the worst case, these figures could imply a longer-term annual operating subsidy obligation for the state of up to $30 million (or even higher if the earlier estimates for the first and second *Piedmont* trains were to rise to that of the third and fourth *Piedmont* trains). This could lead to a 20-year obligation of over $250 million to $600 million or more to subsidize the *Piedmont* trains. The subsidy may not be financially sustainable.

North Carolina Grant Repayment Risk. Under federal grant procedures, North Carolina is obligated to complete the capital improvements and to continue operating the third and fourth *Piedmont* train for 20 years. Any additional costs that occur, whether in capital costs or higher operating subsidies, must be paid by the state.

If the state were to not complete the NCRR improvements because of rising costs, it would be necessary to refund all or part of any federal funding that had been spent. Further, if the state were to cancel the third or fourth *Piedmont* train because of higher-than-anticipated operating subsidies, the state would be required to pay back some or all of the federal capital grants.

North Carolina's financial obligations with respect to the pending $620 million federal grant application would be virtually the same as those that apply to the $545 million in federal grants already received.

Higher-than-projected costs, such as federal grant repayment liabilities and the necessity for operating subsidies, led governors in four states to cancel major infrastructure projects over the last six months. Three of these projects were to have been supported with federal high-speed rail grants.

- In October of 2010, Governor Chris Christie of New Jersey canceled a new rail tunnel under the Hudson River between New York and New Jersey. Governor Christie took this action because of indications that the cost of the tunnel was escalating significantly. Under the federal grant application, any cost escalation was to be the responsibility of New Jersey taxpayers. After the governor's initial announcement, there were discussions between the governor, New Jersey's congressional delegation, and the US Secretary of Transportation in an attempt to find a compromise that would permit the project to proceed. In the end, the potential obligations of New Jersey taxpayers could not be avoided,

and Governor Christie made cancellation of the tunnel final.

- As a candidate for governor of Wisconsin, Scott Walker announced that he would return a high-speed rail grant to the federal government because of the ongoing obligations that would be required of taxpayers. The grant would have speeded up trains between Milwaukee and Madison, though not to the genuine high-speed rail standards. The grant award was cancelled by the US Department of Transportation after Governor Walker was elected.
- Similarly, as a candidate for governor of Ohio, John Kasich announced that he would not accept already approved funding for a so-called high-speed rail line between Cincinnati and Cleveland. As in Wisconsin, the speed of the train would have been well below genuine high-speed rail standards. The grant award was cancelled by the US Department of Transportation after Governor Kasich was elected.
- In February, Governor Rick Scott of Florida canceled one of the nation's two genuinely high-speed rail proposals (the other was in California). The trains would have operated between Tampa and Orlando. Governor Scott cited concerns that there would be substantial cost overruns and that operating subsidies would be required, both of which would have been the responsibility of state taxpayers. Florida had already experienced a demand by the federal government to return one-quarter billion dollars in grant funding because a transit grantee (Tri-Rail, the Miami area commuter rail operator) had failed to maintain the required level of service. Tri-Rail was able to avoid refunding the money to the federal government only by a state bailout amounting to nearly $15 million in annual subsidies. This permitted Tri-Rail to restore service that it could not afford with its own funding sources.

In a fifth state, Missouri, the legislature in April declined to include high-speed rail in its annual budget.[21] Again, this action was justified by concern about longer-term, indefinite obligations for the taxpayers of the state.

The cancellation of already-awarded federal high-speed rail grants to Wisconsin, Ohio, and Florida effectively returned $3.6 billion to the federal treasury. Despite claims from proponents that the funding would simply be given to other states, the eventual reduction of high-speed rail funding in the recent federal budget agreement cut approximately 80 percent of that amount ($2.9 billion). All of the current (fiscal year 2011) budget authority of $2.5 billion was rescinded as well as $400 million of authority from previous years.

Environmental and Energy Sustainability

NCDOT cites environmental and energy conservation justifications for expanding passenger rail service.

Greenhouse Gas Emissions. The NDCOT grant application indicates that the addition of the fourth *Piedmont* train would result in an annual reduction of 2,747 tons of greenhouse gases. This appears to be an exaggeration.

NCDOT indicates that passenger trains emit 0.18 kilograms of greenhouse gases per passenger mile. NCDOT also indicates that cars emit 0.21 kg of greenhouse gases per passenger mile. This means that, according to the NCDOT data, each person switching from a car to the train would reduce greenhouse gas emissions by 0.03 kilograms per passenger mile.

If all of the 12.32 million passenger miles anticipated in the 10th year of operation were to have been diverted from cars (an optimistic assumption),[22] the reduction in greenhouse gas emissions would be only 370 tons. The NCDOT estimate of greenhouse gas emission reductions is thus exaggerated by more than seven times (Table).

Even beyond this apparent error, the emission factors used by NCDOT indicate that passenger rail would be more greenhouse gas–friendly than cars. Over the life of the proposed project, the data show otherwise.

The greenhouse gas emissions estimate used by NCDOT for automobiles uses average data. Such av-

erage data include the much higher greenhouse gas emissions that occur in heavy city traffic. According to the Congressional Research Service, automobiles use 27 percent less fuel per passenger mile on trips of more than 75 miles (the average trip length for a fourth *Piedmont* train rider would be 114 miles, according to the NCDOT federal grant application).[23] Because greenhouse gas emissions are proportional to fuel combustion, the emissions from light vehicles would also be less for an intercity light vehicle trip. Based upon 2010 data from the US Department of Energy *Annual Energy Outlook*, it is estimated that the greenhouse gas emissions per passenger mile of light vehicles on intercity trips would be the approximately the same as passenger trains, at 0.18 kilograms per passenger mile.[24]

Table. Greenhouse Gas Emissions Estimates (NCDOT and Actual) of a Fourth *Piedmont* Train

Line	Factor	Data	Source
A	Passenger Miles	12,320,000	NCDOT
B	Car GHG/Passenger Mile (in KG)	0.21	NCDOT
C	Train GHG/Passenger Mile (in KG)	0.18	NCDOT
D	Reduction from Car to Train (in KGs)	0.03	NCDOT
E	Maximum Reduction in KGs	369,600	D (x) A
F	KGs per Ton	1,000	Supplied
G	Maximum Reduction in Tons	370	E (÷) F
H	NCDOT Figure	2,744	NCDOT
I	NCDOT Figure Compared to Actual	7.4	H (÷) G

Based upon Year 10 data from NCDOT grant application. GHG emissions reduction is overstated because not all travel on the train would be diverted from cars.

Further, the NCDOT analysis fails to account for the improved greenhouse gas emissions that are projected for light vehicles by 2025, which would be the 10th year of operation of the fourth *Piedmont* train. Light-vehicle greenhouse gas emissions are projected to improve substantially by 2026.[25] Based upon data in the US Department of Energy's *Annual Energy Outlook: 2011*, it is estimated that light-vehicle greenhouse gas emissions will fall to 0.14 kilograms per passenger mile by 2025. This is more than 25 percent below the passenger train figure supplied by NCDOT.

This does not include the greenhouse gas emissions that would be expended in the construction activities associated with upgrading the North Carolina Railroad.[26] It is thus likely that the passenger trains will result in a net *increase* in greenhouse gas emissions in later years. Further, it is likely that automobiles will become more fuel efficient after 2025 and emit an even lower volume of greenhouse gases per passenger mile.

Energy Consumption. There are similar difficulties with the NCDOT estimates on energy conservation.

NCDOT indicates that cars consume 3,696 British Thermal Units (BTUs) per passenger mile, compared with the 2,586 BTUs per passenger mile for passenger rail. The costs, according to NCDOT estimates cars consume nearly 50 percent more energy per passenger mile than passenger rail.

If the more representative intercity automobile trip fuel efficiency for a longer trip is used (see "Greenhouse Gas Emissions," above), the latest data indicate that the automobile would consume 2,700 BTUs per passenger mile, only slightly more than passenger rail. Adjusting this figure for the improvement projected for 2025 reduces the energy consumption figure to 2,160 BTUs per mile, which is below the NCDOT passenger train figure of 2,568. This does not include the energy that would be expended in the construction activities associated with upgrading

the North Carolina Railroad. Thus, the trains are likely to increase fossil fuel use or energy consumption or both over the longer term.

Intercity Buses: A More Environmentally Friendly Alternative. In fact, it appears likely that passenger trains are the least environmentally friendly surface mode of intercity transportation over the proposed route. Intercity buses have by far the smallest environmental and energy footprint.

NCDOT uses a figure of 4,315 BTUs per passenger mile for buses. This figure is well above that of intercity buses and is, in fact, for transit buses.[27] Transit buses are inappropriate for comparison to intercity passenger rail services, because they operate principally in urban areas where congestion is greater and because they typically have comparatively low passenger load factors.

Recent research indicates that intercity buses represent the most fuel efficient and least greenhouse- gas–intensive intercity passenger transport mode. The average energy consumption per passenger mile of the intercity bus fleet was estimated at 953 BTUs in 2007, more than 60 percent below the intercity rail figure.[28] However even this figure can be reduced. Research on the emerging "curbside bus"[29] industry estimates energy consumption at 666 BTUs per passenger mile, which is approximately 75 percent below that of passenger rail.

The reduction in greenhouse gas emissions would be similar. A conventional intercity bus system could reduce greenhouse gas emissions 50 percent relative to the passenger rail system. A curbside intercity bus system could reduce greenhouse gas emissions by more than 70 percent.

These lower levels are understated because they do not include the substantial energy consumption and greenhouse gas emissions that would occur during the construction activities in upgrading the North Carolina Railroad.

Figure 3. Estimated 2025 Greenhouse Gas Emissions
By mode: kilograms per passenger mile

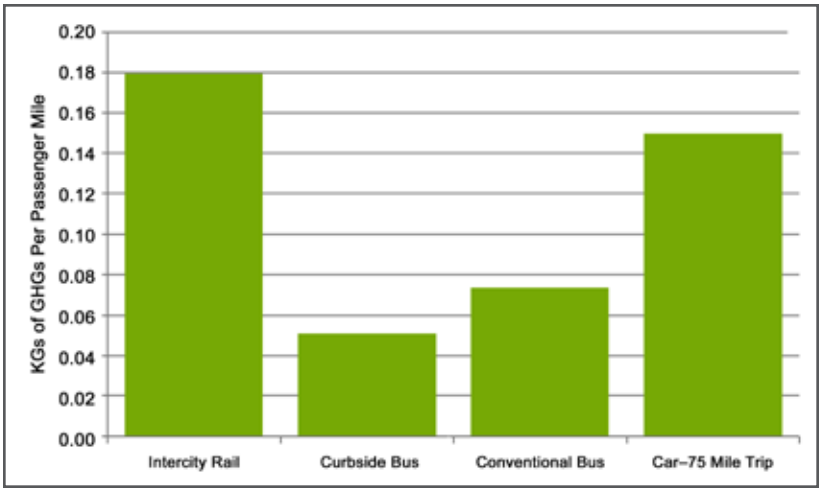
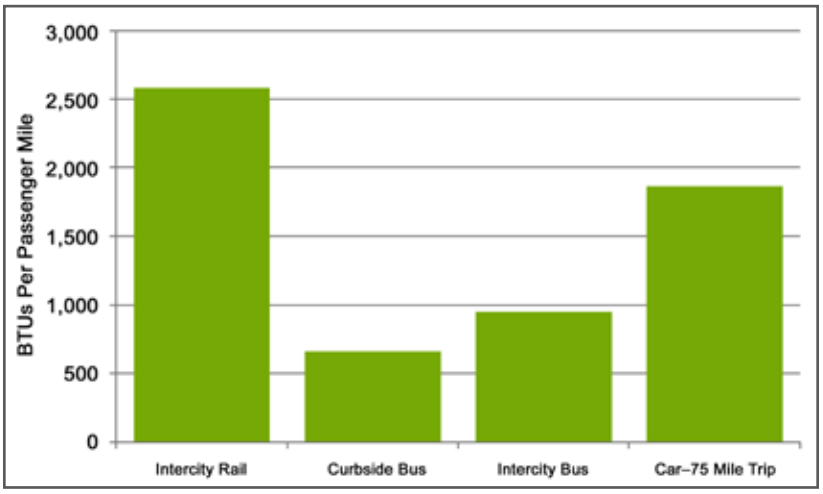


Figure 4. Estimated 2025 Energy Consumption
By mode: BTUs per passenger mile



Therefore an intercity bus–based program (which could be developed by NCDOT under contract), whether conventional or curbside, would produce far better results in energy conservation and greenhouse gas emission reductions (Figures 3 and 4). Moreover, either option would require little or no capital expenditure and far lower subsidies (if any) for operations.

Employment Impacts

NCDOT grant applications indicate that the new

passenger train projects will create jobs. However, the jobs projections fail to take into consideration the jobs that are displaced in the private sector by taking money out of the private economy. Congressional Research Service[30] and Government Accountability Office[31] reports indicate that public infrastructure projects tend to add little or no new jobs overall and can result in overall job losses.

Value of the North Carolina Railroad

The North Carolina Railroad (NCRR), over which the passenger trains travel, is owned by the state. As a result, the state and its taxpayers have a material interest in its future value and profits (or losses). NCRR is managed under contract by the Norfolk Southern Railroad, which operates freight trains over the route. These freight trains are very likely responsible for the full value of the NCRR. The passenger trains have no commercial value, by virtue of their capital and operating losses.

An agreement has been reached between the state, NCRR, the Norfolk Southern Railroad, and Amtrak for the operation of the additional passenger service. It is to be hoped that the parties have made effective arrangements to ensure the continued, expeditious operation of the freight trains that make NCRR a valuable asset.

The mixing of passenger trains and freight trains on the same right-of-way has always posed difficulty, because of the substantially differing speeds, weights, and other requirements of these two very different transport modes. This is illustrated by the international experience in passenger and freight rail.

No high-income nation operates both a high-volume freight rail system and a high-volume passenger rail system.[32] Among major higher-income nations, rail freight volumes exceed that of trucks only the United States (58 percent of the combined total),[33] Canada (61 percent),[34] and Australia (75 percent).[35] In each of these countries, the freight rail systems are owned principally by the private sector. Over the past decade, US freight rail volumes have increased at nearly 1.6 times that of trucks.

Freight rail market shares are very limited in Europe (European Union-27) where passenger train volumes are substantially higher. This is at least in part because the operational requirements of the passenger rail services make it difficult for passenger rail to compete effectively with road freight. In Europe, rail freight accounts for only 19 percent of road and rail freight volumes. Road freight is expanding at 2.4 times that of rail freight.[36] Specific programs by the European Union to increase freight rail volumes have failed to reverse the trend. The European freight market share continues to decline, despite the fact that substantial volumes have been moved from conventional passenger rail services in Europe to the new high-speed rail services that have been built with completely separated rights-of-way. In major urban areas, commuter rail operations restrict the access of freight rail services to and from manufacturers and warehouses. This increases the share of trucks traffic on Europe's urban roads, highways, and freeways.

The situation is similar in Japan, where passenger train frequencies are much higher than in the United States, Canada, and Australia. In Japan, freight rail represents only 6 percent of the combined road and rail freight volumes.[37] This increases the share of trucks traffic on Japan's urban roads, highways, and freeways.

In the one part of the United States where there is a substantial presence of passenger rail, freight rail volumes are very low. In the Northeast corridor, between Washington, New York, and Boston, freight rail has a very small market share, more akin to the smaller freight rail market shares in Europe and Japan.[38]

In the United States, the substantial reduction in passenger rail service that occurred with the establishment of Amtrak provided capacity to support an unprecedented increase in freight rail volumes. The subsequent deregulation of the industry under the Staggers Act a decade later also contributed to this increase.[39]

Thus, at the national level, a substantial increase in intercity rail services could lead to a diversion of freight to trucks, which would intensify traffic volumes within and between urban areas and increase traffic congestion.

These difficulties are highlighted by a recent statement by the Michael Ward, the Chief Executive Of-

ficer of the CSX Railroad, who indicated that the operation of trains at above 90 miles per hour, such as proposed in the Southeast High Speed Rail Corridor, is incompatible with freight operations.[40]

The new NCDOT high-speed rail grant application would implement 110-mile-per-hour maximum speeds in the Raleigh to Richmond corridor as a part of the Southeast High Speed Rail Corridor. Further development of 110-mile-per-hour operations under the Southeast High Speed Rail Corridor could make the NCRR less attractive for freight operations, which could divert volumes to trucks or to other rail routes. This could reduce the value of the NCRR.[41]

Conclusion

Because of the substantial risks to taxpayers of further passenger rail development, the minimal traffic impacts, the fact the passenger rail would reduce neither greenhouse gas emissions nor energy consumption, the minimal job impacts and the potential for reducing the value of the North Carolina Railroad, North Carolina should return the federal high-speed rail grant funding, withdraw its pending application, and seek no more funding for passenger rail.

End Notes

1. The federal High Speed Intercity Passenger Rail Program is principally an intercity rail program rather than a high-speed rail program. Most projects under the program anticipate maximum speeds far below international high-speed rail standards, including the North Carolina program.
2. James Meek, "The £10Bn Crash," *The Guardian*, April 1, 2004, *www.guardian.co.uk/world/2004/apr/01/transport.politics*.
3. See Elizabeth McNichol, Phil Oliff, and Nicolas Johnson, *States Continue to Feel Recession's Impact*, Center on Budget and Policy Priorities, Center on Budget and Policy Priorities, March 9, 2011, *www.cbpp.org/cms/?fa=view&id=711*.
4. "Release: S&P Cuts U.S. Ratings Outlook to Negative," *The Wall Street Journal*, April 18, 2011, *blogs.wsj.com/marketbeat/2011/04/18/release-sp-cuts-u-s-ratings-outlook-to-negative*.
5. International Monetary Fund, *Fiscal Monitor: Shifting Gears Tackling Challenges on the Road to Fiscal Adjustment*, April 2011, *www.imf.org/external/pubs/ft/fm/2011/01/pdf/fm1101.pdf*.
6. For the NCDOT federal grant application for the third *Piedmont* train, see *www.bytrain.org/fra/track2/nct2_3_5th_freq.pdf*.
7. For the NCDOT federal grant application for the fourth *Piedmont* train, see *www.bytrain.org/fra/track2/nct2_2_4th_freq.pdf*.
8. According to Amtrak, the rail distance from Raleigh to Charlotte is 173 miles, which at an average projected speed of 58 miles per hour (from the NCDOT grant application) results in a trip time of 3:00.
9. The *Carolinian* is scheduled to make the trip from Raleigh to Charlotte in 3:32 and toward Raleigh in 3:26. From Charlotte, the *Carolinian* takes 9.5 hours to Washington and 13.5 hours to New York.
10. China's high-speed trains operate at up to nearly 220 miles per hour and were planned to travel as much as 235 miles per hour. However, a recent announcement by the Ministry of Railways indicates that from July 1, no trains will operate faster than 186 miles per hour, due to safety, energy consumption, and fare (cost) considerations. See Brian Spegele, "China Puts Brakes on High-Speed Rail," *The Wall Street Journal*, April 15, 2011, *online.wsj.com/article/SB10001424052748703983104576262330447308782.html*.
11. Southeast High Speed Rail Corridor, *www.sehsr.org*.
12. The grant application for the fourth *Piedmont* indicates that there would be 1,053 minutes of delay per each 10,000 train miles. Over the 173-mile distance from Raleigh to Charlotte, this calculates to a delay of approximately 18 minutes per trip.
13. *2010 National Traffic Scorecard*, INRIX, *www.inrix.com/scorecard/Top100Metros.asp*.
14. Bruce Siceloff, "Mixed Signals on Rail Funding," *The News & Observer*, April 6, 2011, *www.newsobserver.com/2011/04/06/1107891/mixed-signals-on-rail-funding.html*.
15. This assumes that traffic would continue to grow at the rate of population increase and uses the high-traffic point and low-traffic point in the corridor based upon NCDOT traffic counts from 2009. Calculated using data from NCDOT, *2009 Interstate & Freeway Report*, www.*ncdot.org/doh/preconstruct/tpb/traffic_survey/download/2009InterstateFreewayReport.pdf*.
16. Calculated from data in attachments to a letter from Patrick B. Simmons of NCDOT to Administrator Joseph. C. Szabo of the

Federal Railroad Administration, August 24, 2009, *www.bytrain.org/fra/general/nc_finance_plan.pdf*.

17. Capital cost discounted at 4 percent over 35 years.
18. Based upon gross domestic product data, see Demographia, "US Cost of Automobiles/SUVs and Public Transport per Passenger Mile from 1960," Urban Transport Fact Book, *www.publicpurpose.com/ut-drivingcost.pdf*.
19. From the Congestion Mitigation and Air Quality Improvement program of the US Department of Transportation.
20. NCDOT, *Financial Plan: High Speed Intercity Passenger Rail Program*, October 2, 2009, *www.bytrain.org/fra/track2/financial_plan.pdf*.
21. Associated Press, "Lawmakers deal setback to high-speed rail plan," *News Tribune*, April 13, 2011, *www.newstribune.com/news/2011/apr/13/lawmakers-deal-setback-high-speed-rail-plan*.
22. The NCDOT grant application does not project the source of the fourth *Piedmont*'s ridership.
23. Steven J. Thompson, *Amtrak and Energy Conservation in Intercity Passenger Transportation*, Congressional Research Service, September 3, 1996, *ncseonline.org/nle/crsreports/energy/eng-11.cfm*.
24. Calculated from data in US Department of Energy, *Annual Energy Outlook: 2011*, *www.eia.doe.gov/forecasts/aeo*.
25. This figure assumes that there would be no improvements to be fuel efficiency of the light vehicle fleet after the CAFE standards of 2016 are reflected. More stringent standards (which have been proposed) or technological advances or both could make this improvement even greater.
26. A University of California study indicates that the greenhouse gas emissions from construction of that state's proposed high-speed rail system would take 71 years to recover at mid-level ridership projections. See Mikhail Chester and Arpad Horvath, "Life-cycle Assessment of High-Speed Rail: the Case of California," Environmental Research Letters, January 10, 2010, *iopscience.iop.org/1748-9326/5/1/014003*.
27. NCDOT indicates that the 4,315 BTUs per passenger mile are from a US Department of Energy source published in 2009. That source (not directly noted in the NCDOT application) appears to have been the T*ransportation Energy Data Book, Edition 28*, which indicates that the BTUs per passenger mile for *transit* buses were 4,315 in 2007, the last year for which data are provided. Earlier editions of the *Transportation Energy Data Book* had placed intercity bus energy consumption at 932 BTUs per passenger mile in 2000 (the latest year reported).
28. Joseph P. Schwieterman and Lauren Fischer, *The Intercity Bus: America's Fastest Growing Transportation Mode, 2010 Update on Scheduled Bus Service*, Chaddick Institute of Metropolitan Development, DePaul University, December 20, 2010, *las.depaul.edu/chaddick/docs/Docs/2010_Intercity_Bus_Study_12-29.pdf*.
29. The curbside bus industry is a relatively new intercity bus mode. Companies (an example is "Megabus") pick up and discharge passengers at bus stops on streets. Ticketing is virtually all by the Internet and services usually are of a higher quality than traditional intercity bus service, often including high-speed Internet access.
30. David J. Cantor, "Highway Construction: Its Impact on the Economy," Congressional Research Service Report for Congress, January 6, 1993.
31. *Emergency Jobs Act of 1983: Funds Spent Slowly, Few Jobs Created*, US General Accounting Office, December 1986, *archive.gao.gov/f0102/132063.pdf*.
32. In emerging-world China, which has developed the world's largest high-speed rail system, a principal justification has been to move passenger trains off the conventional tracks to allow greater expansion of freight operations. China's rail system operates virtually at capacity in a number of corridors and represents the principal mode of intercity transport for its hundreds of millions of households who do not yet have cars. Unlike Europe and Japan, many of the stations in the largest urban areas (such as Wuhan, Nanjing, Guangzhou, Changsha, Xi'an, and Shanghai) are being constructed outside the urban cores, which eliminates the need to share tracks with freight, unlike the general practice in the larger urban areas of Europe and Japan.
33. Calculated for 2008 from data in National Transportation Statistics, Bureau of Transportation Statistics, United States Department of Transportation, *www.bts.gov/publications/national_transportation_statistics/html/table_01_46b.html*.
34. Calculated for 2008 from data in *Freight Transportation Secondary Energy Use by Energy Source and Transportation Mode*, Office of Energy Efficiency, Natural Resources Canada, Government of Canada, *oee.nrcan.gc.ca/corporate/statistics/neud/dpa/tableshandbook2/tran_00_8_e_4.cfm*.
35. Calculated for 2008 from data in *Yearbook 2011: Australian Infrastructure Statistics*, Department of Infrastructure and Transport, Government of Australia, 2011, *www.bitre.gov.au/publications/92/Files/BITRE_Yearbook_16Mar2011.pdf*.
36. Calculated for 2008 from data in *EU Energy and Transport in Figures*, European Commission (2010).
37. Calculated for 2008 from data in *Japan Statistical Yearbook* , Ministry of Internal Affairs and Communications, Statistics Bureau, Government of Japan, *www.stat.go.jp/data/nenkan/zuhyou/y1204000.xls*.
38. US Cost of Automobiles/SUVs and Public Transport per Passenger Mile from 1960, The Public Purpose, 2010, *www.publicpurpose.com/hwy-frtrail.pdf*.
39. *Ibid.*
40. Lisa Caruso, "CSX Chief Says He 'Can't Be Part of' Obama High-Speed Rail Plan," Bloomberg, April 6, 2011, *www.bloomberg.com/news/2011-04-06/csx-chief-says-he-can-t-be-part-of-obama-high-speed-rail-plan.html*.
41. The NCDOT grant application indicates that revenues on the Southeast High Speed Rail Corridor would "handily" exceed costs. Based upon the pervasive losses evident in both international and US passenger train systems, an assumption of profitability for the Southeast High Speed Rail Corridor is considered exceedingly optimistic.

About the Author

Wendell Cox is principal of Demographia, a public policy firm located in the St. Louis metropolitan area. He has completed projects in the United States, Western Europe, Canada, Australia, New Zealand and Africa. He has authored two reports on high-speed rail in Florida (for the James Madison Institute in 1997 and for the Reason Foundation in 2011) and was co-author with Joseph Vranich of a high speed rail report in California (for the Reason Foundation in 2008). He was appointed to three terms on the Los Angeles County Transportation Commission (which oversaw highway and transit policy in the nation's largest county) by Los Angeles Mayor Tom Bradley and was appointed by Speaker of the House of Representatives Newt Gingrich to the Amtrak Reform Council, to fill the unexpired term of Governor Christine Todd Whitman of New Jersey. He holds a BA in Government from California State University, Los Angeles and an MBA from Pepperdine University, in Los Angeles.

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"To prejudge other men's notions before we have looked into them is not to show their darkness but to put out our own eyes."

JOHN LOCKE (1632–1704)

Author, *Two Treatises of Government* and *Fundamental Constitutions of Carolina*

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