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Stop that Train:

RTD's Light Rail Boondoggle is on a Fast Track for Disaster

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Denver was once served by over 150 miles of trolley lines which boasted a ridership of 36 million passengers per year in the early 1900s. This was at a time in Denver's history when the population was only 110,000 residents. The introduction of the motorbus (which doesn't require a fixed guideway) and the rapid growth in the availability and affordability of personal automobiles put an end to the golden era of streetcars. In 1945, daily ridership had fallen to 22,500, or less than 8 million per year. The last trolley service ran on the streets of Denver on June 3, 1950. A private bus company provided mass transportation services for many years, but with declining ridership, it was unable to survive. When the private company ceased operation, voters agreed to provide publicly subsidized bus services through a new government agency: the Regional Transportation District (RTD).

From the beginning, RTD has promoted expensive alternatives to the bus system. In fact, RTD is spending more than $100 million dollars of "excess tax revenues" to build a short segment of LRT ("Light Rail Transit") near the middle of Denver.

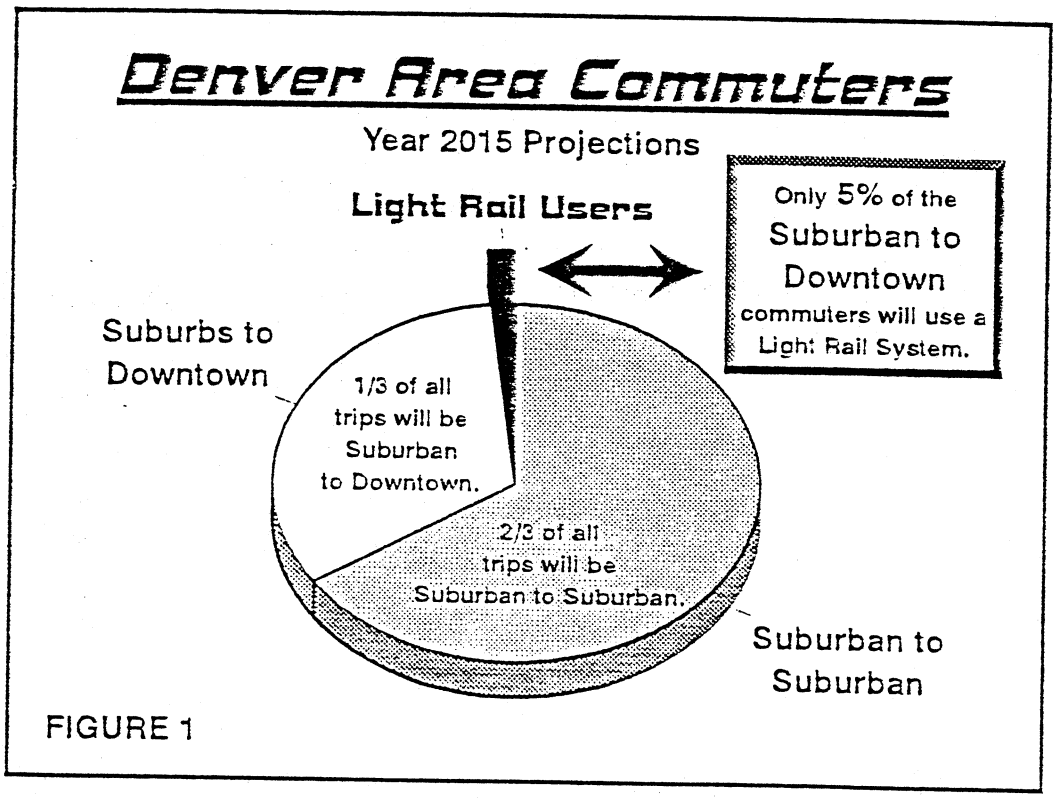
In Brief...

- *RTD is pushing a major public relations campaign to build an expensive light rail transit (LRT) system in southwest Denver, and eventually the whole metro area.*
- *In nine US cities that constructed LRT projects, actual costs exceeded projections and ridership fell short of projections. Actual cost per rider exceeded projections by an average of 5.4 times.*
- *Contrary to RTD's claim that LRT is the least expensive of several alternatives, LRT is about 10 times as expensive as building dedicated highway lanes for buses and carpools.*
- *The MAC demonstration project carried a promise to the people that LRT could be observed in operation for two years before a proposal for an enlarged system would be advanced. RTD has an obligation to honor this promise.*

RTD is now advocating a plan to reinstitute streetcar-like vehicles. The costs will be substantial, and the benefits questionable. Figure 1 shows the distribution of the commuting population in the year 2015. The Denver Regional Council of Government (DRCOG) expects that 2/3 of the trips will be from one suburban location to another suburban location. Only one third of the trips will be from the suburbs to downtown Denver. Light rail experiences in other American cities indicate that only about five percent of the commuters who are actually going downtown can be expected to regularly use the proposed light rail system. Please note that 5% of the one third is only 1.7% of the total commuting population.

Light rail may create more problems than it solves. Traffic signals are being re-timed to accommodate the light rail demonstration project (MAC project) which is currently under construction. Signal retiming will diminish the signals' effectiveness for automobile traffic and thereby increase traffic congestion, and in turn, add to the automobile component of Denver's air quality problem. Since the MAC system will operate primarily at ground level on reserved right of way, other transportation improvements will be prevented at locations where the MAC exists. RTD promised that the MAC demonstration project would provide an opportunity to prove and demonstrate the benefits of LRT before proposals for an expanded system would be considered. If the benefits of LRT are so great that these promises must be abandoned, then let the benefits be stated publicly.

Figure 1: PROJECTED COMMUTERS



Currently, RTD is pushing a plan to extend the MAC project to Littleton, along Santa Fe Drive. The Southwest Corridor project will add 8.7 miles at a projected cost of $125 million. When a similar plan appeared before the voters in a 1980 election, the voters rejected it.

Transportation is necessary for continued economic health. Mass transportation fills a need in a highly mobile society. Mass transportation generally services the poor, the pre-driving-age youth, the elderly, and the physically challenged.

In recent times, providers of mass transportation have sought to encourage broader ridership, particularly in crowded metropolitan regions. They have extolled the virtues of taking a bus or a train instead of an automobile. They are trying to attract a different clientele: more affluent, environmentally aware, and "politically-correct" commuters. Mass transportation systems have become safer, cleaner, and faster as a result of this strategy. Costs have also risen in proportion to the improvements in service.

Taxpayers will pay for expanded service as long as they receive a benefit. People have been conditioned to believe that if they ride mass transportation, highways will be less crowded and cities will be less polluted. The truth is that these high cost LRT systems have not eased traffic congestion in a single metropolitan region. The air quality benefits of these systems have yet to be confirmed.

Mass transportation services can be provided in a variety of forms. The most common forms are taxi cabs and bus systems. Less common are light rail and heavy rail transit (HRT) systems. The simple reason that there are many more cab and bus companies (at least when the government does not create oligopolies) is that they are less capital intensive and more economically viable than LRT and HRT systems. Independently driven vehicles serve more people better and cheaper than fixed guideway systems unless a very special set of circumstances exist. Taxpayers pay for a portion of the costs of every LRT or HRT system in this country. There are no revenue-neutral or revenue-generating light rail systems in the U.S. Every single one of them operates at a loss.

A key factor for choosing a fixed guideway system over a bus system is population density. A metropolitan region must have a population density of 16,000 to 20,000 people per square mile, in order for a fixed guideway mass transportation system to pay for itself. If the population density is less, the system will require a taxpayer subsidy. This will certainly be the case with any light rail system for the Denver area. Denver's population density is about 3,000 people per square mile.

Instead of presenting the full economic picture, RTD is conducting a misleading public information campaign calling for the immediate construction of an LRT system in the Southwest Corridor.

The Southwest Corridor is one of several "public transportation corridors" that has been studied by RTD. While the $125 million cost of a light rail system may sound manageable, it should be remembered that the Southwest Corridor is a very small portion of a much larger system. When RTD's total plan is unveiled, only the new Denver International Airport will exceed the total system cost. If RTD intends to establish a 63 mile light rail system for the entire Denver area, the total system cost will be nearly $1.5 billion. In the early 1900s, Denver's trolley system was more than twice this size, and still an economic failure. Denver's service area has expanded more than twentyfold since the early 1900s, and population density has declined.

In the 1994 State Legislature, RTD has asked for the authority to increase sales tax by 1%. This would generate $211,000,000 per year in new taxes to RTD and provide a bonding capacity of $2 billion to $4 billion.

The debate on LRT needs to center around RTD's plan for the entire Denver metropolitan region, not just the relatively small Southwest Corridor. People outside of this corridor should understand that they will pay for a LRT system that they may never use. Taxpayers in the entire district need to understand the commitment that RTD is seeking for the entire mass transportation system, and then compare these total costs to the reasonably expected benefits of the system. There are other expenditure options for the money RTD is asking the citizens of Denver to spend.

Four Transit Alternatives

The RTD has developed four alternatives for transit in the Southwest Corridor. Unfortunately, the alternatives are not comparable.

1. TSM

The Transportation System Management (TSM—better known as Bus/HOV Lanes) alternative consists of the construction of 6.0 mile Bus/High Occupancy Vehicle (HOV) lane in the middle median of an expanded South Santa Fe Drive. Both buses and privately owned vehicles with a specified number of riders would be allowed to use this facility. RTD has named this plan "TSM," although the Bus/HOV lane concept is well known to the general public. RTD estimates capital (construction and new equipment) costs for this design at $35 million.

2. Busway

The Busway alternative consists of the construction of a 8.7 mile long busway. A Busway is a road built for the exclusive use of buses. Busway capital costs are estimated at $100 Million.

3. LRT

In the Light Rail Transit alternative, the MAC demonstration would be extended 8.7 miles. RTD has acquired most of the necessary right of way, but the capital construction and equipment acquisition costs for this spoke of the LRT system is estimated at $125 million.

4. Commuter Rail

The Commuter Rail alternative is also referred to as Heavy Rail Transit (HRT). It consists of the construction of 17.2 miles of two new railroad tracks separate from the freight train tracks along South Santa Fe Drive. The Commuter Rail alternative is expected to require $150 million of capital expenditures.

Summary and Analysis of the Alternatives:

Figure 2 is a table which summarizes the four alternatives that RTD has presented for the Southwest Corridor. It defines the lengths and costs of each of the alternatives and presents the cost ratios of the alternatives using TSM as the base expenditure.

Figure 2: CAPITAL COSTS

Alternative	Length	Capital Cost	Capital Cost Ratio	Costs per Mile	Cost per Mile Ratio
1. TSM (Bus/HOV Lanes)	6.0 Miles	$ 35 Million	1	$ 5.8 Million	1
2. Busway	8.7 Miles	$100 Million	2.9	$11.5 Million	2.0
3. Light Rail Transit	8.7 Miles	$125 Million	3.6	$14.4 Million	2.5
4. Commuter Rail	17.2 Miles	$150 Million	4.3	$ 8.7 Million	1.5

Figure 2 shows that the construction of the physical facilities and the acquisition of the equipment necessary for the TSM alternative is only forty percent (cost ratio 1:2.5) of the LRT alternative on a cost per mile basis. Light Rail Transit is the most expensive option on a per-mile basis. The finding is in direct opposition to RTD's brochures that show LRT to be the most cost-effective transit alternative in the Southwest Corridor. Figure 3 is a bar graph showing the costs per mile of the various alternatives.

Figure 4 is a table which compares the projected operating costs of the 4 alternatives on a cost per mile basis. The figure shows little difference between the alternatives.

Figure 3: CAPITAL COSTS PER MILE

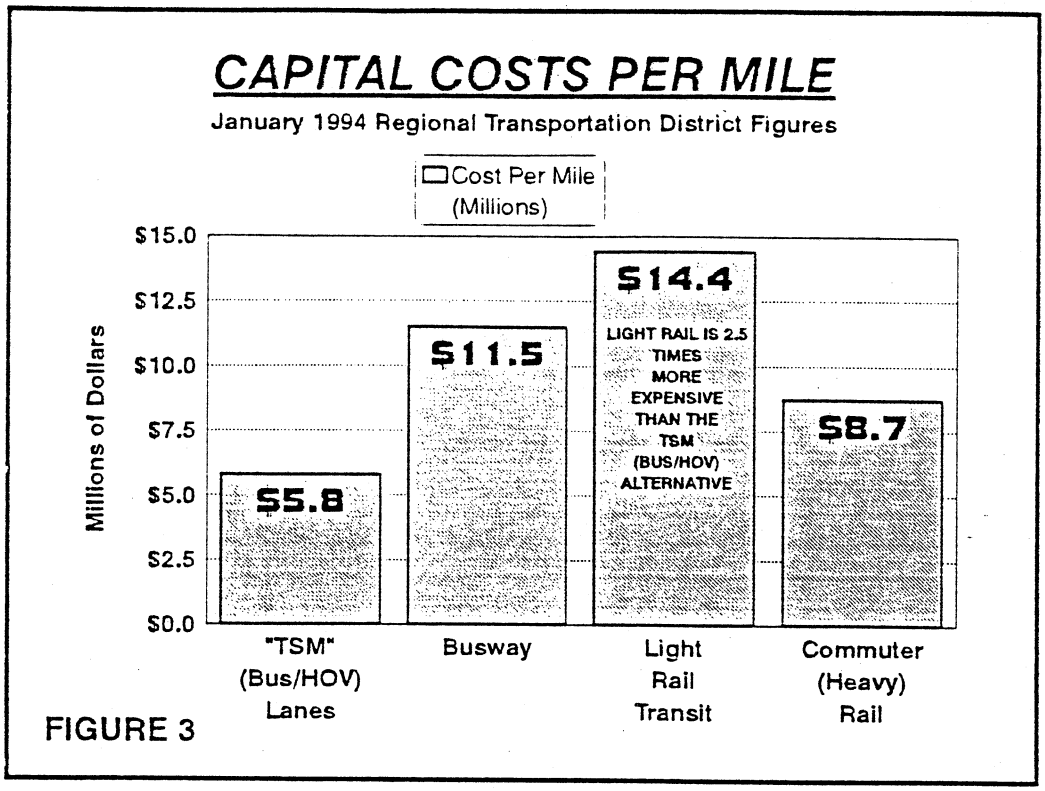


Figure 4: OPERATING COSTS

Alternative	Length (Miles)	Operating Costs	Operating Cost/Mile
1. TSM (Bus/HOV Lanes)	6.0	$ 3.1 Million	$ .51 Million
2. Busway	8.7	$ 4.8 Million	$ .55 Million
3. Light Rail Transit	8.7	$ 4.3 Million	$ .49 Million
4. Commuter Rail	17.2	$ 6.8 Million	$ .39 Million

Figure 5 shows that RTD's high operating costs for both the TSM and busway alternatives can be mitigated through privatization. RTD was legislatively mandated to privatize 20% of its bus routes. The result has been a 45% reduction in operating costs on those routes. Thus, if RTD elects to contract out either of these alternatives, the operating costs can reasonably be expected to decline by about 45%. These privatized operating costs are shown in Figure 5.

Figure 5: PRIVATIZED OPERATING COSTS

Alternative	Operating Costs (Privatized)	Operating Cost Ratio	Operating Cost/Mile (Privatized)	Operating Cost/Mile Ratio
1. TSM (Bus/HOV Lanes)	$ 1.7 * Million	1	$ .28 Million	1.1
2. Busway	$ 2.6 * Million	1.5	$ .25 Million	1
3. Light Rail Transit	$ 4.3 Million	2.5	$ .49 Million	2.0
4. Commuter Rail	$ 6.8 Million	4	$ .39 Million	1.6

* indicates RTD numbers adjusted by authors

RTD's Ridership Projection

In RTD's *Southwest Corridor Spotlight*, the ridership projection of only 8,400 passenger boardings per day does not include carpoolers. A highway traffic lane has a capacity of approximately 2,400 vehicles per hour. Peak hour traffic counts are typically 10% of the 24 hour total. An HOV lane can therefore be expected to carry 24,000 vehicles per day. Assuming an average of 2.1 passengers per vehicle, 50,000 carpool passengers per day plus the bus passenger volume should be used in the ridership projections. *Spotlight* has neglected to state how many busses will be using this 35 million dollar facility. Assuming that each articulated bus is carrying 50 passengers, it would take 168 bus trips per day to yield 8,400 passengers. This is 84 round trips per day, or an average of 3.5 round trips per hour in year 2015.

To compare TSM and LRT, the elements analyzed should be comparable (apples to apples). If TSM service level is allowed to equal LRT, TSM ridership will equal or exceed LRT. If carpool ridership is accounted for conservatively, passenger trips per day increase from 8,400 to at least 58,400. Figure 6 represents the authors' efforts to sift through the RTD numbers and represent the system costs in comparative terms. The operating costs of TSM and busways have been reduced by 45% to account for

privatization of bus operations. Capital costs have been amortized to reflect annual debt service on capital of approximately 10%. TSM ridership has been increased to account for carpool users. The results are quite dramatic. The LRT alternative is about 10 times as costly as bus/HOV lanes (TSM). ($2.33 per ride versus $0.24 per ride respectively.)

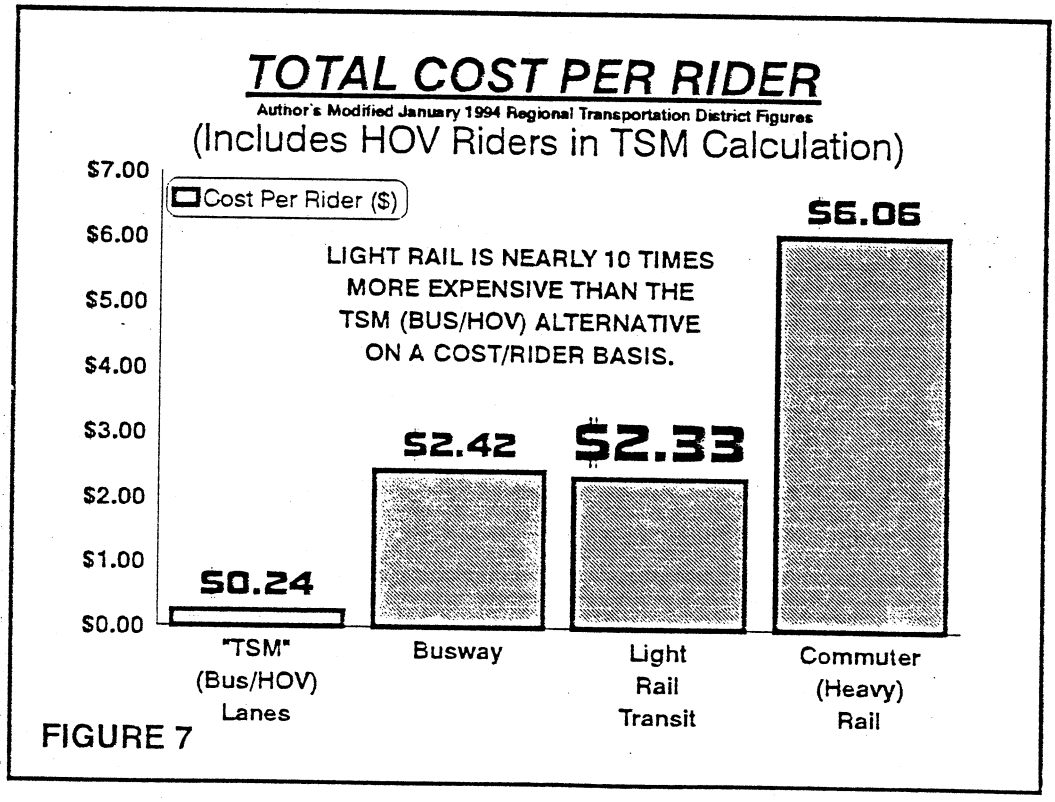
RTD claims that the "Total Investment per Rider" is lowest for the LRT alternative. (*Southwest Corridor Spotlight*, vol. 2, Number 1, January 1994). Figures 6 and 7 demonstrate otherwise.

Figure 6: TOTAL COST PER RIDER, DATA

Alternative	Capital Cost	Annual Amortization of Capital Cost	Operating Costs (Privatized)	Total Annual Cost	Riders per Year	Total Cost per Rider
1. TSM (Bus/HOV Lanes)	$ 35 Million	$ 3.5 Million	$ 1.7 * Million	$ 5.2 Million	21.3 * Million	$ 0.24
2. Busway	$100 Million	$10.0 Million	$ 2.6 * Million	$ 12.6 Million	5.2 Million	$ 2.42
3. Light Rail Transit	$125 Million	$12.5 Million	$ 4.3 Million	$ 16.8 Million	7.2 Million	$ 2.33
4. Commuter Rail	$150 Million	$15.0 Million	$ 6.8 Million	$ 21.8 Million	3.6 Million	$ 6.06

* indicates RTD numbers adjusted by authors

Figure 7: TOTAL COST PER RIDER, GRAPH



Environmental Benefit Projection

Everyone is trying to improve the air quality of the Denver metropolitan area. The expenditure of $125 million on a LRT system for the Southwest Corridor may not improve the region's air quality. RTD claims that the LRT system will create no pollution because LRT uses "clean" electric motors. But electricity must be produced in power generating plants. Power plants generally are about 30% efficient. (Nuclear plants are slightly higher; coal and oil fired power plants are slightly less efficient.) The 70% power efficiency loss is related to impacts to the environment in the form of thermal pollution, hydrocarbon emissions, particulate emissions, and other pollutants.

Moreover, there are additional losses in transmission, transforming, and in running the LRT electric motors. There are real economic reasons for the fact that a BTU of electricity costs three times as much as a BTU of natural gas.

Thus, LRT may partly "solve" the automobile air pollution problem by centralizing the pollution at the site of electricity generation.

Ultimately, the greatest environmental impact will be determined by system efficiency. If LRT is running empty trains or consumes maximum power at power plant peak demand times, then the negative environmental impacts could be enormous. RTD's claim that there are no environmental impacts is not correct.

Figure 8 provides an example of the particulate pollution which is generated by a power station in comparison to transportation related pollutants. Particulates are the major component of Denver's "brown cloud." Carbon monoxide is usually not a problem pollutant for power generating facilities.

Figure 8: POLLUTION

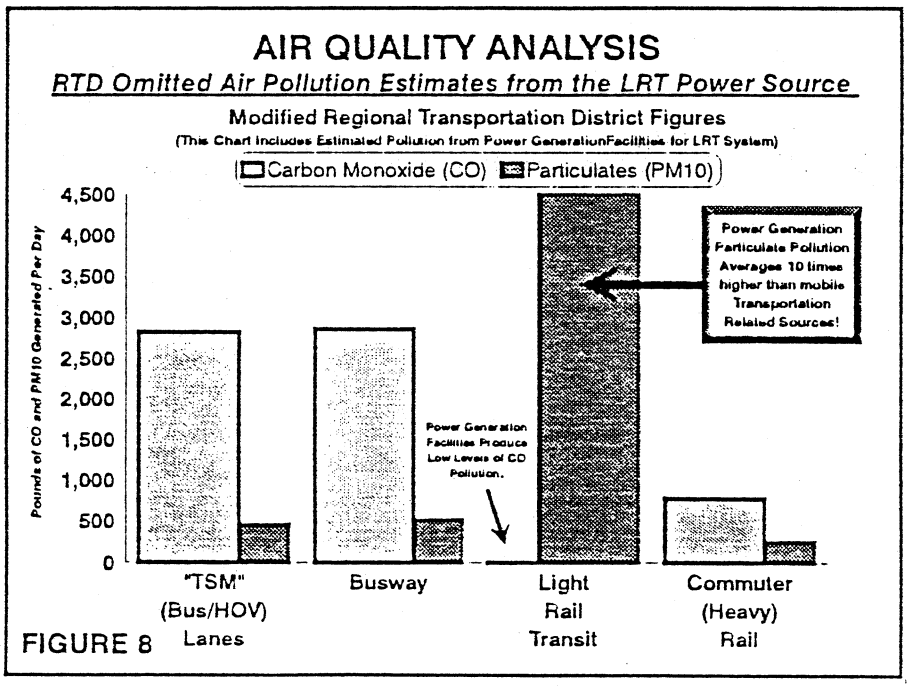


FIGURE 8

Recent Light Rail Experience in Other Cities

Local government officials have been swayed by a desire named streetcar. Michigan Congressman Bob Carr, Chairman of the House Appropriations Subcommittee on Transportation, is concerned that urban transit officials are seduced by light rail as a status symbol. Carr's subcommittee has adopted stricter economic criteria for judging transit projects. Figure 9 lists the nine systems built during the 1980s and 1990s.

Figure 9: LIGHT RAIL SYSTEMS OPENED IN THE 1980S AND 1990S

City	Length	Year Opened	Average Weekday Trips
1. Baltimore	22.5	1992	13,000
2. Buffalo	6.2	1985	29,900
3. Los Angeles	21.6	1990	40,000
4. Pittsburgh	22.6	1987	32,500
5. Portland	15.1	1986	24,500
6. Sacramento	18.3	1987	23,400
7. San Diego	36.0	1981	45,000
8. San Jose	21.0	1987	21,000
9. St. Louis	18.0	1993	22,000

The need for new criteria is illustrated by the experience of the last 15 years. During the 1980s and 1990s, nine U.S. cities have constructed light rail systems. Don H. Pickerell, USDOT National Transportation Systems Center Economist, said in a 1990 study that actual LRT ridership averages 66% to 85% *lower* than initial forecasts, and actual capital costs average 13% to 50% *higher* than original estimates. Thus, **average cost per rider is 5.4 times greater than originally projected.** RTD's projections merit intense scrutiny to ensure that they are accurate and to ensure that Denver does not repeat the experience of these other nine cities.

Figure 10 is a listing of the capital costs of the nine LRT systems built during the 1980s and 1990s. It is important to note that the Federal Government does not typically bear the full costs of construction for an LRT. In Denver's case, the federal government was unwilling to contribute any funds to the MAC demonstration project. Systems operations and maintenance are generally the responsibility of the local jurisdictions.

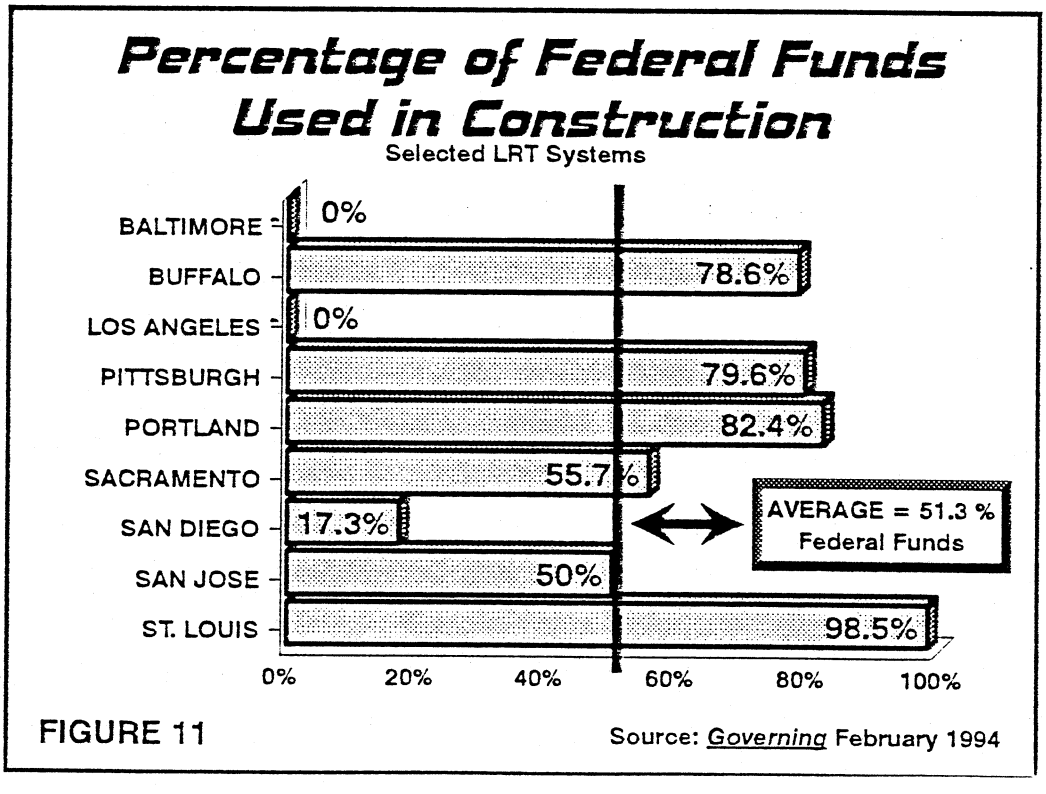
Figure 11 shows that the federal government's average "contribution" for construction of LRT systems has been 51.3%. St. Louis is currently facing a ten million dollar per year operating deficit—even though the federal government paid for 98.5% of

the LRT system construction. Figure 12 graphically demonstrates required local taxpayer subsidy to cover the operations of LRT system. Not a single system is revenue-neutral in covering its operating costs. St. Louis is now proposing a state-wide sales tax increase to finance its desire for streetcars.

Figure 10: FINANCES OF RECENTLY CONSTRUCTED LRT SYSTEMS

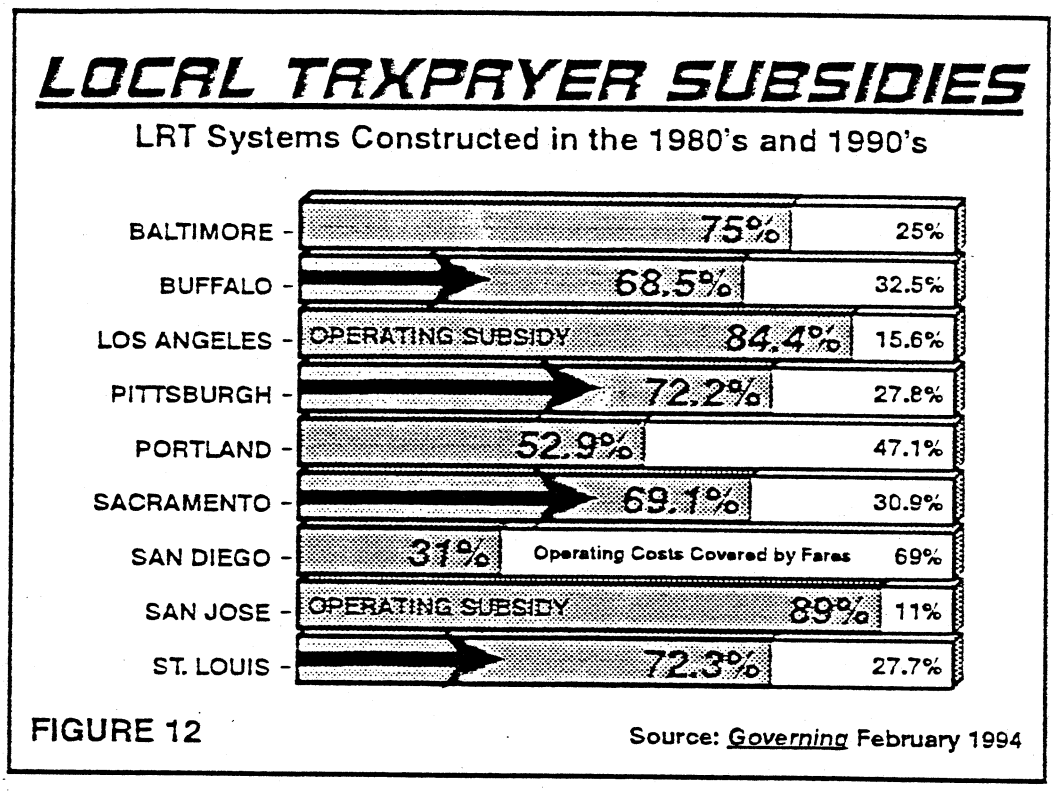
City	Cost (Millions)	Federal Funding (Millions)	Operating Cost Covered by Fares
Baltimore	$364.0	0	25.0%
Buffalo	$535.8	$421.4	32.5%
Los Angeles	$877.0	0	15.6%
Pittsburgh	$539.0	$429.1	27.8%
Portland	$214.0	$176.3	47.1%
Sacramento	$176.0	$98.0	30.9%
San Diego	$308.4	$53.4	69.0%
San Jose	$500.0	$250.0	11.0%
St.Louis	$351.0	$345.6	27.7%

Figure 11: FEDERAL FUNDS



In Houston, local officials rejected plans for a LRT system in favor of a 105 mile system of HOV lanes. Mayor Bill Lanier said that HOV lanes "cost us less per mile than the rail by a good bit, and they move more people....not only transit passengers but also those people able to double up or triple up in cars to form carpools." Figure 12 shows the enormous subsidies required in cities that chose light rail over HOV.

Figure 12: LIGHT RAIL SUBSIDIES



Conclusion

A light rail system for the Denver metropolitan area or for the Southwest Corridor has serious problems of costs, service levels, and environment. A full and accurate representation of the total costs and benefits must be disclosed before the citizens of Colorado are subjected to another political boondoggle.

All transit alternatives should be carefully evaluated. In the short term, it would seem prudent to minimize the amount of public capital put at risk by committing to a single technology and instead to pick public policy options that maximize the options available in the future. Is LRT really the best use of $125,000,000 in the Southwest Corridor? And is LRT the best used of $1,500,000,000 metrowide?

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