Commission Briefing Paper 3D-01

2006 C&P Findings: Future Transit Investment Needs

Prepared by: Section 1909 Commission Staff
Date: March 14, 2007

Introduction

This paper is part of a series of briefing papers to be prepared for the National Surface Transportation Policy and Revenue Study Commission authorized in Section 1909 of SAFETEA-LU. The papers are intended to synthesize the state-of-the-practice consensus on the issues that are relevant to the Commission's charge outlined in Section 1909, and will serve as background material in developing the analyses to be presented in the final report of the Commission.

This paper presents information on the findings from the 2006 Conditions and Performance Report with regard to current transit system needs. Where data is available the analysis addresses the needs of the components of the transit system, including rail vehicles, buses, stations, maintenance facilities and track.

Background and Key Findings

The information and findings presented in this paper are extracted from the 2006 *Status of the Nation's Highways, Bridges, and Transit: Conditions & Performance* Report to Congress, and is based on data from 2004. All projected investment needs are in 20004 dollars. Key findings include:

- FTA estimates that the replacement value of the urban transit infrastructure in the United States in 2004 was $402.7 billion.

- Estimated annual investment needs to maintain the conditions and performance of the Nation's transit system at its 2004 level are estimated to be $15.8 billion. To improve the average condition level of transit assets to "good" by 2024, as well as to improve performance by increasing vehicle speeds as experienced by passengers and reducing occupancy rates to threshold levels, would require an additional $6.0 billion per year for a total average annual capital investment of $21.8 billion.

- Eighty-seven percent of transit investment requirements are concentrated in urban areas with populations of over 1 million, reflecting the fact that, in 2004, 92 percent of the Nation's passenger miles were in these areas.

- Fifty-eight percent of the total amount needed to maintain conditions and performance ($9.0 billion dollars annually) and 60 percent of the total amount needed to improve conditions and performance ($13.0 billion annually) are estimated to be for rail infrastructure.

- The estimated amount needed to maintain the conditions and performance of rural vehicles and facilities was $269 million in 2004 dollars and the estimated amount to improve the conditions and performance of rural vehicles and facilities was $733 million in 2004 dollars. (These amounts are included in the totals.)

- It is estimated that special service vehicles will need an average investment of $205 million annually to maintain conditions and performance, and $316 million to improve conditions and performance. (These amounts are included in the totals.)

Value of Transit Assets

FTA estimates that the value of the urban transit infrastructure in the United States was $402.7 billion in 2004, based on the information contained in TERM and on data collected through the NTD and the other FTA data collection efforts discussed in this chapter. This estimate excludes the value of assets that belong to rural and special service operators that do not report to the NTD.

Investment Needs

Methodology

FTA uses the Transit Economic Requirements Model (TERM), a model based on engineering and economic concepts, to estimate total capital investment needs for the U.S. transit industry. TERM identifies potential investments using asset decay curves relating condition to age, and in some cases additionally to maintenance and use. TERM also identifies investments needed to achieve stated performance goals based on proxies of vehicle occupancies and passenger travel time. TERM uses benefit-cost analysis to limit the actual level of investment recommended by TERM to a subgroup of the total investments identified based on asset condition and performance targets which have benefit-cost ratios greater than one.

TERM projects capital investment requirements required to achieve the following benchmarks which are then combined to form the different investment scenarios:

- **Maintain Asset Conditions**

  Transit assets are replaced and rehabilitated over the 20-year period such that the average condition of the assets existing at the beginning of the period is the same at the end of the period.

- **Maintain Performance**

  New transit vehicles and infrastructure investments are undertaken to accommodate increases in transit ridership so that the vehicle utilization rate existing at the beginning of the period is the same at the end of the period. Ridership growth estimates are obtained from MPOs.

- **Improve Conditions**

  Transit asset rehabilitation and replacement is accelerated to improve the average condition of all transit assets to a "good" level at the end of the 20-year period. If an average condition

of "good" can be reached only by replacing assets that are still in operationally acceptable condition, then the "Improve Conditions" scenario targets a lower condition level. This condition level will be equal to the highest condition that can be achieved without replacing assets that are in operationally acceptable condition.

- **Improve Performance**

  The performance of the Nation's transit system is improved as additional investments in bus rapid transit (BRT), light rail, or heavy rail are undertaken in urbanized areas with the most crowded vehicles and the systems with the slowest speeds to reduce vehicle utilization rates (and crowding) and increase average transit operating speeds.

Total Investment Needs

Annual investment needs for transit are estimated to be $15.8 billion to maintain the conditions and performance of the system at its 2004 level. To improve the average condition level of transit assets to "good" by 2024, as well as to improve performance by increasing vehicle speeds as experienced by passengers and reducing occupancy rates to threshold levels, would require an additional $6.0 billion per year for a total average annual capital investment of $21.8 billion. These investment requirements assume a 1.57 percent average annual increase in ridership over the 20-year projection period compared with a 2.3 percent average annual growth rate in passenger miles traveled between 1995 and 2004.

Annual Transit Investment Requirements by Type of Improvement, 2005–2024

Type of Improvement	Maintain Conditions & Performance	Improve Conditions & Maintain Performance	Maintain Conditions & Improve Performance	Improve Conditions & Performance
Replacement and Rehabilitation	$10.4	$10.9	$10.4	$10.9
Asset Expansion	$5.4	$5.4	$5.4	$5.4
Performance Improvements			$5.5	$5.5
Total	$15.8	$16.4	$21.2	$21.8

Source: Transit Economic Requirements Model and FTA staff estimates.

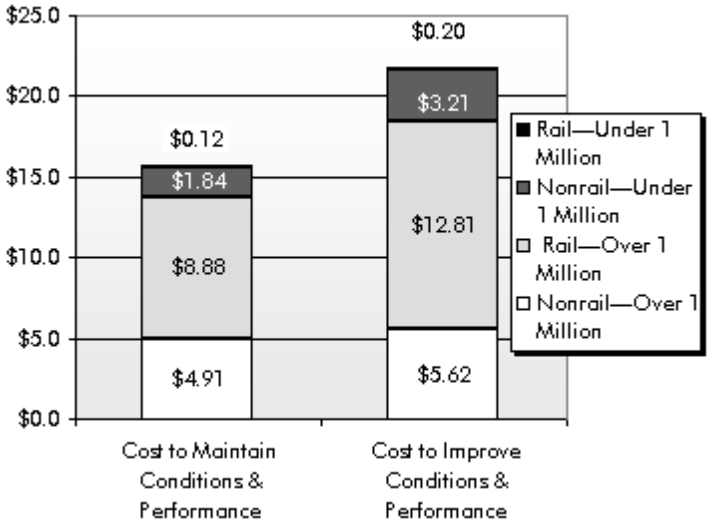
Asset replacement and rehabilitation costs are estimated to be $10.4 billion annually to maintain conditions and $10.9 billion annually to improve conditions to a good level. The difference between the replacement and rehabilitation costs to maintain conditions and the replacement and rehabilitation costs to improve conditions is $0.5 billion annually as asset condition levels are estimated to be close to good. Asset expansion costs needed to meet the projected 1.57 percent average annual increase in ridership growth are estimated to be an additional $5.4 billion. The amount needed to improve performance (by increasing passenger speeds and reducing crowding in systems not operating at "good" performance threshold levels) is estimated to be an additional $5.5 billion annually.

Investment Needs by Population Area Size

Eighty-seven percent of transit investment requirements are concentrated in urban areas with populations of over 1 million, reflecting the fact that, in 2004, 92 percent of the Nation's passenger miles were in these areas. It is estimated that an average of $13.8 billion annually would be needed to maintain conditions and performance of the transit assets in these large urban areas, and $18.4 billion annually would be needed to improve them. The needs of less-populated areas (i.e., those with populations under 1 million) are estimated to be considerably lower than those of more populous areas because they have fewer transit assets. It is estimated that an average of $2.0 billion annually would be needed to maintain the conditions and performance of the transit infrastructure in these less-populated areas, and $3.4 billion annually to improve them.

Sixty-four percent of the total transit investment requirements of large urban areas, or $8.9 billion annually is estimated to be needed to maintain conditions and performance of the transit rail infrastructure in these areas; and 36 percent of the total investment requirement in these larger urban areas, or about $4.9 billion annually, would be needed to maintain the conditions and performance of this nonrail infrastructure.

Transit Average Annual Investment Requirements by Area Population Size and Mode, 2005–2024 (Billions of 2004 Dollars)



Source: Transit Economic Requirements Model and FTA staff

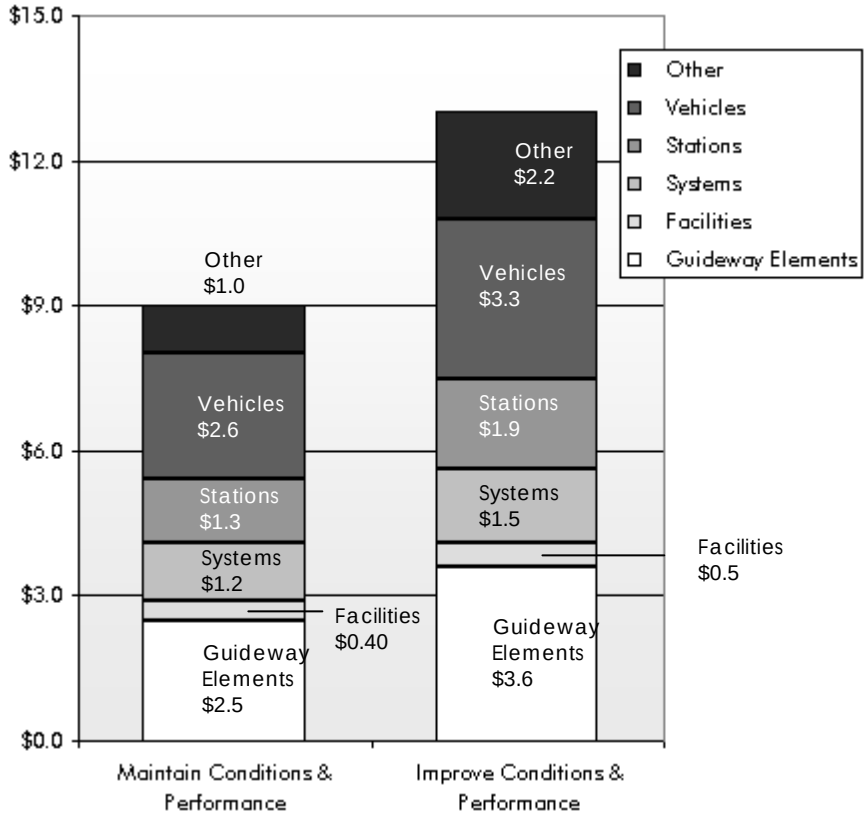
Ninety-four percent of the transit investment requirements in areas with populations under 1 million (including rural areas) is projected to be for nonrail transit. The annual cost to maintain conditions and performance of the nonrail transit infrastructure in these less-populated areas is estimated to be $1.8 billion annually. Rail needs in areas with populations of less than 1 million are minimal. Six light rail systems currently operate in these less-populated areas so that the need to maintain these systems is minimal.

Investment Needs by Asset Type

The Conditions and Performance Report provides estimates investment needs for five major asset categories—guideway elements, facilities, systems, stations, and vehicles, and for a category called "Other Project Costs" which includes the services necessary to support investment in new transit capacity such as expenditures for project design, project management and oversight, right-of-way acquisition, and site preparation.

Rail. Fifty-eight percent of the total amount needed to maintain conditions and performance ($9.0 billion dollars annually) and 60 percent of the total amount needed to improve conditions

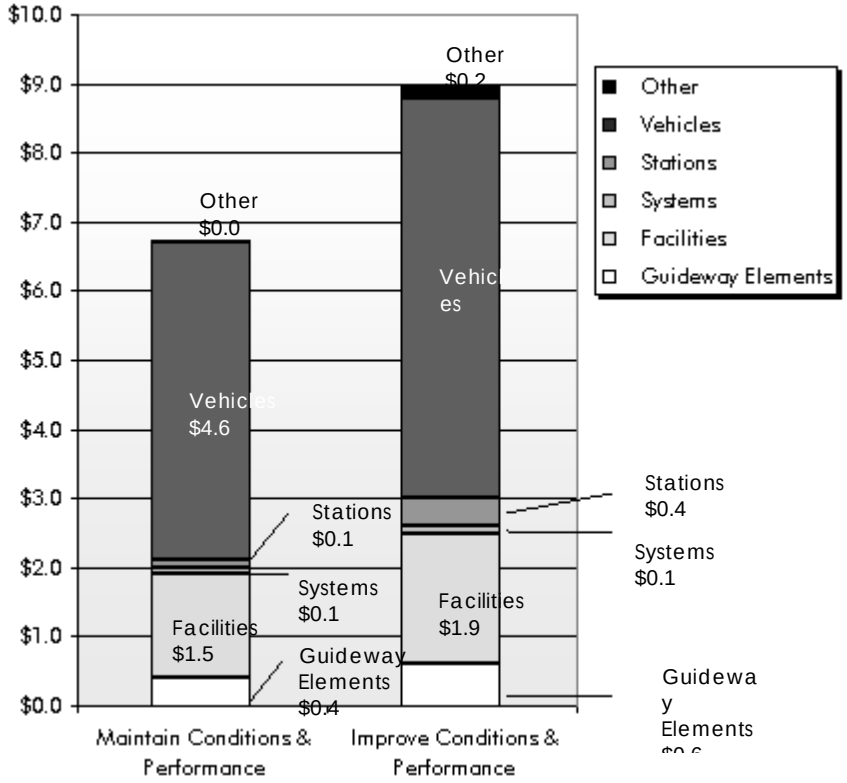
and performance ($13.0 billion annually) are estimated to be for rail infrastructure. As shown in vehicles and guideway elements are estimated to require the largest amounts of the total capital investment of all rail assets between 2005 and 2024, followed in descending order of investment requirements by stations, systems, and facilities.



Source: Transit Economic Requirements Model and FTA staff estimates.

Non-rail. Forty-three percent of the total amount needed to maintain conditions and performance, or $6.8 billion dollars annually, and 40 percent of the total amount needed to improve conditions and performance, or $8.8 billion annually, are estimated to be for nonrail infrastructure. Vehicles are estimated to require the largest amount of the total capital investment in nonrail assets between 2005 and 2024, as shown in *Exhibit 7-14,* followed in descending order of investment requirements by facilities, guideway elements (dedicated lanes for buses), stations, and systems.

Nonrail Annual Investment Requirements, 2005-2024 (Billions of 2004 Dollars)



Source: Transit Economic Requirements Model and FTA staff

Investment Needs of Rural Transit Vehicles and Facilities

The estimated amount needed to maintain the conditions and performance of rural vehicles and facilities is $269 million annually and the estimated amount to improve the conditions and performance of rural vehicles and facilities is $733 million annually. These estimates are based on information on the number and ages of vehicles and facilities published by the Community Transportation Association of America (CTAA) and 2004 vehicle and facility cost information collected by FTA. These rural estimates have been derived outside of TERM, but are included in the investment totals. The improve scenario assumes that the number of rural vehicles increase at an average rate of 3.5 percent. There are only a few recent studies on rural transit needs which are limited to a few states. Anecdotal evidence suggests that there are additional unmet investment needs in rural areas.

Investment Needs of Special Service Vehicles

It is estimated that special service vehicles will need an average investment of $205 million annually over the 2005-2024 period to maintain conditions and performance, and $316 million to improve conditions and performance. These amounts are included in the investment needs totals. These investment estimates assume a total special service fleet of 37,720. Note that FTA funding has been used to support the purchases of about 43 percent of this fleet. Fifteen percent of special service investment requirements are assumed to be in areas populations of over 1 million, and 85 percent of special service investment requirements are assumed to be in areas with populations of less than 1 million.

Investment Backlog

TERM estimates that there is an investment "backlog" of $27.7 billion. This is the amount TERM estimates would be required to replace all assets with conditions below the condition replacement thresholds specified by TERM necessary to improve conditions. TERM estimates that $23.8 billion is needed to replace assets with conditions below the threshold levels specified by TERM to maintain conditions. For most asset types, these thresholds are set just below the adequate level.

Transit Capital Spending and Investment Needs

The average annual investment estimated needed to maintain transit vehicle conditions and performance is $7.1 billion, 109 percent above actual investment of $3.4 billion in transit vehicles in 2004; the estimated amount to improve transit vehicles and conditions is $9.2 billion in 2004 dollars, 171 percent about actual 2004 investment.

The average annual investment estimated to be needed to maintain transit nonvehicle asset conditions and performance is $8.6 billion, 7 percent below actual investment of $9.2 billion in transit nonvehicle assets in 2004; the estimated amount needed to improve transit nonvehicle conditions and performance is $12.7 billion, 38 percent about actual 2004 investment in transit nonvehicles.

Average conditions for non-vehicle assets are, on average, higher than the average condition for vehicles.

Impacts of Investment

Estimated Effect of Reduced Investment on Average Conditions

FTA has used TERM to estimate the effect of reductions in rehabilitation and replacement expenses on transit asset conditions. TERM estimates that if the amount spent on capital investment is 10 percent lower than the amounts needed to maintain conditions (rehabilitation and replacement expenses) in urban areas is reduced by 10 percent, the average condition of transit assets would fall from 3.9 in 2004 to 3.5 in 2024. If the amount estimated to be needed for rehabilitation and replacement expenses in urban areas is reduced by 30 percent, to $6.92 billion, TERM estimates that average asset conditions would fall to 3.4 in 2024. [Note that this analysis excludes rural and special service vehicles.]

Effect of Capital Spending Constraints on Transit Condition Estimates

	2004 Condition	Percent of Recommended Rehabilitation and Replacement Expenditures to Maintain Conditions			
Asset Type		100%	90%	80%	70%
Guideway Elements	4.4	4.1	4.0	4.0	3.9
Facilities	3.6	3.2	2.9	2.9	2.9
Systems	3.9	3.7	3.7	3.5	3.4
Stations	3.4	3.1	3.1	3.1	3.1
Vehicles	3.4	3.4	3.3	3.3	3.1
All Assets	3.9	3.6	3.5	3.5	3.4
Rehabilitation and Replacement Expenditure Scenarios *		$9.36	$8.89	$7.91	$6.92

* Excludes rural vehicles and facilities.

Estimated Effect of Performance-Improving Investment on Ridership

TERM considers, in its benefit-cost analysis, the effect of transit capital investment on user costs and the effect of the change in these costs on transit ridership. TERM estimates that $5.2 billion annually in performance enhancing investment in urbanized areas to increase the average speed of passenger travel and to decrease vehicle occupancy levels will generate an additional 74.5 million transit riders annually.