07-Gates

Evaluating Transit Investment Alternatives in the Face of Rising Fuel Costs

It is increasingly clear that the era of stable oil prices is coming to an end. Demand will continue to drive prices up as China and other developing countries compete aggressively with the US for a limited supply of oil. Prices may also increase with the implementation of regulatory mechanisms that incentivize reductions in Greenhouse gas emissions, perhaps through carbon taxes or through cap-and-trade schemes. Instability in oil-producing countries could also contribute to higher oil prices. As the US Department of Transportation prepares its biennial Surface Transportation Conditions and Performance Report to Congress, and anticipates the reauthorization of the Surface Transportation Bill, this issue is being factored into analysis of investment alternatives.

At the Federal Transit Administration (FTA) the Transit Economic Requirements Model (TERM) has been developed over the past decade to provide input for the Conditions and Performance Report. It forecasts transit investment needs for the next twenty years assuming that current conditions are maintained in the face of expected growth in demand, or that conditions are improved. Expected growth in demand is taken from Metropolitan Planning Organization (MPO) forecasts in urban areas across the country. These forecasts are based on expected population and employment growth. It is not known what effect an increase in fuel prices will have on this demand. Past experience is that sharp increases in the price of gasoline do push some drivers to take transit alternatives for some of their trips. Gradual increases do not seem to have the same effect; recent substantial increases have occurred gradually and have not resulted in any measurable mode shift from driving to transit. How long this can continue is not clear and the policy implications of different scenarios are motivating analysis at the Federal Transit Administration.

TERM provides the best available estimates of the capital investment needed to provide transit service to meet projected demands over the next twenty years. By varying the demand estimates for some, or all, metropolitan areas it is possible to explore the costs of policies or economic forces that result in a shift of travelers from driving to taking transit. Likewise, the benefits of such a mode shift can be calculated by considering the reduction in personal vehicle miles traveled applying well-established cost-per-mile factors to determine the savings. TERM uses this factor to evaluate the cost-benefit ratio of service expansions that are needed to meet growing demand according to its own embedded assumptions about the mode split between alternatives if the expansion is not undertaken.

Given that the sensitivity of the transit/highway mode shift to relative cost is not well understood the question must be posed as "if X people respond to an increase in fuel prices of Y by switching from commuting by car to commuting by transit then how much will the nation have to invest in transit to maintain, or improve, current levels of service over the next twenty years". X and Y are independent variables whose relationship depends on assumptions for each scenario, but are external to the TERM analysis. FTA is using this approach to evaluate two scenarios that are of current interest, reducing greenhouse gas emissions and evaluating the effect of increased demand on transit systems due to fuel price increases.

Key to both these analyses are assumptions about the potential fuel savings of moving a commuter from a car to a bus (or rail transit). National averages from FTA's National Transit Database (NTD) for the 2006 reporting year are discouraging in this respect; the average transit bus carries just over 11 passengers and gets about 2.5 miles per gallon (mpg). Thus, on average, bus transit is no more fuel efficient than the national average 1.1 people riding in a typical 25 mpg vehicle. For this reason, the analysis must work with assumptions that target opportunities for moving drivers from personal vehicle onto relatively full transit vehicles. There are good reasons to consider commuting as the most likely prospect here. Transit vehicles run with a higher load factor during peak periods, and personal vehicles are less efficient because roads are more congested. The routine nature of commuting travel also lends itself to more easily overcoming the transit learning curve.

In 2006, according to the American Community Survey, 104.7 million commuters drove personal vehicles, 6.6 million took public transportation. The average commute was about 12 miles and commuting constituted some 15% of all trips by car and roughly 50% of all trips by transit. (Commuting in America III: The Third National Report on Commuting Patterns and Trends, NCHRP Report 550, Transportation Research Board, October 2006.)

Assuming an average full-time worker (250 days/year) stops driving his 25mpg vehicle to work and starts riding the bus, which runs with an average of 33 passengers, this saves:

500 trips * 12 miles/trip * (1/(1*25mpg) – 1/(33*2.5mpg)) = 167 gallons of fuel.

Although these are reasonable assumptions under some circumstances, not everyone has access to transit as a viable alternative commuting mode. That kind of transit infrastructure is mostly available to commuters in a limited number of large metropolitan areas. Thus we focus analysis of these scenarios on commuting in the nation's largest cities. Good data on regional commuting behavior is available for these areas and can be used to refine the above estimated savings.

Moving a significant number of people from their personal vehicles to transit at peak hours would require additional investment in transit vehicles and facilities. Many transit vehicles have very high load factors during these periods already. Since much of our transit infrastructure is supported by Federal grant money, Congress is very interested in forecasting the cost of meeting future demands.

The transportation sector contributes about 20 percent of the nation's greenhouse gas emissions. To comply with possible restrictions on these emissions it might be necessary to compel a shift in popular modal commuting decisions to favor transit. The desired reduction in emissions could be calculated from fuel savings (preliminary estimates are that the 167 gallon savings above is equivalent to about 1.5 tons of greenhouse gas emissions) and then converted to the number of people who would need to switch to transit. Moving 10 million commuters to transit could reduce emissions by 15 million tons. This would not, however, be without cost as it would more than double the demand for transit services. Meeting this demand would result in a significant public expense. The TERM model will be used to calculate this expense for a number of desired levels of emissions reduction. These analyses will not assume an increase in the price of fuel.

A more complicated situation arises when the price of fuel increases as this will gradually move commuters to transit, since fuel is a relatively lower part of the cost of transit than of driving personal vehicles. There is virtually no experience with the cost of fuel being high enough to motivate this mode shift in the United States. The possibility of this changing, however, has led FTA to start to look at the cost of meeting increases in demand well beyond the historical average (about 1.5% per year over the last decade).

TERM works by starting with an inventory of transit assets for every transit agency in the country. Some 650 agencies report their data directly to the FTA through the National Transit Database, the others are estimated from national averages for similar agencies. The condition of each asset is established at the start of the run based on age, maintenance history, and use, as characterized by "decay curves" for each type of asset. TERM runs year-by-year for 20 years into the future, evaluating the need for repair or replacement of all assets each year. TERM also factors in recent Metropolitan Planning Organization growth estimates for transit use and adds new facilities to meet the predicted demand. Additional service must meet cost-benefit criteria or they are not implemented. One of the factors in cost-benefits analysis is the cost of alternatives should the facility not be built. The primary alternative being commuting in a personal vehicle with the cost of operating that vehicle being accounted for in the analysis.

So, with fuel prices increasing, more facility enhancements pass TERM's cost-benefit test. Growth in demand may also increase beyond the current MPO estimates, which do not assume significant fuel price increases. Since it is not known at what point drivers will decide it is too expensive to drive, a number of scenarios will be tested and the implications for transit investment needs in each case evaluated. With current Federal support for transit running at more than $10 billion annually there is a substantial interest in this topic.

This work is being undertaken as a special analysis for the 2008 US Department of Transportation report to Congress on the Conditions & Performance of the surface transportation system. Results will be available toward the end of 2008.

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