Light Rail: Prospects and Perspectives

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In the 1970s this author, while employed by Regional Plan Association (RPA), a New York region-based planning and research not-for-profit organization, participated in two large studies that sought to define the lane use conditions consistent with a variety of public transit modes. In Public Transportation and Land Use Policy (1) transit cost and demand estimates were determined for hypothesized residential and nonresidential densities and development patterns. The result was a generalized topography of "where transit works." Modes examined included taxi, dial-a-bus, local bus, express bus, light rail, automated guideway transit, rapid transit, and commuter rail. Following this effort, in Urban Rail in America (2) a more specific effort to define appropriate demand thresholds for light rail, rapid transit, and downtown people movers was undertaken. These thresholds, based on service frequency, operating savings, capital investment levels, and energy and land savings, were applied to the major urban regions in American to establish a generalized level of national investment for fixed-guideway transit.

The findings of these two works as they relate to light rail are reviewed briefing because such material is readily available elsewhere. The primary focus of this paper is on observations about light rail from the perspective of a planner who is currently responsible for helping to shape the future transit system of the fourth largest transit system in the nation, NJ Transit.

FINDINGS OF RPA STUDIES

In Public Transportation and Land Use Policy (1) the focus on light rail was largely on an examination of land use characteristics that could generate a level of demand, measured in daily passenger-miles or passengers, to support light rail transit as a line-haul mode in a residential corridor leading to a major central business district (CBD). In terms of operating costs per passenger, which are lower than those for local bus service, a niche for light rail was found in CBDs larger than 20 million ft^2. However, on a capital cost basis, measured as capital investment per daily passenger-mile, a light rail line required a CBD of more than 35 million ft^2 unless the light rail right-of-way could be built cheaply (i.e., largely at grade). With a downtown of this size considerable investment in right-of-way, including some tunneling, to keep the line free from vehicle traffic interference, could be justified. Light rail was shown to be a reasonable option in corridors with residential densities averaging 9 dwellings per acre over an area of 25 mi^2 or larger. A full discussion appears elsewhere (1,pp.155-162, 187-188). It is of interest here, and for subsequent discussion, to note that the niche for express bus service was shown to be roughly the same as for light rail, with park-and-ride bus services possible for CBDs in the 20 million ft^2 range, but that "walk-on" express bus was shown to require CBDs of 50 million ft^2 or more.

In Urban Rail in America (2) trip demand-based criteria were developed for the three fixed-guideway modes examined. Each of these criteria was calculated with a common measure, annual place-miles of service per line-mile (apmplm) where a place-mile was defined as one place occupying 6 ft^2 in a transit vehicle multiplied by 1 mi of vehicle movement.

The five criteria were

1. Demand sufficient to warrant at least a 7 1/2 min peak-period service headway consistent with the maximum such headway provided by existing fixed-guideway systems; this translates into a demand threshold of 5 million apmplm required for light rail;
2. Demand sufficient to create labor savings compared to bus service where light rail is assumed to average 20 mph and 8 trains an hour and buses are assumed to average 12 mph; this translates to 4 million apmplm required for light rail;
3. Demand sufficient to create life-cycle energy savings compared to mode used by travelers before they diverted to light rail; this measure varies widely from 7 million to 35 million apmplm with the lowest number in effect if no tunneling is required and the highest if the entire line is in tunnel;
4. Demand sufficient to save land compared to that consumed by automobile and bus use; this translates to 6 million apmplm if the automobile access was by arterial roadway and 16 million apmplm if by freeway; and
5. Demand sufficient to warrant capital investment per passenger-mile consistent with the median value of current fixed-guideway investments; this translates to 5, 9, or 16 million apmplm assuming all at-grade construction, 1/3 in cut and fill, or 1/5 in tunnel, respectively.

When these criteria were arrayed against the estimated major corridor demand in 24 U.S. cities not fully committed to rapid transit systems, it was shown that Seattle, Detroit, Honolulu, Houston, Dallas, St. Louis, Pittsburgh, and Milwaukee could each support at least one light rail line of quite

robust standards, including some tunneling. Eight other cities including Portland, Buffalo, and San Diego, each of which has embarked on a light rail program, could support a light rail line but with no tunnels and some grade separation. Three cities, Columbus, Kansas City, and New Orleans, might barely support a light rail but only if the right-of-way came cheaply. The five other cities could not come close to supporting light rail.

NEW JERSEY PERSPECTIVES

Light rail has been in operation in New Jersey for approximately 50 years; the Newark subway is a 4.3-mi, one grade crossing line that carries 12,000 passenger trips daily at 22 mph on 24 Presidents' Commission Cars (PCCs) between Belleville, a contiguous suburb north of Newark, and Newark's CBD. This line operates with demand characteristics consistent with light rail lines recommended in the works cited above.

Although New Jersey's light rail system consists solely of this line, potential light rail applications have been suggested from time to time. They fall in the following major groups:

1. A light rail system connecting the prospective major developments along the Hudson River waterfront and linked to NJ Transit's Hoboken Terminal and the Port Authority Trans-Hudson (PATH) rapid transit system;
2. Extension of the existing Newark subway to the south to link with Newark Airport;
3. Branches to existing commuter rail lines on unused or lightly used freight lines in either fast-growing areas, especially in Monmouth and Ocean Counties, or areas of high automobile commuter densities (i.e., Bergen County);
4. Substitutes for existing commuter rail (e.g., Boonton line or Montclair branch with relatively light traffic);
5. Extension of the existing Newark subway to the north possibly as far as Paterson to serve additional suburban territory; and
6. New lines radiating out from Newark, the state's largest city and largest CBD.

It must be recognized at the onset that the works cited earlier give only general guidance and are in no way a substitute for careful evaluation of the New Jersey light rail prospects, each of which is unique. Previous efforts to create a general model of light rail suitability based on land use and resultant demand focused on radial routes to the urban core whereas most of the New Jersey light rail prospects serve other purposes in the urban-suburban landscape.

The realistic prospects for each of these proposals vary significantly, ranging from "recently rejected" to "a real short-term possibility." The remainder of this paper is a discussion of the status of these proposals and the intended actions by NJ Transit and others to determine their eventual fate.

HUDSON RIVER WATERFRONT

Along a 20-mile stretch of New Jersey's Hudson River waterfront developments have been proposed that total more than 26 million ft^2 of floorspace, 28,000 dwelling units, 2 million ft^2 of retail space, and numerous hotels and marinas. Even should the market in the next generation absorb only some of this development, the travel demand generated will require major public transit investment. The highway network that would be used to serve this development is hopelessly congested by Trans-Hudson traffic and cannot be easily expanded because of adverse topographic features and extremely high capital costs. Fortunately, numerous abandoned or to-be-abandoned rail freight rights-of-way can be made available to create the nucleus of a transitway system. This system would connect with the PATH rapid transit system and NJ Transit's rail lines in Hoboken, provide north-south access along the waterfront, and provide access from key points to the west. Efforts are now being completed, led by the New Jersey Department of Transportation and NJ Transit with consultant assistance, to determine the transit and highway network improvements that can absorb varying levels of development. A transit network of up to 25 mi is likely to be recommended with segments devoted solely to busways, segments devoted solely to light rail, and segments with shared busway and light rail rights-of-way. Sizable park-and-ride intercept lots beyond the waterfront, parking fees, and limitations on parking ratios are all likely elements of the proposed plan. Discussions with affected municipalities and developers and concept engineering for the proposed outline will refine this plan during the coming months.

NEWARK AIRPORT

Travel demand at Newark Airport has tripled since 1978, largely as a result of deregulated airlines and resultant low fares. This phenomenon has created overtaxed parking facilities and a need for improved public transit to the airport. Among the many long-term fixed-guideway options proposed (Figure 1) is the extension of the existing Newark subway light rail line. This 3-mi connection might be done either using the right-of-way of the old Central Railroad Company of New Jersey (CNJ) Newark branch or by constructing a wholly new right-of-way. In addition, extension of the PATH rapid transit line to the airport, a new station on the Northeast Corridor with a people mover system connecting the railroad to the airport, and a people mover connection directly to Penn Station-Newark are all to be examined as part of a major joint effort by NJ Transit and the Port Authority of New York and New Jersey, with consultant assistance.

MONMOUTH AND OCEAN COUNTIES

These two central New Jersey counties are growing significantly. The traditional major transit corridors have been on the "edges" of the counties with the North Jersey Coast Line (NJCL) carrying 10,000 rail commuters and the Route 9 bus corridor carrying approximately 8,000 riders to Newark and New York (Figure 2). NJ Transit in coordination with the New Jersey Department of Transportation has embarked on an effort to determine how to better serve the growing markets, especially in the center of these two counties, making use, if possible, of the Southern and Freehold branches, two unused rail freight rights-of-way that branch off the NJCL. Along with light rail feeder systems, commuter rail extensions and busways will be examined for either or both of these rights-of-way. Regular route feeder bus service not using these rights-of-way is also to be examined.

BERGEN COUNTY

Here too, rail freight lines may be used to carry light rail. The purpose would be to capture a larger share of the Bergen County-to-Manhattan market for transit. This is traditionally a high automobile use

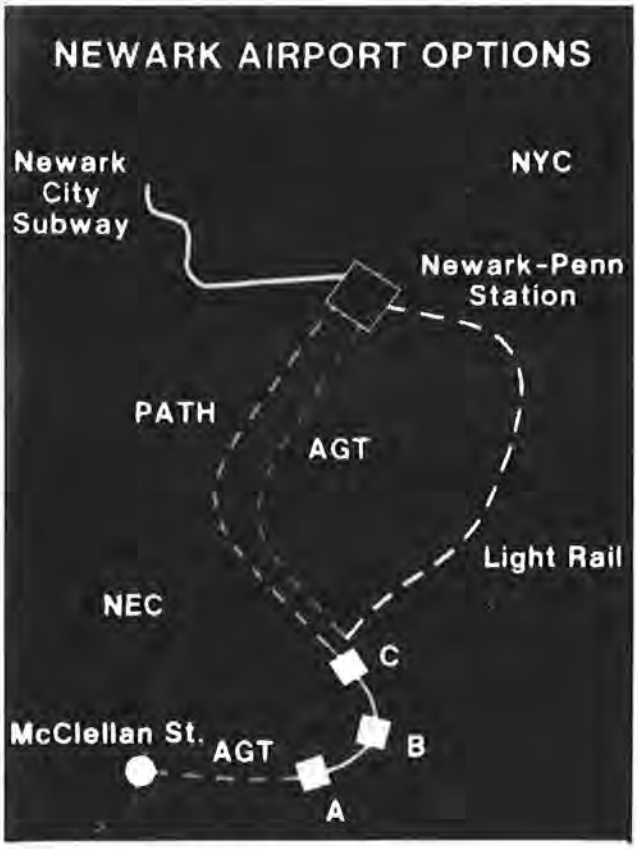

FIGURE 1 Proposed fixed-guideway options.

FIGURE 2 Existing commuter routes and possible transit extension for Monmouth and Ocean Counties.

area. Light rail rights-of-way may be found on Conrail's northern branch or on the New York Susquehanna and Western Railroad. Light rail might be tied to the waterfront transitway network described earlier. NJ Transit is currently exploring all relevant options in a sketch-planning framework.

MONTCLAIR-BOONTON CORRIDOR

The Montclair branch of the Morris & Essex lines and the Boonton line are two commuter rail lines into Hoboken, where commuters transfer to PATH to complete their trip to New York. Because these two proximate lines are NJ Transit's poorest performers and because major repairs of the Boonton line appear to be necessary, a project is under way to examine how to best modify them, including a possible 1,200-ft connection of the two in Montclair, to provide a more cost-effective system. In the early stages of the alternatives analysis a variety of options involving light rail were explored, including extensions of the nearby Newark subway to, onto, and in the rights-of-way of the two commuter rail lines. All light rail options have since been rejected because of either high capital cost or increased rider inconvenience from added transfers, or both.

NEWARK SUBWAY EXTENSIONS NORTH

Depending on which alternative is finally chosen for the Montclair-Boonton project, some rights-of-way may become available to extend the subway along the Conrail Orange branch right-of-way, possibly eastward on the Boonton line (if abandoned east of the Orange branch), and possibly with a connection northward on the Newark branch that extends through Nutley, Clifton, and Paterson. When the Montclair-Boonton situation is clearer these options can be examined.

NEWARK RADIAL ROUTES

New light rail routes radiating from downtown Newark have not been considered in the last few years. Perhaps the only possible option, other than those extensions discussed in the preceding two sections, is a line on Springfield Avenue, which was studied some 10 years ago. However, the significant decline in population in this corridor coupled with the unavailability of a right-of-way has dampened any previous enthusiasm.

In sum, it would appear that light rail in New Jersey may have some applications, but a number of uncompleted studies make the future quite uncertain. The brightest hope is probably the eventual evolution of a light rail system on the waterfront if the amount of new development comes quickly enough to mobilize construction of a network that could not be handled cost-effectively by a bus system.

REFERENCES

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