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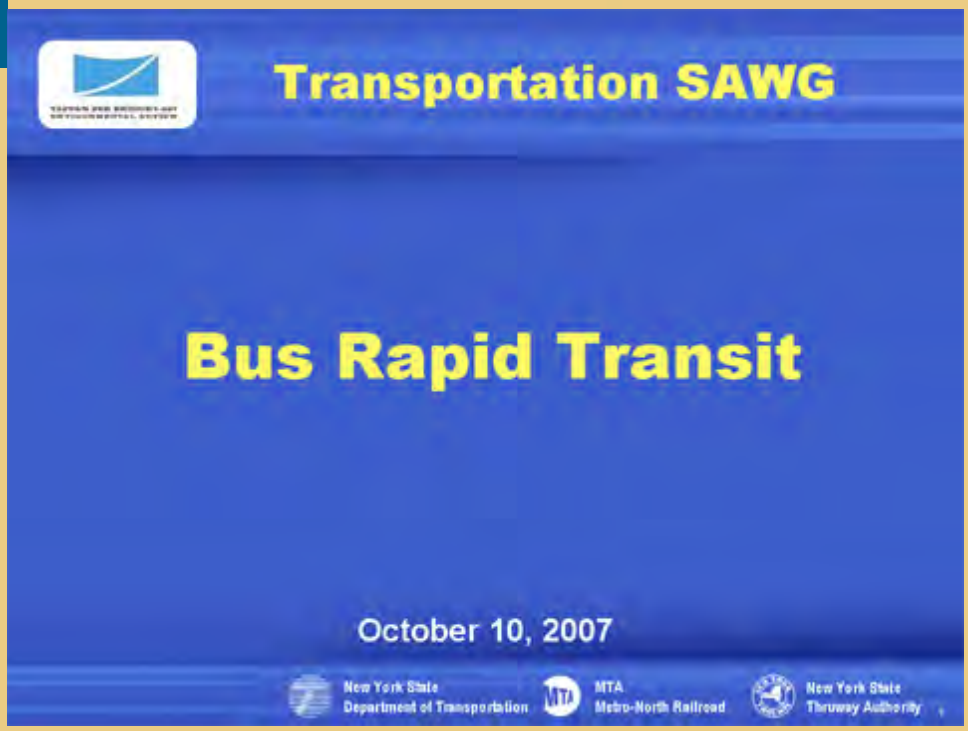
Stakeholders' Advisory Working Group Traffic and Transit Group Meeting #4, October 10, 2007

The Traffic and Transit SAWG meeting #4 was held on October 10th, 2007 at Power Authority in White Plains, NY. View minutes of the meeting here (PDF, 44KB).

The presentation can be viewed in the following formats:

- PDF format (1.4MB)
- View the slides below with text narration



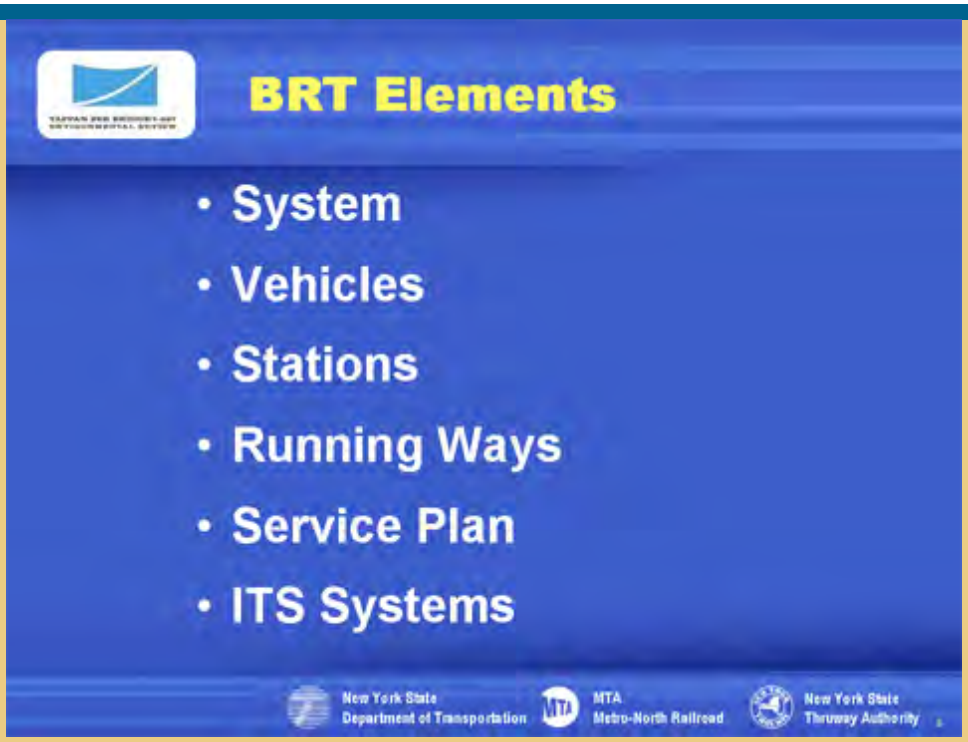
The focus of this presentation is on Bus Rapid Transit (BRT), which is a key element of Alternative 3, one of the Build Alternatives under consideration for implementation in the study corridor.

The presentation is organized in four parts: an overview of BRT, examples of implemented BRT systems, concepts under consideration in the I-287 corridor, and the results of the Tappan Zee Bridge BRT Workshop held in September.

The first section of the presentation provides an overview of the elements that comprise a modern BRT system.

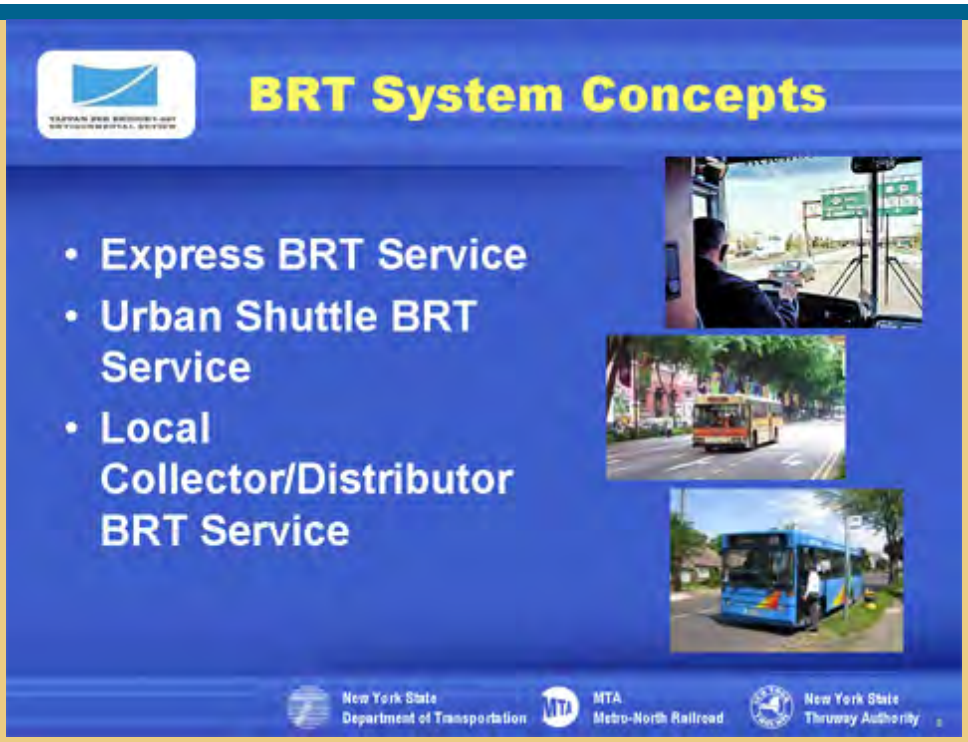
BRT is not about putting 1950's style buses on the streets. It is a mature technology that is much more than just buses on streets.

The Federal Transit Administration's (FTA) definition of BRT focuses on the creation of a transit system providing efficient, high quality service to users.

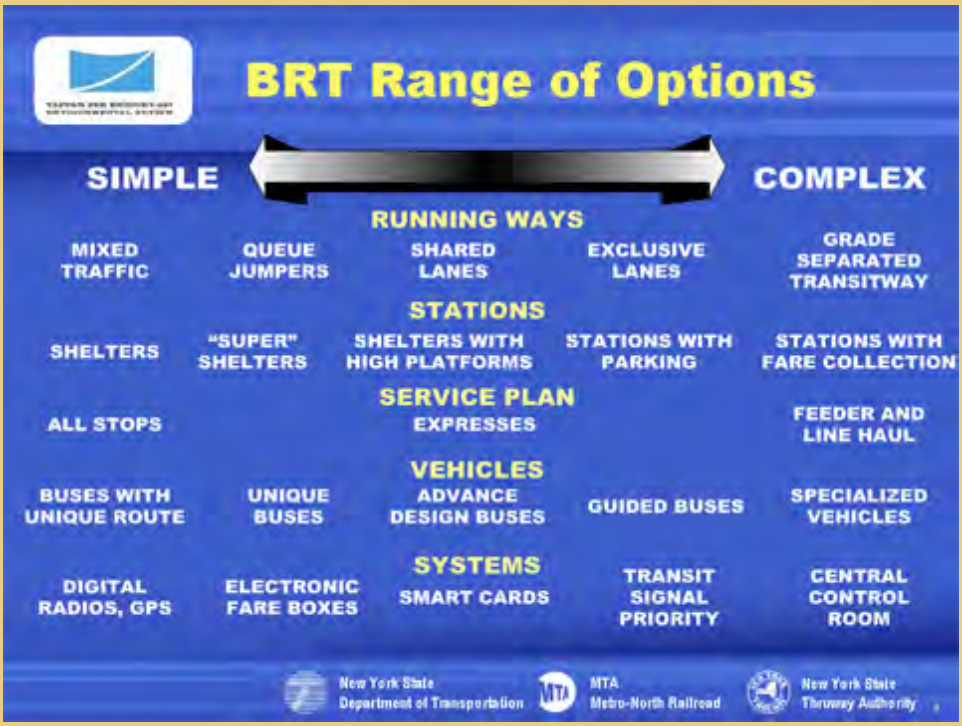


BRT systems consist of many of the same system components one would expect with rail systems, but utilize rubber-tired vehicles that are also capable of operating in streets where rail vehicles cannot go.

A key concept is that a BRT system must truly be a system; its elements have to be carefully and seamlessly coordinated to operate effectively.



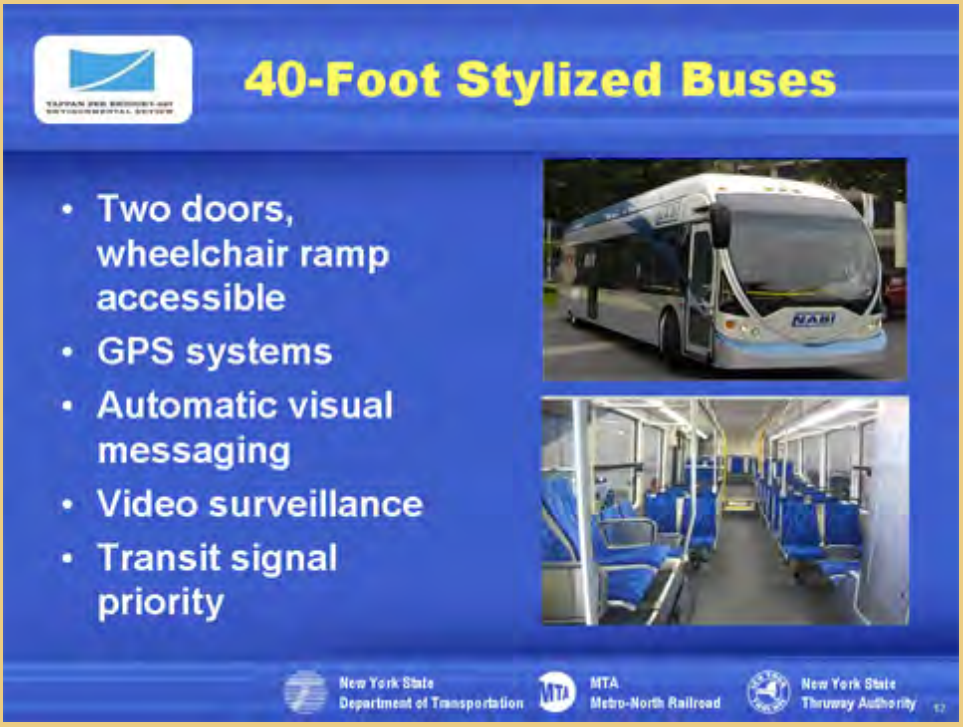
BRT systems provide high speed express service on exclusive or semi-exclusive guideways, as well as access to the system via shuttles and local buses that bring people to the express service.



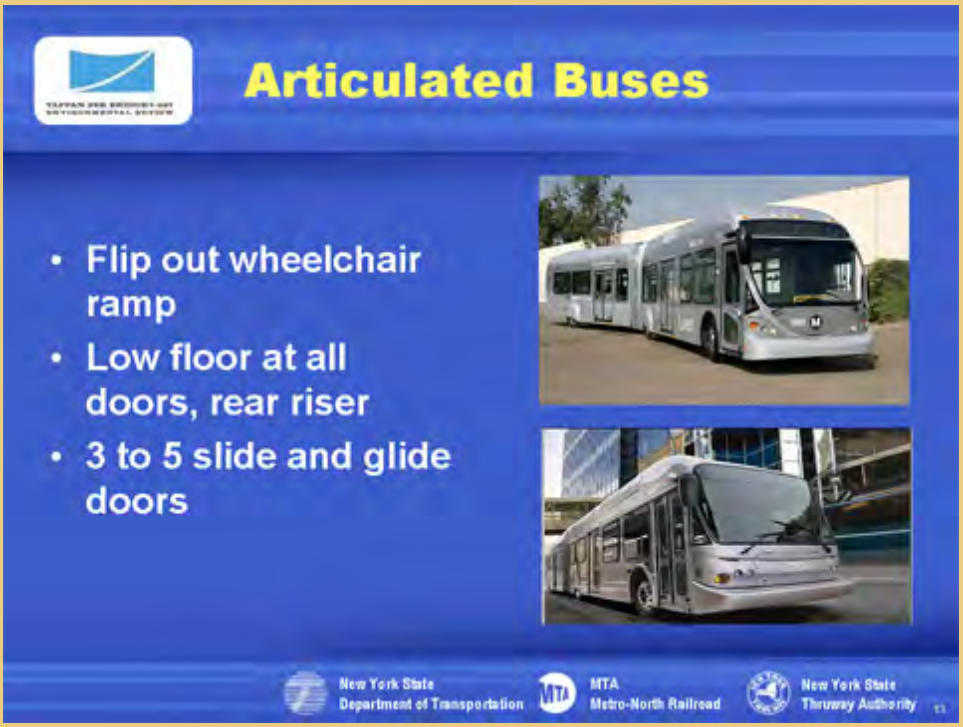
There are many “levels” of BRT possible depending on the components selected. High level BRT systems have elements very similar to rail systems, while lower level BRT systems may have less advanced elements yet still provide a high level of service. Many of the systems built in the US are a mix of high and lower level components.

The most visible element is the BRT vehicle, which is designed specifically for the system in which it operates. There are many alternative vehicles available and most systems use a mix of these vehicles to match the type of operations with the vehicles' capacities.

BRT vehicles vary in their design depending on the specific system, but they frequently include low floors to eliminate steps in the vehicles and support level boarding. They also have multiple doors to make loading and unloading quicker and easier. They may feature certain design elements that differentiate them from traditional buses as part of a branding strategy. To increase their appeal to riders they also typically feature modern interiors – not the typical vinyl bench seats of older model buses. Finally, they include modern propulsion systems that create less noise and low or zero emissions.



However, BRT vehicles may add technological features that improve service. A Global Positioning System can keep track of where the buses are. Message signs can provide information (e.g., upcoming station) to passengers and video surveillance can enhance security. Signal priority is used to allow BRT vehicles to operate more reliably and efficiently.



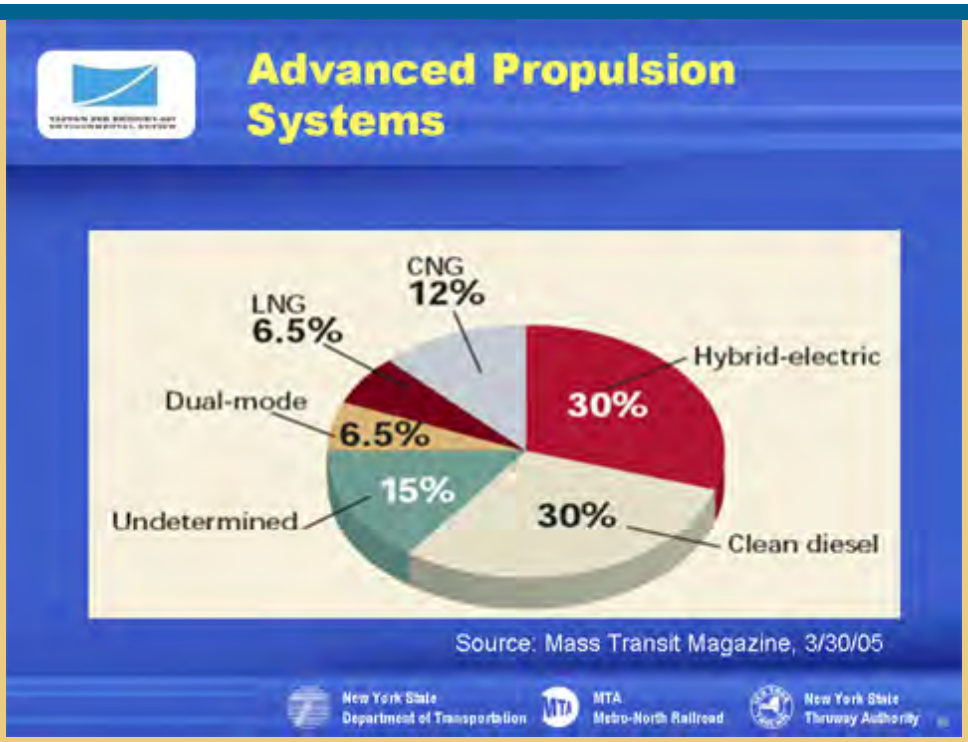
Articulated buses are longer than typical buses (typically about 60 feet), increasing capacity, but include a joint in the center that allows them to remain maneuverable on city streets.

For any bus, access to mobility impaired passengers, elderly and children is equally important. Wheelchair ramps are standard features. The side doors can be double width as well to ease

entering and exiting.

Even more specialized vehicles are available, including ones with built-in guidance systems to allow the buses to approach the waiting platforms more closely, minimizing the step over into the vehicle.

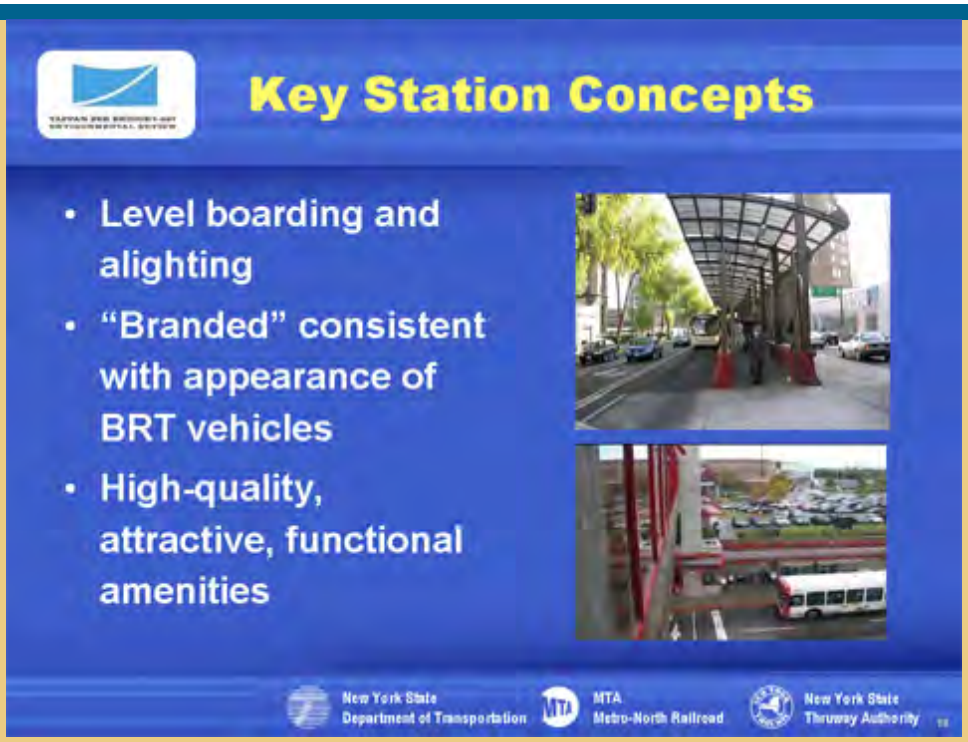
Modern BRT vehicles feature attractive and comfortable seating as well, as these pictures show.



As is the trend in standard bus systems, BRT systems can use clean diesel, hybrid electric, or more exotic propulsion systems. The days of smoking diesel buses are over.

Station platforms align with the height of the low-floor of the buses allowing level boarding.

Branding means the stations, vehicles and guideway have a coordinated appearance so when you are using the system you know you are in a system.



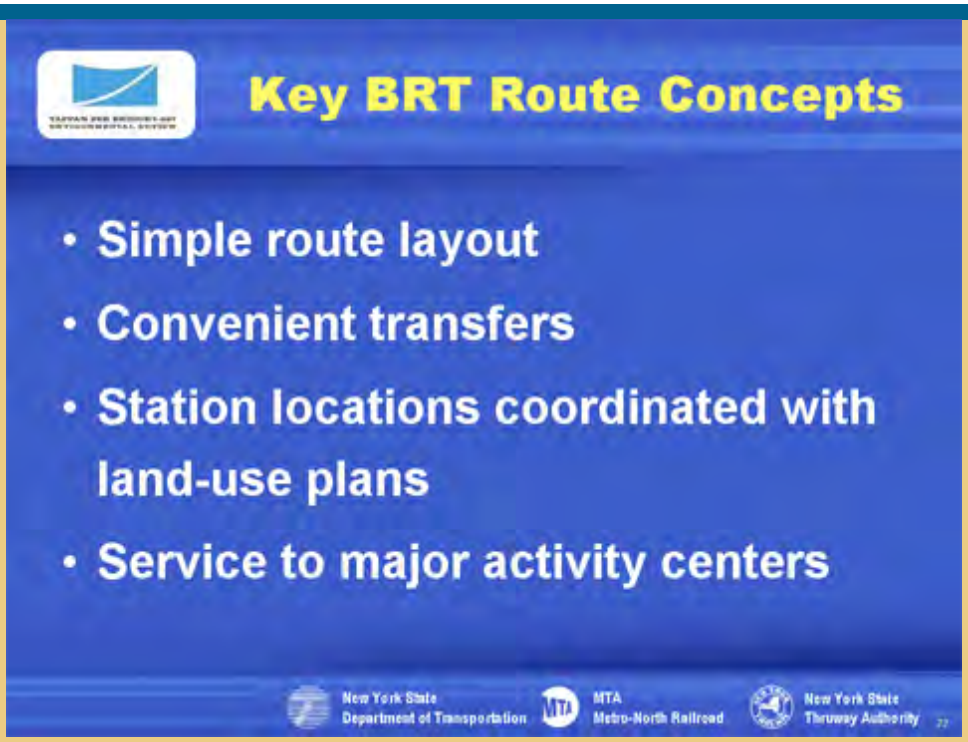
Station platforms align with the height of the low-floor of the buses allowing level boarding.

Branding means the stations, vehicles and guideway have a coordinated appearance so when you are using the system you know you are in a system.

Stations can be located at-grade in city streets, elevated, or even below-ground. These pictures show two Seattle bus stations, which are in a tunnel under downtown Seattle and have been in operation for over a decade.

Since many BRT guideways are in street medians, so are the stations. These are pictures of a Beijing median station, but similar stations are used in U.S. BRT systems.

The following section discusses types of running ways or guideways that can be used as part of a BRT system. The type of guideway used depends on the areas being served.



Several key features of the BRT route can influence the success of the system. First, the route structure must be understandable – no more confusing bus schedules. Transfers between modes or other routes must be convenient and the stations need to be where people are going or coming from, such as malls, office complexes and apartment developments.

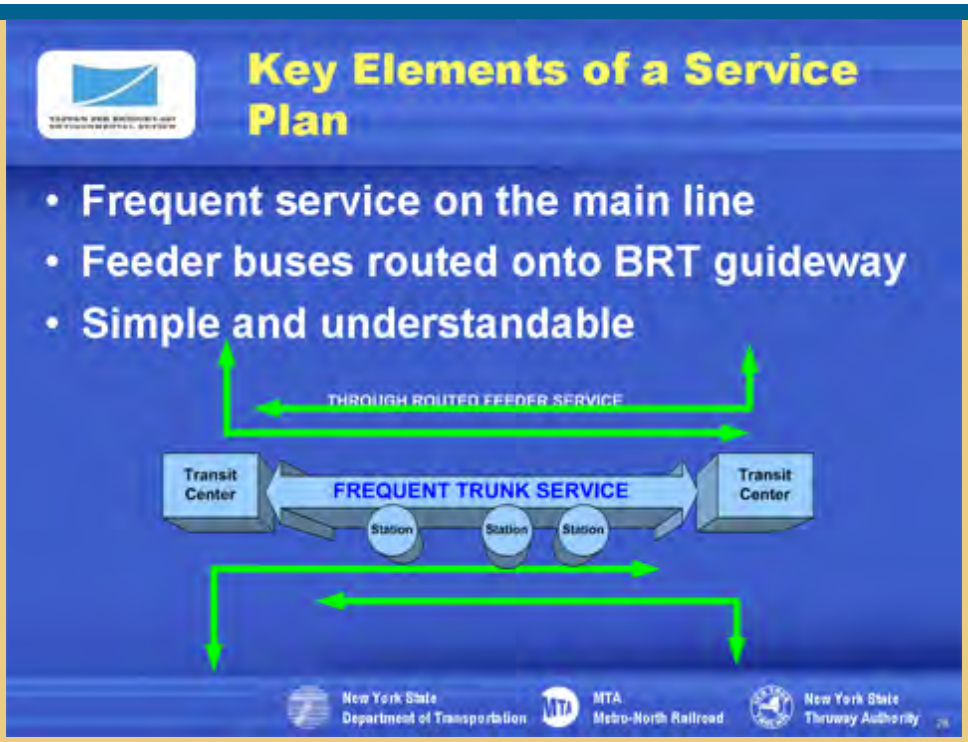
The guideway can be a separate busway like the one shown in Brisbane, Australia, or clearly designated lanes within the street that use a distinctive pavement treatment or other means to distinguish it from travel lanes for general traffic.

Pittsburgh and Los Angeles have made use of land adjacent to a rail corridor to create an exclusive busway. The Houston system is located in the center of a freeway and features fly-over ramps to access the busway. The Houston system also allows use by HOVs.

This slide shows additional freeway median systems and some of the different ramp configurations in use. The Bellevue picture shows a side loading T-ramp. The Totem Lake picture shows a ramp that rises from the median and provides access to either side of the roadway.

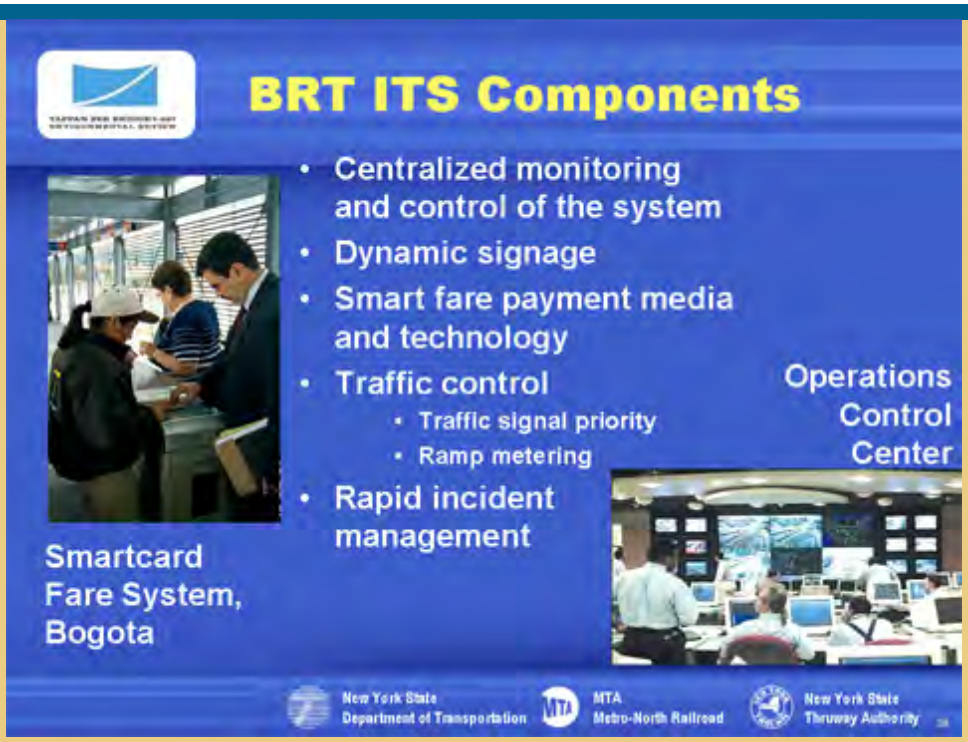
Planning for BRT guideways must address the interaction of the BRT vehicles with other uses or vehicles within the guideway and at its termini. The top left picture shows how the Orange Line in Los Angeles interacts with other vehicles at an intersection. Guideways can provide access to nearby development (bottom left photo). Some systems accommodate HOV vehicles as well; however, the key is to control volumes to maintain the desired speeds for buses. The picture on the bottom right shows what you do NOT want – a traffic jam at the end of your busway.

The BRT Service Plan details how the BRT system will operate within the guideway.



The service plan needs to feature express service as the backbone with local routes either dropping riders at stations or continuing directly into the busway to complete the trip without the need to transfer. The routing should be simple and understandable and should minimize the need for transfers.

ITS stands for Intelligent Transportation Systems and consists of a range of technological systems that can be used to improve operations, security, and communication with passengers in real time.

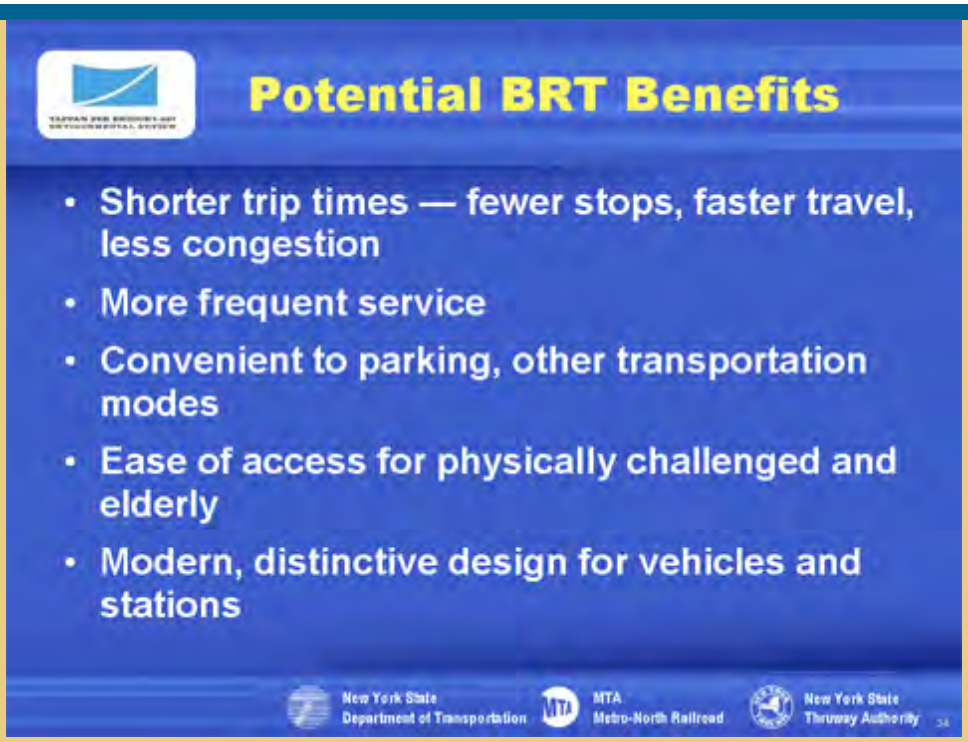


An operations control center continuously monitors system performance allowing for real time service adjustments. Fare collection can be accomplished similar to rail systems, with fares collected off the buses within the station so boarding and leaving the bus is quicker and easier. ITS also allows for traffic signal prioritization for buses, increasing average speeds where buses operate on local streets. Incident management is used to respond to traffic accidents or respond to incidents on a bus. Such a system allows the operator to deploy special vehicles or people as needed to where a problem is.

Part of making the BRT system user friendly is providing real time information so passengers know when the next bus is coming, or what stop is coming up next.

Closed circuit cameras in stations and on vehicles allow the system to be monitored from the Operations Control Center. The picture on the left shows a monitor displaying real time conditions at several locations in a BRT system.

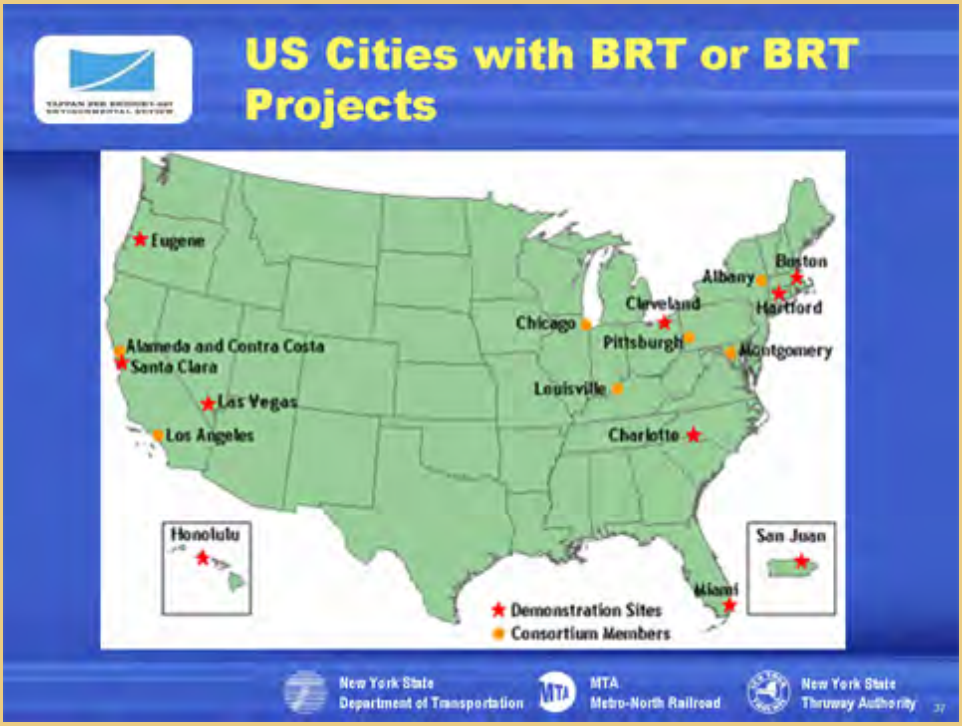
A well-designed BRT system can provide numerous benefits and advantages over traditional bus or rail systems.



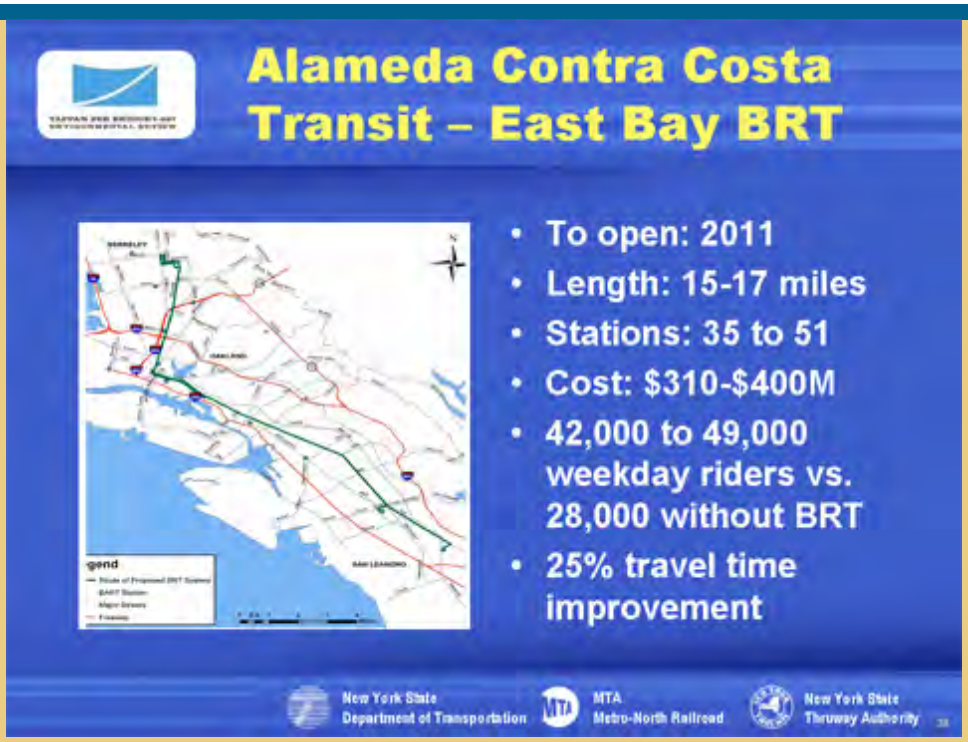
BRT systems can offer shorter trip times, with fewer stops and less congestion than other types of transit. It can also offer more frequent service and convenience to parking and other modes. Level boarding can provide easier access for the physically challenged and elderly. Finally, the system is attractive and modern.

BRT offers a number of benefits that are intended to make the system more attractive, user friendly and convenient. As mentioned earlier, off-board fare collection through modern collection systems and level boarding make boarding and exiting quick and easy. BRT can provide clean, comfortable service for an affordable price and new vehicle technologies allow for low emissions and noise. Finally, BRT is flexible, facilitating future expansions of the system when needed.

The following section provides examples of some of the more than a dozen BRT systems that are planned or in operation in the United States.

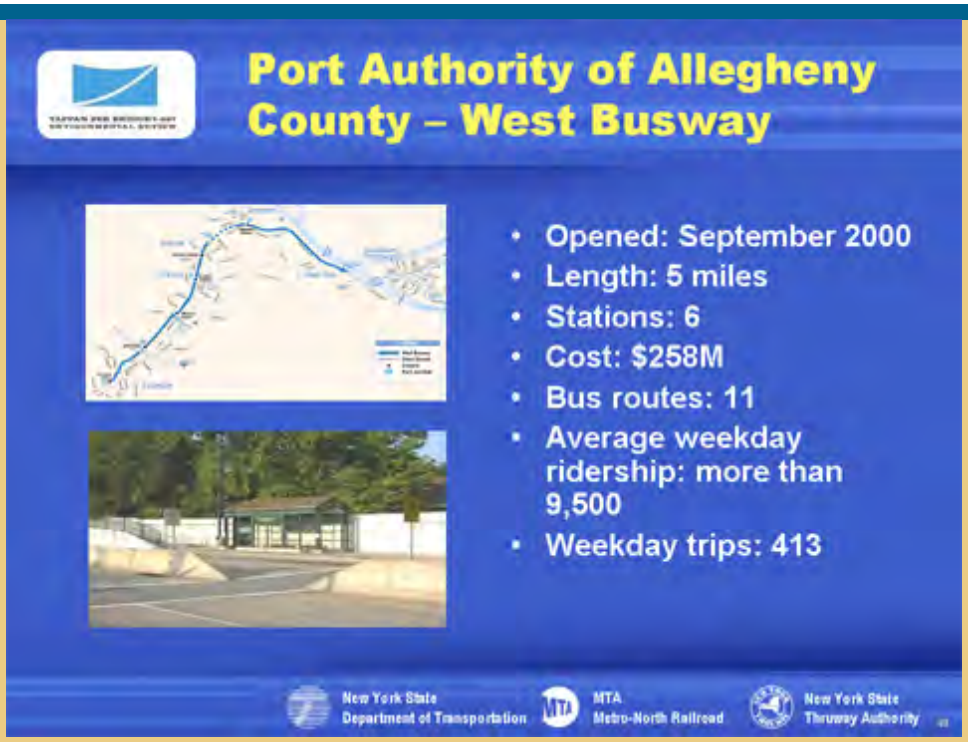


Many BRT systems currently exist or are in development today. As shown, this includes northern cities as well as cities with warmer climates.

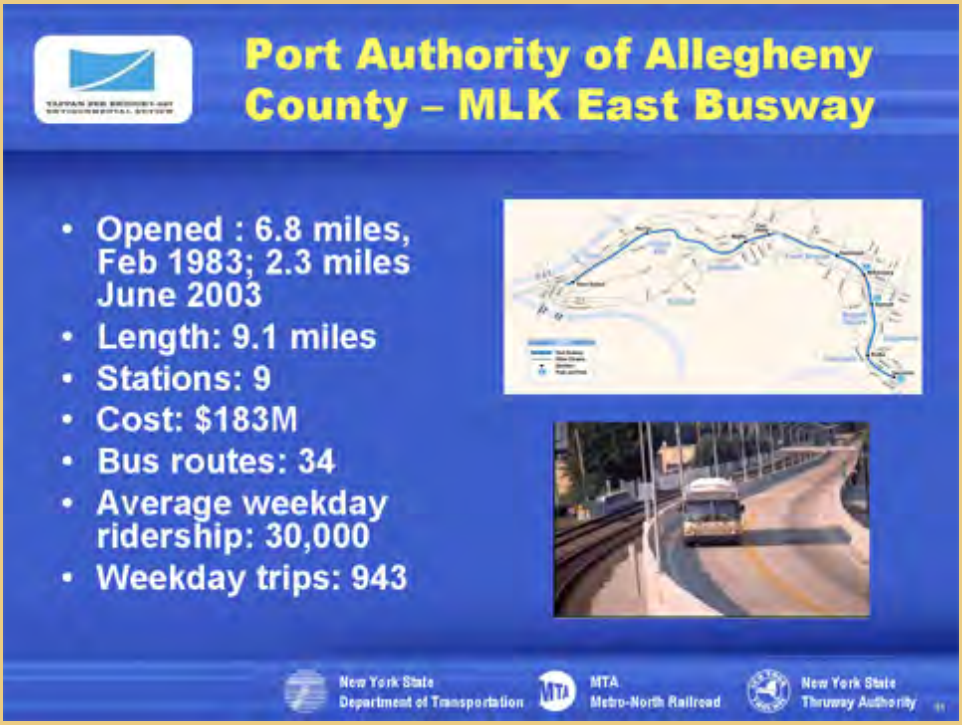


In Alameda Contra Costa a new BRT system, about 15 miles in length, is being planned. It is projected to have between 35 and 51 stations and cost $310 to $400 million. It is projected to carry about 50% more riders than the bus system it is replacing and provide a 25 percent time savings.

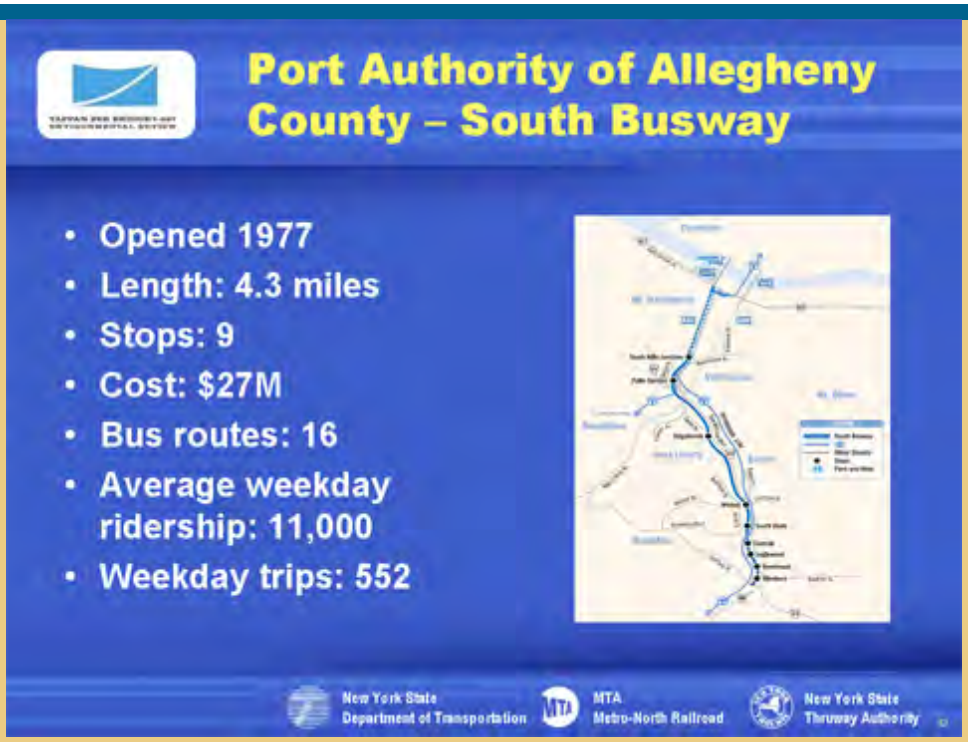
The system is being implemented by converting the center lanes of the street into an exclusive busway.



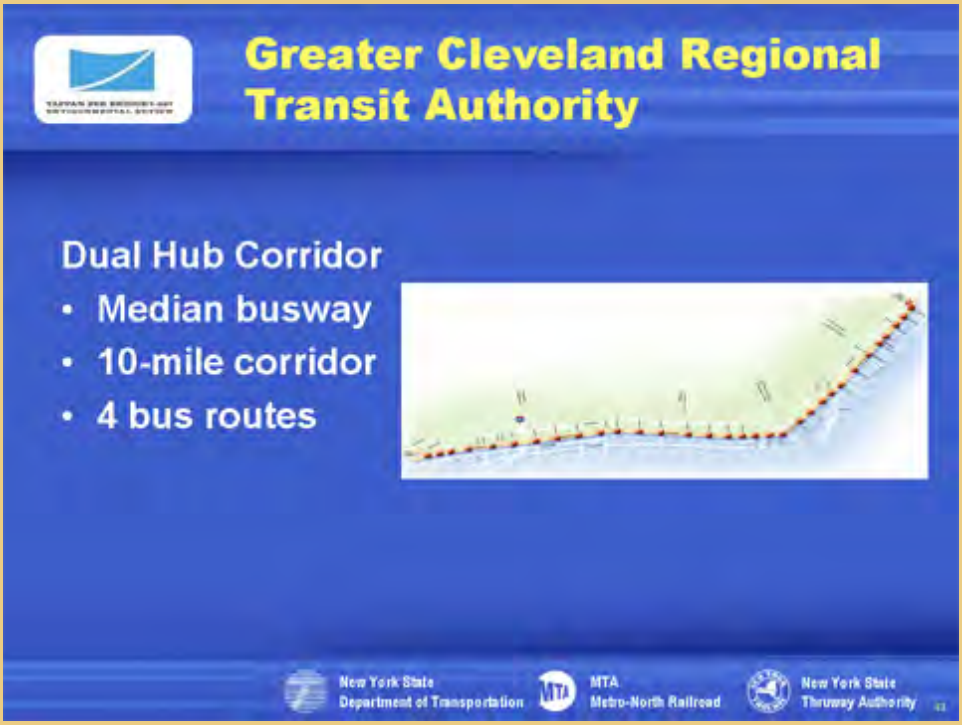
Pittsburgh has three busways. The West Busway uses an abandoned railroad right of way to connect downtown Pittsburgh with a southern suburb. This busway opened in 2000, with 6 stations over a 5-mile length and a cost of $258 million. The 11 routes (413 trips daily) that use the busway have an average weekday ridership of more than 9,500.



The East Busway shares the right of way with a freight rail line. It was extended in 2003 and is now over 9 miles long with 9 stations. Its 34 routes (943 trips daily) carry about 30,000 riders each weekday.

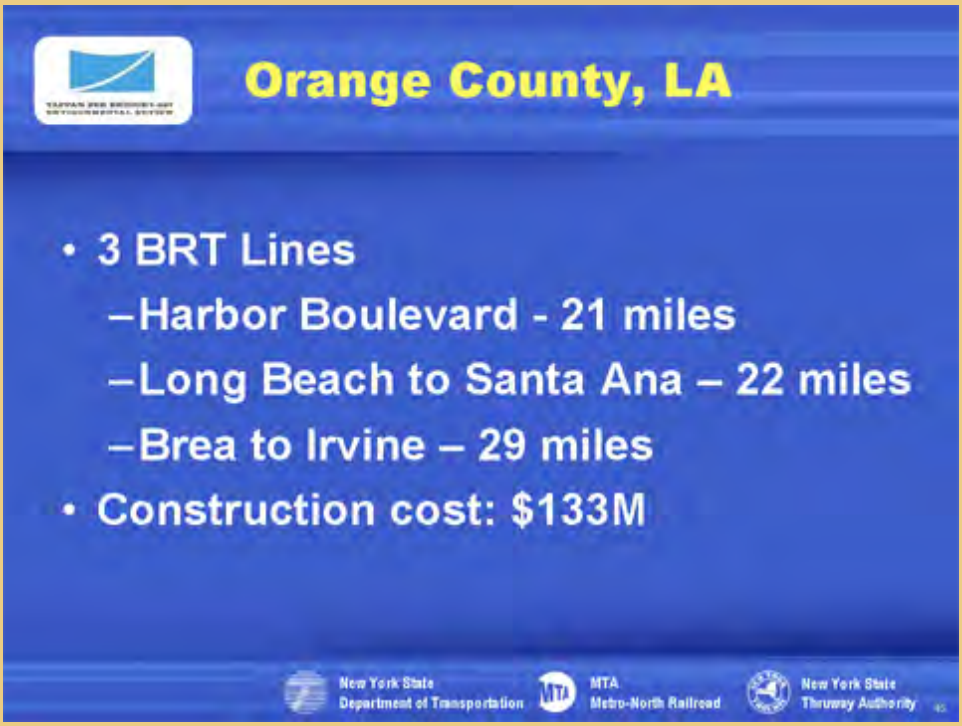


The oldest of the three Pittsburgh busways is the South Busway, which is 4.3 miles long with 9 stops. It was built in 1977 and was recently refurbished. The 16 routes (552 trips daily) that use the busway carry about 11,000 passengers each weekday.



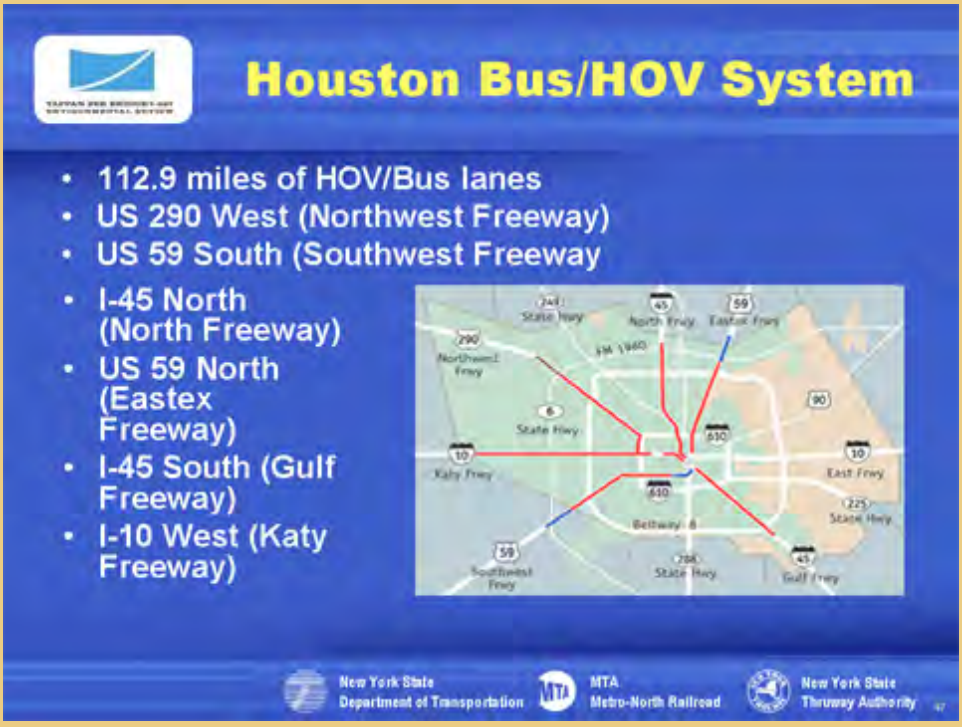
Cleveland has been completing a different sort of BRT project. This one connects downtown with University Circle, running in the middle of Euclid Avenue. The large number of stations makes the system more of a local service than some of the express busways.

These pictures show how Euclid Avenue will look when it is completed. The bus will use the median of the street for stations, requiring the buses to have left side doors.



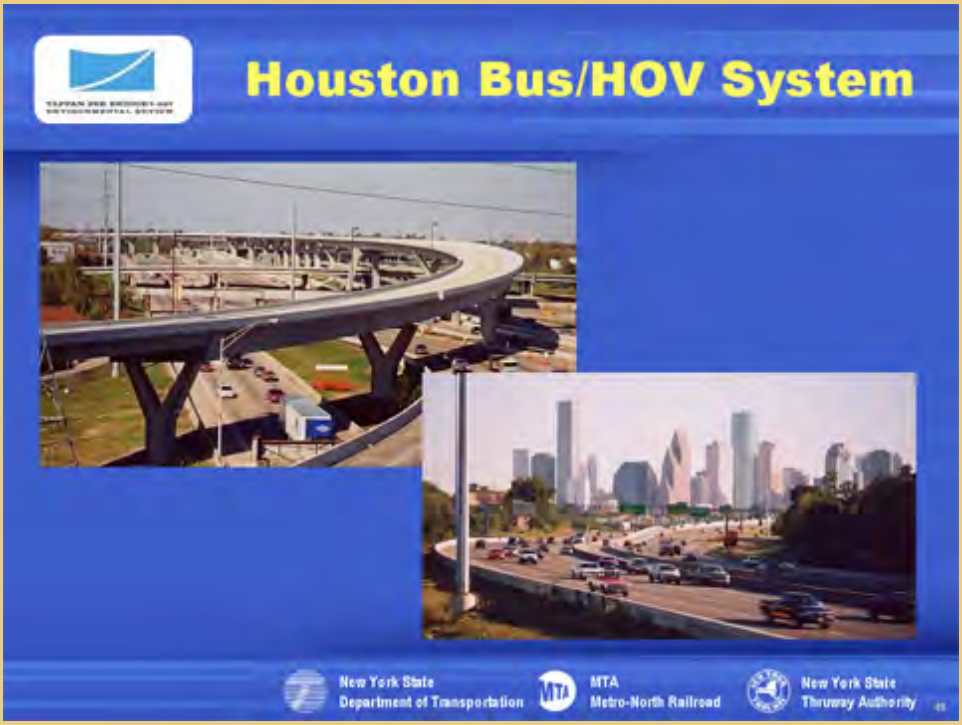
Los Angeles, Orange County, CA is implementing three BRT lines, which will include over 70 miles of BRT busways when complete at a cost of $133 million.

This is an example of branding - a design that is planned for the BRT vehicles on the Orange County BRT system.



Houston, Texas has over 112 miles of busways with high occupancy vehicles (HOVs) using them as well. They extend in almost every direction from downtown Houston.

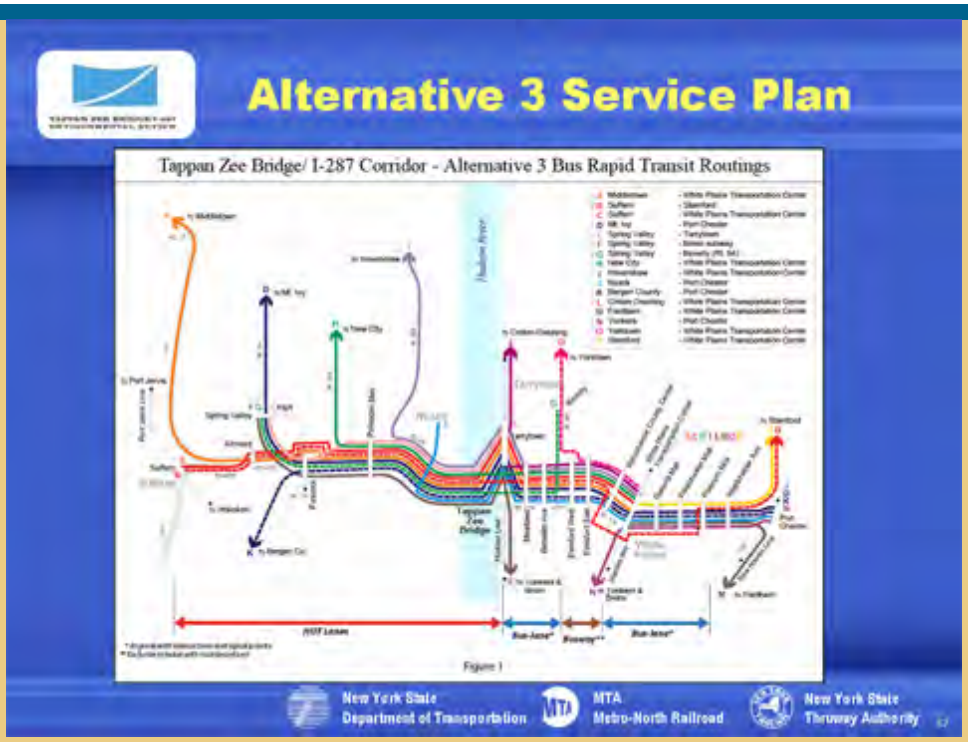
The Houston system has a large number of very large park and ride lots for riders to use. Because HOVs are allowed on the busways it is important to make sure people understand where they can and cannot drive. Clear signage keeps people who are not in an HOV from entering the busway.



These pictures show two types of busways used in Houston. The one on the left shows an elevated flyover used to get buses through the freeway interchange without being slowed. The bottom right picture shows a median at-grade busway lane in the middle of a freeway.

There is also a number of very successful BRT system in foreign cities including Ottawa, Canada; Brisbane, Australia; Curitiba, Brazil; and Bogata, Columbia.

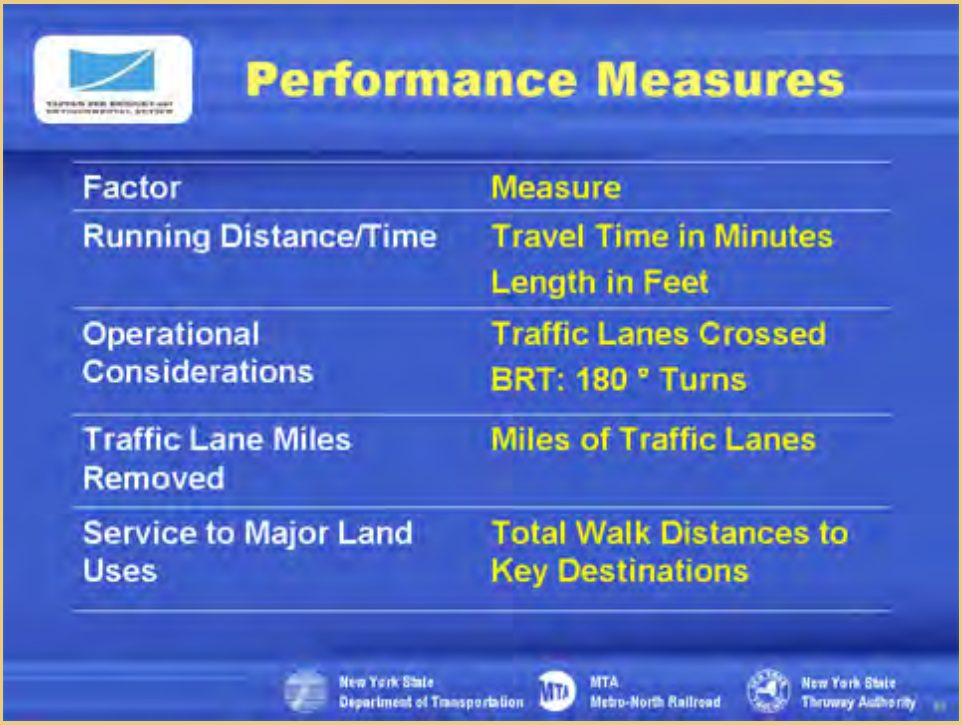
This section describes the conceptual service plan developed for the BRT system included in Alternative 3 of this project.



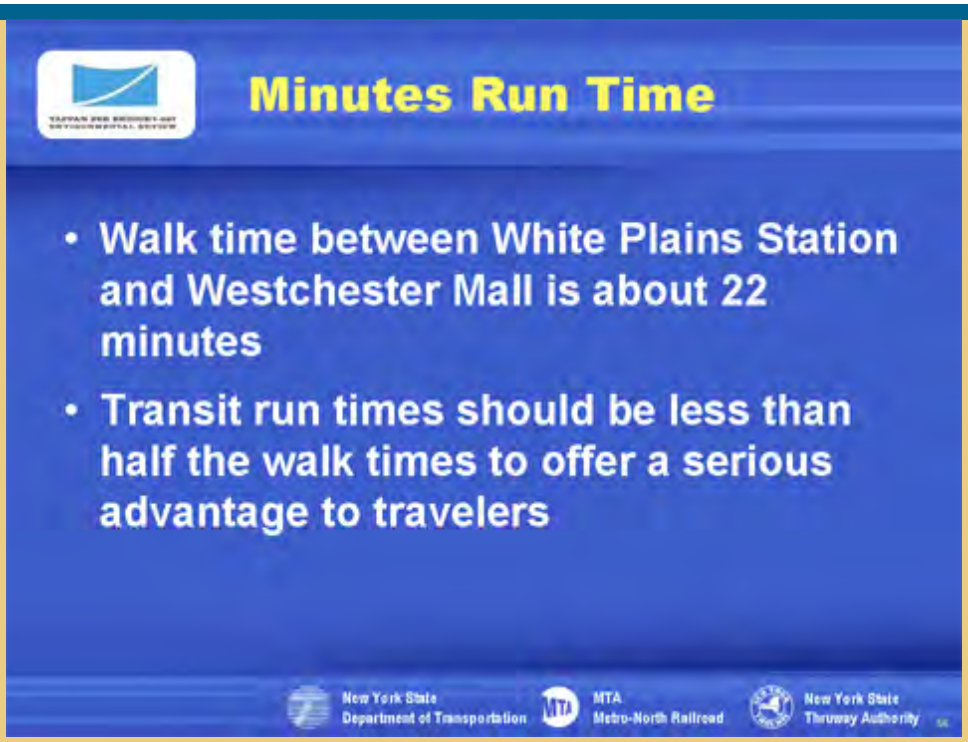
The route structure would include a trunk service in the I-287 corridor with numerous routes that would feed that corridor providing service to communities north and south of the corridor.

As a key destination of the BRT system, a study of routing through White Plains has been developed in coordination with the City of White Plains.

The study began by identifying key destinations in downtown White Plains. One quarter mile walking distances are shown as circles in the figures. These were used to determine how many stations would be needed to provide convenient access to people using the system.

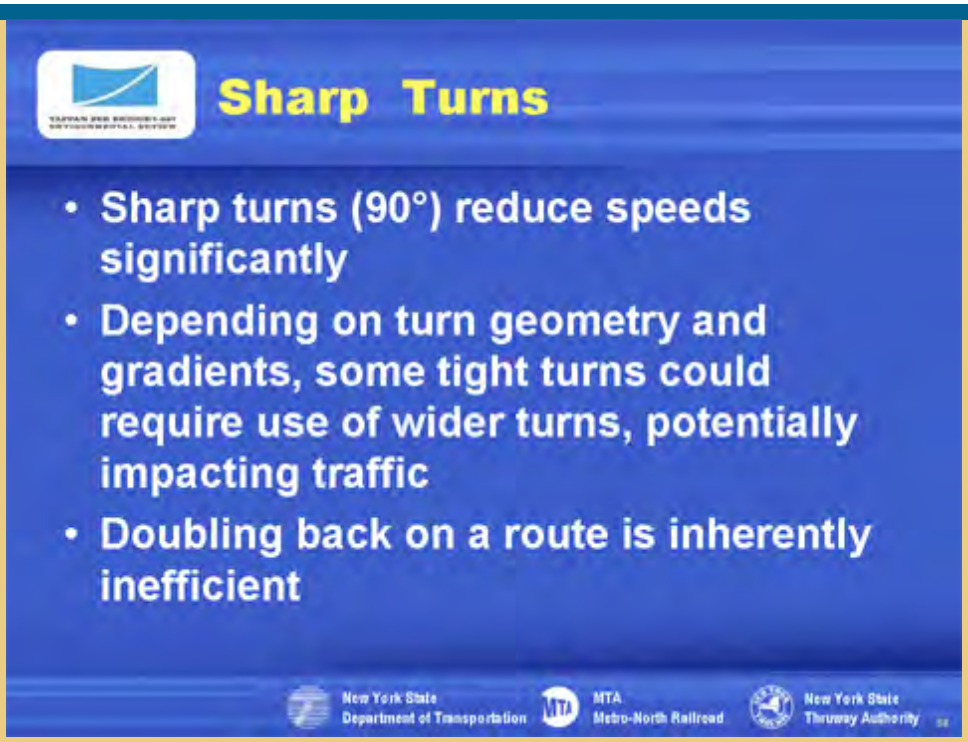


The factors used to evaluate the alternatives consisted of the time it would take for a bus to cross downtown White Plains, the ability of the buses to operate efficiently along the route, the number of lane miles each alternative would require and the total walk distances from bus stops to the key destinations for each alternative.

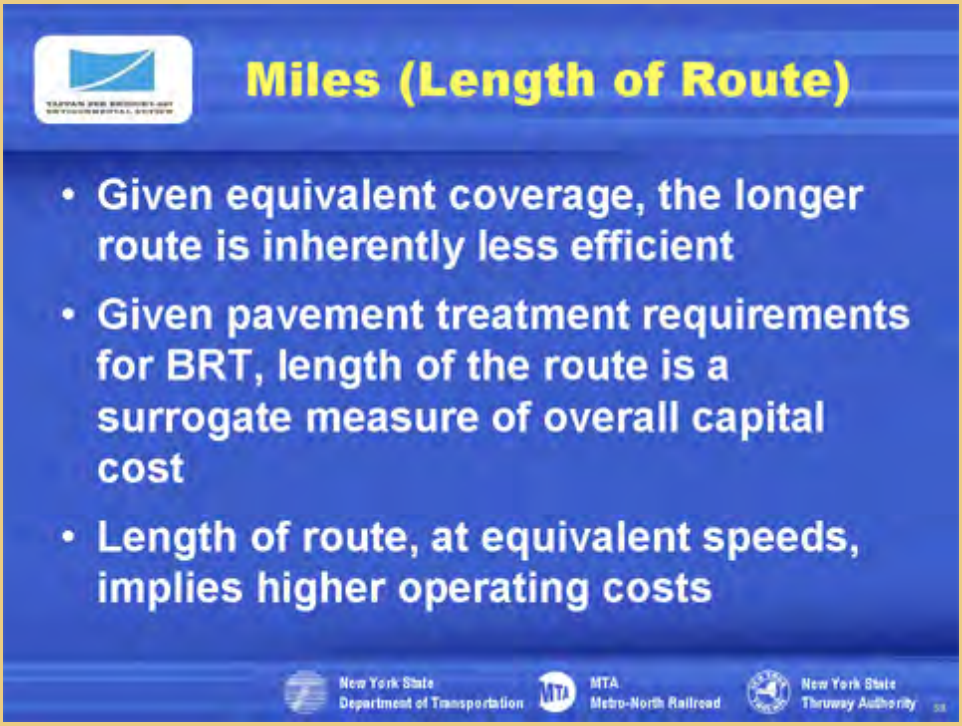


It takes about 22 minutes to walk from the White Plains Station to Westchester Mall. To be an effective alternative to walking, a BRT system would need to take less than half that time in order to offer a significant advantage.

The one-way street system throughout much of downtown White Plains would require the use of different streets for eastbound and westbound routes. For the system to be effective it was important that the eastbound and westbound routes not be too far apart; otherwise users would be forced to walk an undesirable distance on one end of their trip. Also, stations located several blocks apart for the same stop would be confusing for riders.

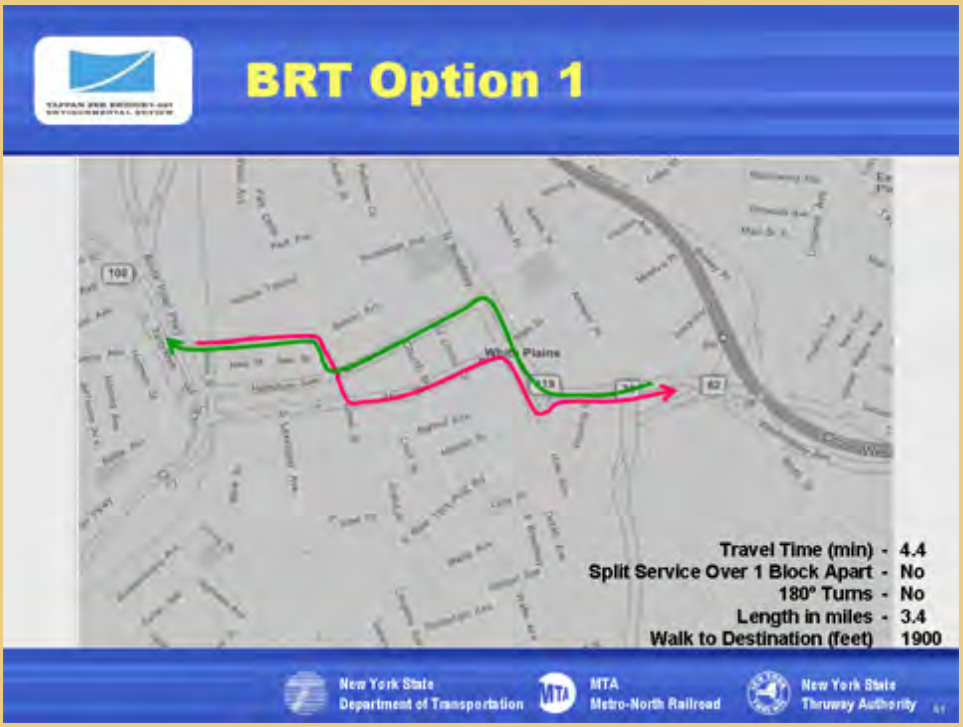


Because of their size and acceleration capabilities, frequent or sharp turns as part of a route reduce average speeds and can cause conflicts with other traffic. Sharp turns are undesirable as they force the buses to slow to a crawl to make the turns. Depending on the geometry of the turn, sharp turns can also force buses to make wide turns that may impact adjacent or oncoming traffic. Finally, any route that is overly circuitous will suffer in terms of travel time.

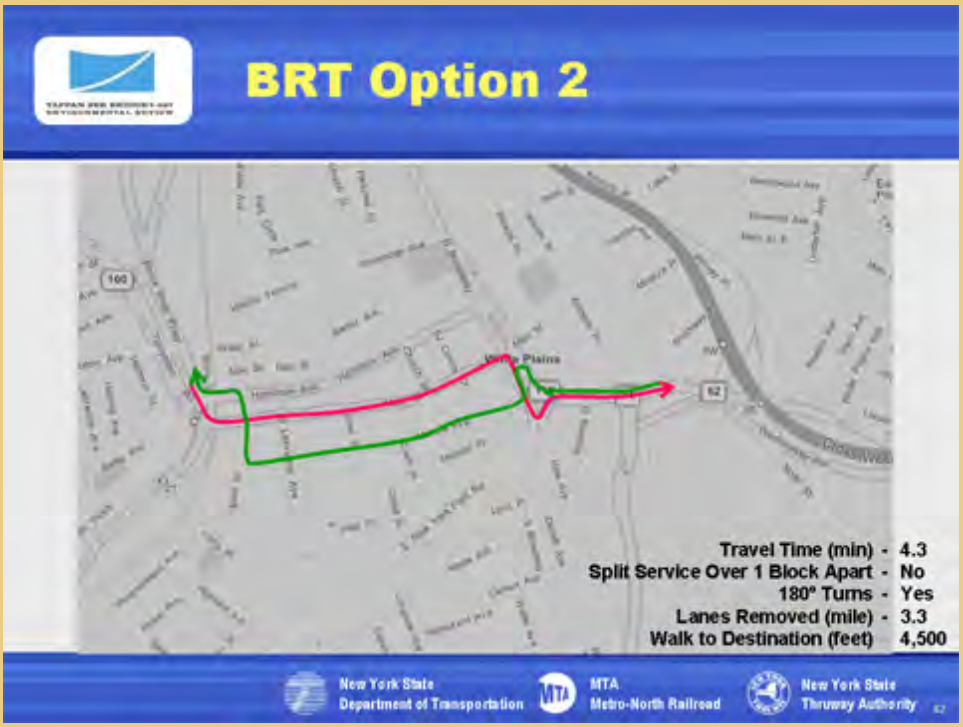


Route length is an important consideration when planning a system. When selecting among route options of equivalent coverage, longer routes are inherently less efficient. Capital costs rise as the length increases. Finally, given equivalent operating speeds, the route length also plays a key role in operating costs.

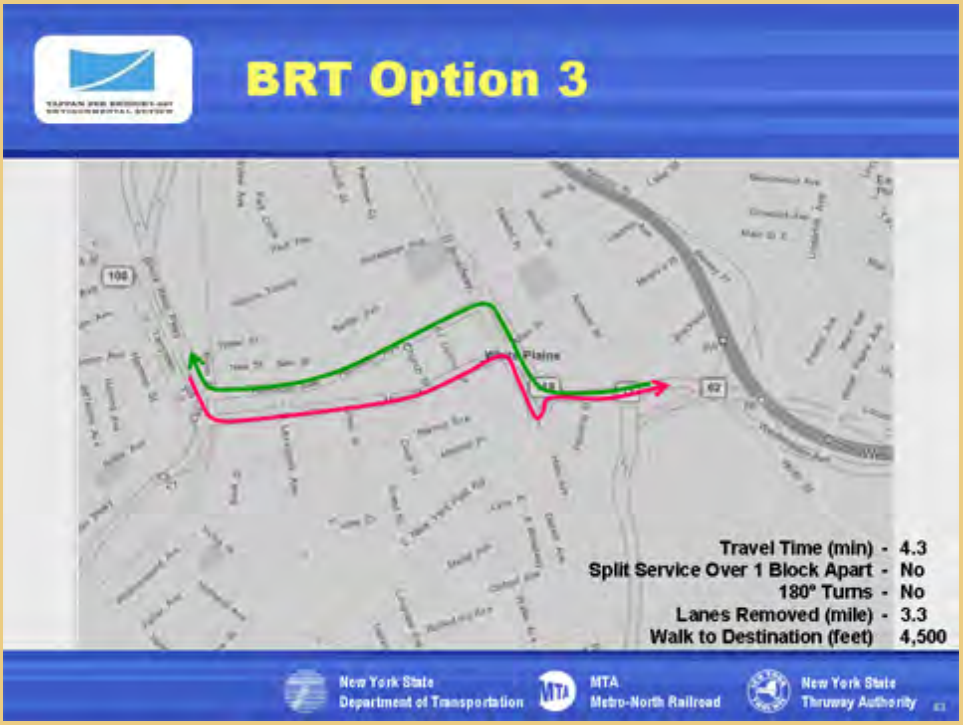
Walk distances are key to convenience. Some people will walk a half mile or more to reach a station, but most will not walk more than a quarter mile. To attract a large ridership the system must be as convenient as possible for the largest number of riders as possible. The total walk distances of each option were measured. Since riders could exit at any station, the total walk distance to each destination was measured from the closest station for each option.



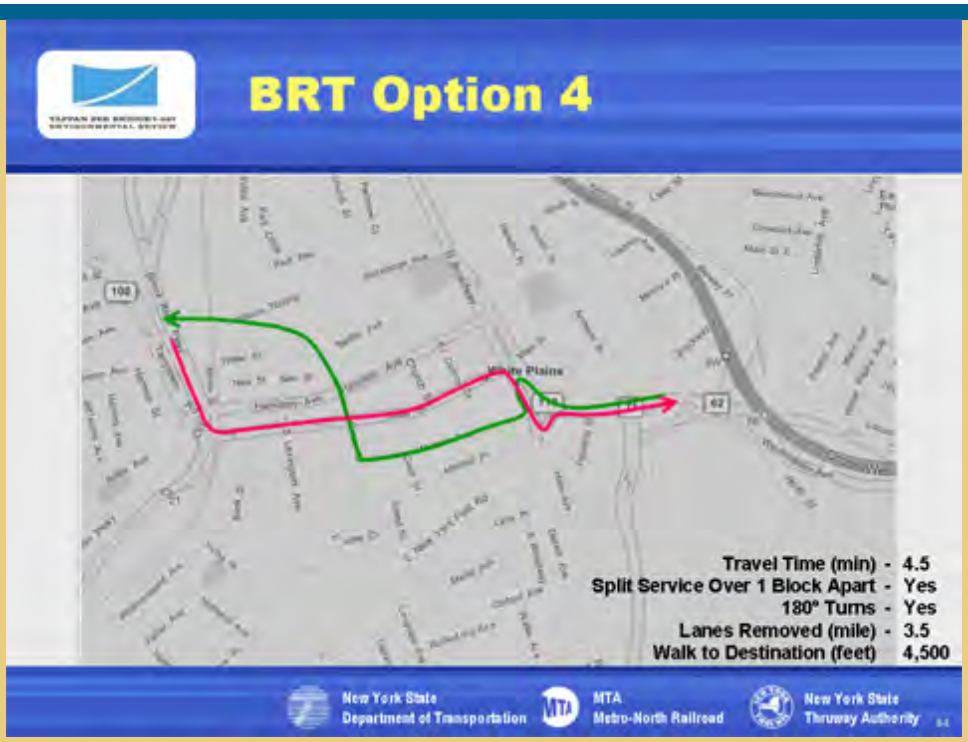
Option 1 for routing through White Plains would pass north of the Metro-North Station, go to the Transit Center and continue eastward to Westchester Mall. This option is fairly direct, but would require a new tunnel to pass under the railroad.



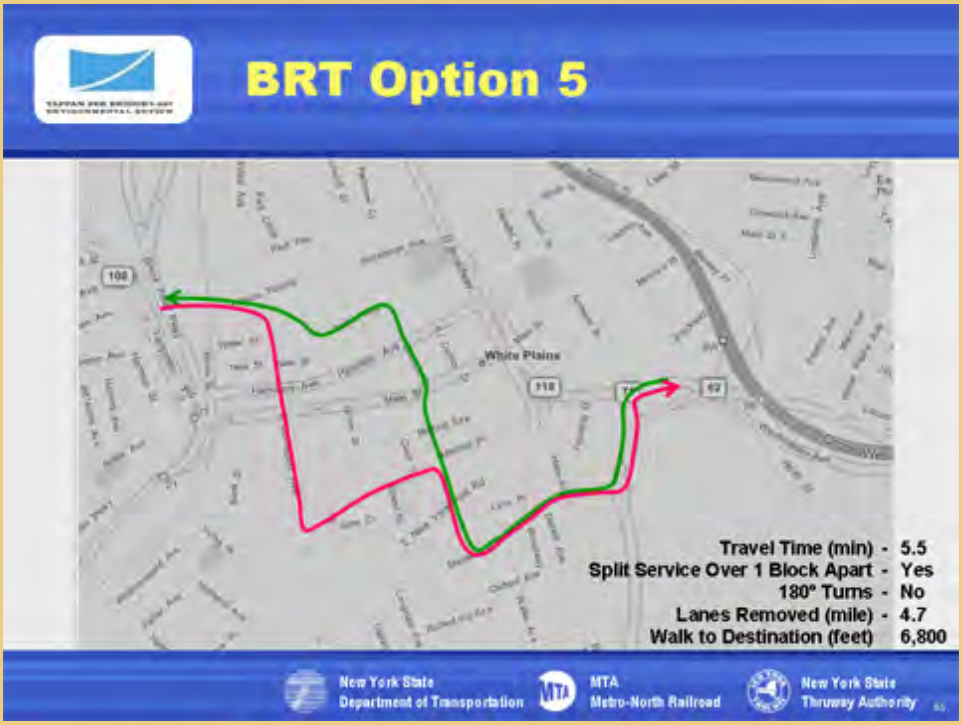
Option 2 would travel to the south of the Metro-North Station, would not require a tunnel, and is also fairly direct.



Option 3 is similar to Option 2, but is shifted to the north of the Option 2 routes.



Option 4 would split service by several blocks and would require a tunnel north of the Metro-North station under the railroad for the westbound route.



The goal of Option 5 was to avoid the busiest streets in White Plains. However, it would require a new tunnel, spread the eastbound and westbound routes by the greatest distance, is circuitous, and does not go very near most of the key destinations.

BRT Options Results

Option	Minutes Run Time	Split Service Over 1 Block Apart	180° Turns	Lane Miles Removed (miles)	Total Walk Distances to Key Destinations (feet)
BRT 1	4.4	No	No	3.4	1,900
BRT 2	4.3	No	Yes	3.3	4,500
BRT 3	4.3	No	No	3.3	4,500
BRT 4	4.5	Yes	Yes	3.5	4,500
BRT 5	5.5	Yes	No	4.7	6,800

New York State Department of Transportation · MTA Metro-North Railroad · New York State Thruway Authority

Each option was evaluated using the criteria described earlier. As you can see, option 5 was by far the worst of the options. Option 1 was the best for walk distances and close to the others in the remaining criteria.

BRT Options Summary

Alternative	Minutes Run Time	Split Service Over 1 Block Apart	180° Turns	Length in Miles	Total Walk Distances to Key Destinations (feet)
BRT 1					
BRT 2			●		
BRT 3					
BRT 4		●	●		
BRT 5	●	●		●	●

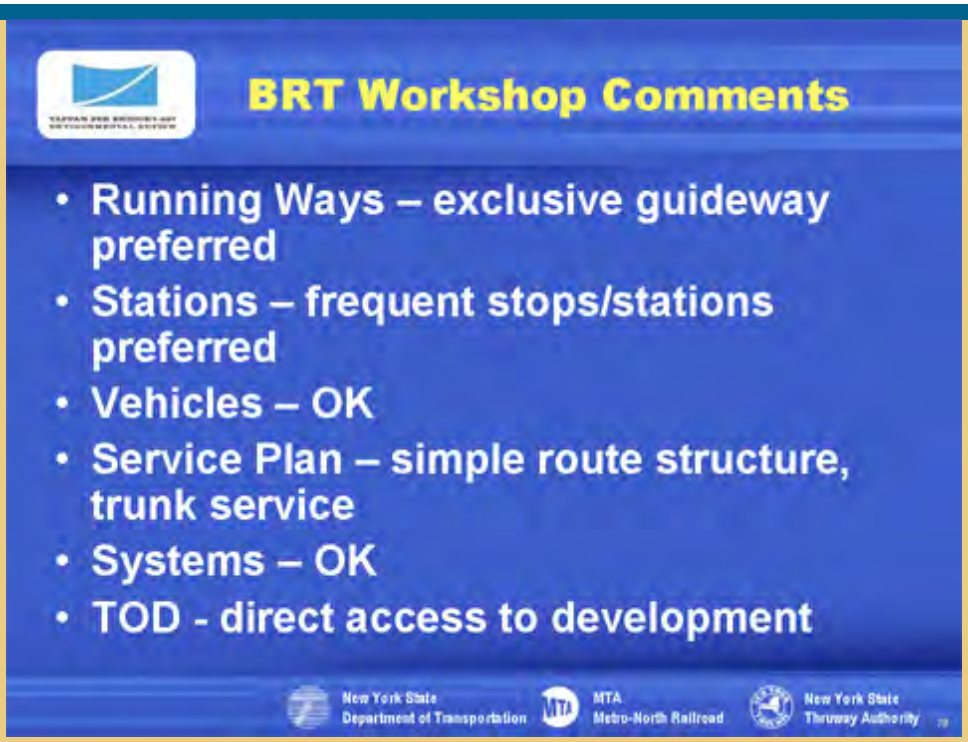
● Does not meet criterion

New York State Department of Transportation · MTA Metro-North Railroad · New York State Thruway Authority

The five options were compared against the goal for each criterion. Only options 1 and 3 met each criterion. Option 2 met all but one, Option 4 met three out of five, and Option 5 met only one.

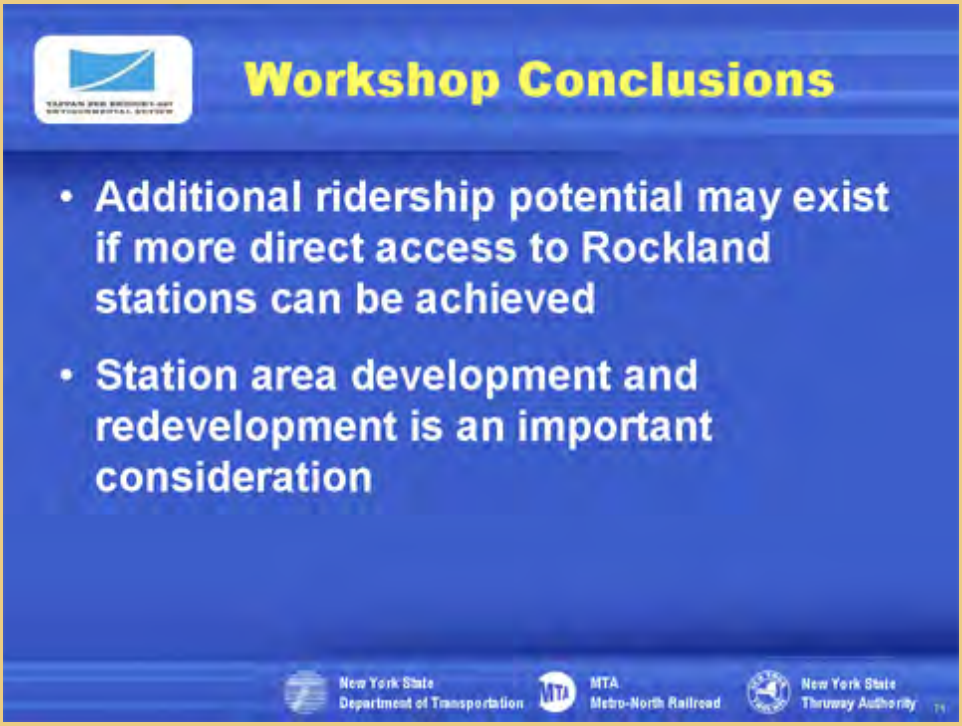
The project held a BRT Workshop September 10th and 11th to review the various BRT plans and gather input from participants.

The workshop included a panel of experts who have been involved in BRT planning, funding, implementation and operations in the US, Canada, and South America. They provided information about a variety of systems featuring the Ottawa and Brisbane systems in some detail, with systems in Bogota and Mexico City discussed as well.



After being shown the same information about the BRT plans as you have received tonight, they had several recommendations:

- Simplify the operating plan
- Provide more frequent service, with 5 minutes headways during peak periods
- Provide more direct access to the developments along the corridor
- Consider adding more stations



The panel suggested that making the recommended changes would increase ridership, particularly in Rockland County.

They also emphasized the importance of coordinating the location of stations

with existing and planned development.