

Florida High Speed Rail Authority

Orlando-Miami Planning Study Executive Summary

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With:

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March 2003

The logo for the Florida High Speed Rail Authority, featuring the text "FLORIDA HIGH SPEED RAIL AUTHORITY" in a bold, sans-serif font, centered within a stylized, horizontal, blue and white striped graphic that resembles a train or a speed line.

FLORIDA HIGH SPEED RAIL AUTHORITY

1. Introduction

In July 2002, the Florida High Speed Rail Authority authorized a preliminary, planning level study of Phase 2 of the implementation of a High Speed Rail System in the State of Florida. This study examines high-speed rail technology options, corridor options from Orlando to Miami, capital and operating costs, ridership/revenue projections and benefits. The study is similar in scope and detail to the planning level study conducted for St. Petersburg – Tampa – Orlando that was presented in the Authority's 2002 Report to the Legislature.

2. Conclusions

- Revenues are expected to exceed operating and maintenance costs for the segment between Orlando and Miami, based on preliminary ridership, revenue and cost estimates. Furthermore, the net present value of economic benefits to Florida residents and visitors is expected to exceed the cost of the segment.
- The net present value of economic benefits to the residents and visitors is expected to exceed the cost of the high speed rail system on the total St. Petersburg – Tampa – Orlando – Miami corridor. This is consistent with previous findings resulting from examination of the St. Petersburg – Tampa – Orlando corridor.
- Travel times between Orlando and Miami will range, depending on the steel wheel/steel rail technology chosen, from 2:06 to 2:33 hours with the total trip between St. Petersburg and Miami requiring between 3:30 and 4:01 hours.
- Estimates of annual ridership in 2020 between Orlando and Miami range from 4.618 to 7.092 million trips, depending on the steel wheel/steel rail technology employed.
- The estimated capital cost of high speed rail from Orlando to Miami is between \$5.1 and \$9.1 billion in year 2002 dollars, based on the choice of steel wheel/steel rail technology, exclusive of ROW and rolling stock costs.
- The average annual operating and maintenance costs will range from \$117 to \$174 million in year 2002 dollars based on the steel wheel/steel rail technologies.
- Operating ratio estimates for the year 2020 range from 2.93 to 3.05 depending on the technology. The conclusion may be drawn that excess revenues above operating and maintenance costs could contribute to funding capital infrastructure costs.
- Benefit to cost ratios are estimated to range from 1.57 to 1.95, depending on the steel wheel/steel rail technology selected.

3. Route Options

Four alignment options for the Orlando – Miami route were evaluated in this study.

CSX Railroad

From Orlando International Airport, this alignment follows the Greenway (SR 417) or Beeline (SR 528) to I-4. From I-4, the alignment follows State Route 27 south to the CSX rail corridor west of Haines City. The alignment continues west on the CSX rail corridor to Auburndale and south to West Palm Beach. From West Palm Beach, the alignment proceeds along the South Florida Rail Corridor (SFRC) to the Miami Intermodal Center. The length of this route is approximately 264 miles.

Ronald Reagan Turnpike

From Orlando International Airport, this alignment follows Boggy Creek Road to the Turnpike west of Kissimmee. The alignment continues south along the Turnpike to its intersection with the Sawgrass Expressway. The alignment passes to the west of the populated coastal region, following the Sawgrass, I-75 and State Route 924 to join the South Florida Rail Corridor to Miami's Intermodal Center. This route is approximately 226 miles long.

Interstate 95

From Orlando International Airport, this alignment follows the Beeline east to I-95. Proceeding south along the I-95 corridor, the alignment diverges southwest at Melbourne, rejoining the I-95 corridor west of Vero Beach. The alignment follows the I-95 corridor further south to Fort Pierce, where it joins the Turnpike and proceeds south to West Palm Beach. At this point, the alignment joins the CSX corridor and South Florida Rail Corridor to the Miami Intermodal Center. This route is approximately 229 miles long.

FEC Railroad

From Orlando International Airport, this alignment also follows the Beeline east to the Florida East Coast Railroad at Cocoa. It then proceeds south on the FEC corridor to Miami, turning west on an FEC branch line to join the South Florida Rail Corridor at Hialeah. From this point the alignment continues south on the South Florida Rail Corridor to the Miami Intermodal Center. The length of this route is approximately 230 miles.

Seven candidate station locations have been identified along these route options.

Station Locations by Alignment

STATION	CSX	I-95	Turnpike	FEC
Orlando International Airport	•	•	•	•
Winter Haven	•			
Brevard County (SR 520 area)		•		•
Fort Pierce		•	•	•
West Palm Beach	•	•	•	•
Ft. Lauderdale/N. Lauderdale	•	•	•	•
Miami Intermodal Center	•	•	•	•

As noted in the preceding table, the station locations are dependent on the alignments chosen. Specific sites are located as follows:

- The Orlando station is located on the south side of the Orlando International Airport and would be constructed under the Phase 1 Tampa to Orlando project.
- The Winter Haven station is located on the southern city limits of Winter Haven along the CSX/US 17 alignment.
- Two alternative stations in Brevard County were considered. These are located at the northwest quadrant of SR 520 and I-95 and at the southwest quadrant of the intersection of SR 528 (Beeline) and US 1.
- Two Fort Pierce stations were considered. One is located along Orange Ave between Florida’s Turnpike and I-95 and the other on the FEC alignment along at Orange Ave.
- Three stations in West Palm Beach were considered. One is located on the CSX /Interstate 95 alignments at the eastside of the Palm Beach International Airport. A second alternative is on the FEC railroad/US 1 alignment at Belvedere Road. The third is on Florida’s Turnpike north of Southern Boulevard.
- In the Ft. Lauderdale area, the two stations under consideration are south of Interstate 595 along the CSX/Interstate 95 alignments in the vicinity of the Ft. Lauderdale Airport. A second alternative is north of the Interstate 595 / Interstate 75 interchange along the east side of the Sawgrass Expressway.
- All alignments will terminate with a station located in the Miami Intermodal Center east of the Miami International Airport.

Orlando-Miami Route and Station Options



4. Capital Costs

Capital cost estimates were prepared for each of the four alternatives based on updated unit costs that were originally developed for use in the Authority's Orlando-Tampa Study. Where applicable, the unit costs have been updated from 2000 to 2002 dollars by inflating at 2.5% per year, rounded to 5%. As in the Orlando-Tampa study, the unit costs include base construction cost plus contingencies and program costs totaling 51%. Right-of-way costs and the cost of rolling stock are not included in these estimates.

Capital Costs (billions of 2002 dollars)

Route/Technology	Electrified	Non-Electrified
CSX	\$5.8	\$5.1
I-95	\$6.9	\$6.2
Turnpike	\$6.3	\$5.6
FEC	\$9.1	\$8.4

Although the segment from West Palm Beach to Miami is approximately 1/3 the length of the entire corridor, this segment accounts for between 40% and 60% of the total cost. This is due to the fact that much of the guideway must be constructed on elevated structure to achieve grade separation from the existing transportation infrastructure.

5. Right of Way

Due to the uncertainty of establishing costs for privately owned property, this report did not include property acquisition costs in the capital cost estimates. However, estimates of property acquisition requirements in acres have been established, so as to aid in ranking the routes.

Each of the four alignments traverses privately owned land for most of distance between Orlando and Miami. The principal exception occurs for the I-95 and CSX routes, where much of the alignment runs in the I-95/South Florida Rail Corridor between West Palm Beach and Miami International Airport. The I-95 corridor and the South Florida Rail Corridor are owned by the State of Florida.

For planning right of way requirements, we have assumed that either publicly owned or privately held right of way must be obtained for the construction of the high-speed rail alignment. In order to estimate required acreage, we have assumed that alignments parallel to an existing freight railroad will require a 60 ft wide strip and alignments parallel to a highway or traversing cross country will require a 100 ft wide strip.

Right-of-Way Estimates in Acres, Including Public and Private

Segment / Route	CSX	I-95	Turnpike	FEC
Orlando – West Palm Beach	1218	1890	1714	1102
West Palm Beach – Miami	881	881	964	625
Total	2099	2771	2678	1727

6. Route Evaluation

The four route alternatives have been evaluated qualitatively on the basis of expected travel time, capital cost, travel demand and environmental factors. Routes were rated as follows:

Comparative Summary

Route	Travel Time	Capital Cost	Ridership / Revenue	Environmental
CSX	Fair	Good	Fair	Fair
I-95	Good	Fair	Good	Good
Turnpike	Good	Good	Fair	Good
FEC	Poor	Poor	Good	Poor

7. Travel Time

Travel times were determined based on the I-95 route option using different technologies.

Travel Time Comparison among Technologies

Speed Category	Travel Time*		
	St. Pete-Orlando	Orlando-Miami	St. Pete-Miami
120+ mph	1:28	2:33	4:01
150+ mph	1:25	2:19	3:44
180+ mph	1:24	2:06	3:30

*Travel time with five percent recovery time, two-minute station dwell time and local stopping pattern

8. Frequency of Service

The frequency of service was determined based on estimated ridership. In practice, frequency generally increases with the speed of the technology chosen. The frequency ranges from 12 to 20 round trips per day between St. Petersburg and Miami.

Proposed Frequencies in the Corridor (by technology and route segment)

Technology	Route Segment	Frequency (Daily Round Trips)
120+ mph	Tampa Bay – Southeast Florida	12
	Orlando Area Service	8
150+ mph	Tampa Bay – Southeast Florida	16
	Orlando Area Service	8
180+ mph	Tampa Bay – Southeast Florida	20
	Orlando Area Service	8

9. Train Sets Required

Timetables and frequencies yield trainset quantities and capital costs as follows:

Trainsets Required for System Operation (St. Petersburg-Tampa-Orlando-Miami)

Technology	Total		
	Trainsets Required*	Number of Spares	Trainsets Required Including Spares
120+ mph	13	3	16
150+ mph	17	3	20
180+mph	21	4	25

*One trainset is provided for Orlando Area Shuttle Service

Rolling Stock Cost Summary

Technology	Total		
	120+ mph	150+ mph	180+ mph
Consist ⁽¹⁾	1+7+1	1+4+1	1+5+1
Cost per Trainset (millions)	\$16	\$17	\$18
Required Initial Number of Trainsets ⁽²⁾	16	20	25
Rolling Stock Cost (millions)	\$256	\$340	\$450
Cost per Seat (thousands)	\$63	\$65	\$60

(1) For the three steel-wheel-on-steel-rail technologies, the first number indicates the lead locomotives in the consist; the second, the number of passenger cars; and the third number, if present, is the trailing locomotive and/or cab car.

(2) For each of the technologies, the trainset requirement includes a spare trainset.

10. Operating & Maintenance Costs

Operating and maintenance costs have been determined based on technology and annual train miles.

Total Annual Trainmiles and Operating & Maintenance Costs for Entire System (St. Petersburg-Tampa-Orlando-Miami)

	Technology		
	120+ MPH	150+ MPH	180+ MPH
Total Annual Trainmiles (millions)	2.96	3.92	4.87
Total Annual Operating and Maintenance Costs (millions of 2002\$)	\$116.6	\$157.7	\$174.0

11. Ridership

Forecasts for the four different high-speed rail technologies were generated for the I-95 Route from Orlando to Miami. Station stops include Orlando, Brevard County, Ft. Pierce, West Palm Beach, Ft. Lauderdale, and Miami.

Orlando to Miami Ridership by Technology (Based on Varying Trip Frequency by Technology)

Technology	Annual Ridership/Revenue	Forecasted Years			
		2011*	2015	2020	2040
120+ mph	Ridership (millions)	1.794	4.046	4.618	7.686
150+ mph	Ridership (millions)	2.217	5.000	5.707	9.497
180+ mph	Ridership (millions)	2.755	6.213	7.092	11.801
* Includes 50 percent ramp-up for first year of operation					

Ridership projections were also made using a uniform round trip frequency to demonstrate the changes in ridership due purely to the technology (and resultant travel time) chosen. All other ridership dependent computations in this study employ the ridership values estimated using varying trip frequency by technology.

Orlando to Miami Ridership by Technology (Based on 16 Round Trips)

Technology	Annual Ridership	2011*	2015	2020	2040
120+ mph	Ridership (millions)	1.886	4.235	4.862	8.090
150+ mph	Ridership (millions)	2.217	5.000	5.707	9.497
180+ mph	Ridership (millions)	2.501	5.616	6.447	10.728
* Includes 50 percent ramp-up for first year of operation					

The construction of the Orlando to Miami segment will increase ridership on the previously constructed St. Petersburg – Tampa – Orlando segment.

**Incremental Increase in Ridership from St. Petersburg to Orlando Corridor
(Based on Varying Trip Frequency by Technology)**

Technology	Annual Ridership	Forecasted Years			
		2011*	2015	2020	2040
120+ mph	Ridership (millions)	0.276	0.623	0.711	1.184
150+ mph	Ridership (millions)	0.335	0.755	0.861	1.434
180+ mph	Ridership (millions)	0.404	0.912	1.04	1.731

* Includes 50 percent ramp-up for first year of operation

12. Financial and Economic Analysis

Two key measures of success of a passenger rail system are operating ratio and benefit to cost ratio. Operating ratios are calculated by dividing operating revenue by operating cost. Ratios are presented for the year 2020. Ratios greater than 1.0 are favorable results for passenger rail service. The sensitivity of the predicted operating revenues has been tested by considering the possibility that revenues are overstated by 20% and operating costs understated by 20%. Resultant operating ratios remain strongly favorable.

**System Operating Ratios by Technology in 2020
(St. Petersburg-Tampa-Orlando-Miami)**

Technology	Total Operating Revenue (\$ Millions)	Operating & Maintenance Cost (\$ Millions)	Operating Ratio (2020)	Sensitivity of Operating Ratio* (2020)
120+mph	\$342.730	\$116.639	2.93	2.22
150+mph	\$436.046	\$157.733	2.76	2.09
180+mph	\$531.122	\$174.040	3.05	2.30

Note: Operating revenue include farebox and ancillary revenues.
*Sensitivity is +20% O&M Cost and -20% Operating Revenue

Benefit to cost ratios are calculated by dividing the NPV of total project benefits by the NPV of total project costs. Ratios greater than 1.0 are favorable. Results for the St. Petersburg-Tampa-Orlando-Miami service are strongly favorable.

**System Benefits to Costs Comparison
30-Year Net Present Value in Millions of 2002 Dollars
(St. Petersburg-Tampa-Orlando-Miami)**

	30-Year Net Present Value (in \$ Millions, 2002\$)		
	120+ mph	150+ mph	180+ mph
Total Benefits	\$14,830.49	\$18,771.85	\$22,660.12
Total Costs	\$9,435.62	\$10,211.15	\$11,592.56
Ratio of Benefits to Costs	1.57	1.84	1.95