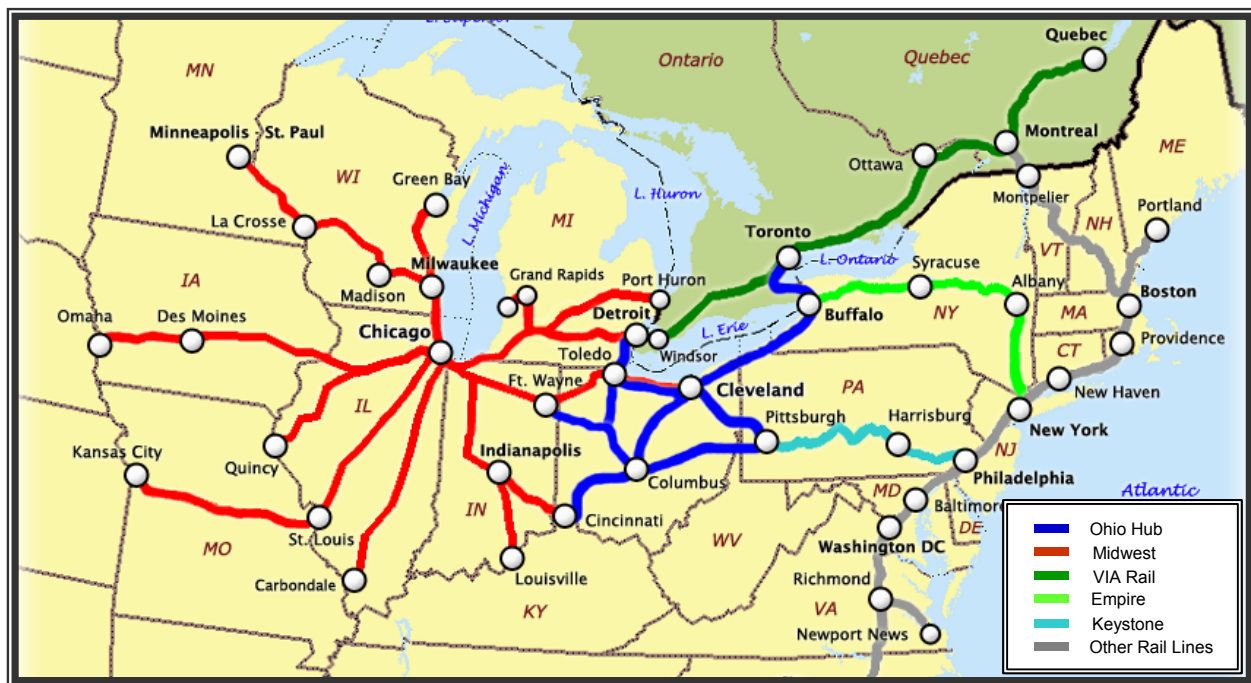


## 1. Introduction

The Ohio Hub Study is part of an ongoing effort by the Ohio Rail Development Commission, and the Ohio Department of Transportation to further develop the concept of expanding transportation capacity by improving the railroad system for both passenger and freight trains. This report culminates a multi-year effort to determine, at a conceptual level, the financial and economic feasibility of developing an intercity/interstate passenger rail system serving all of the major metropolitan areas in the region while connecting to the proposed Midwest Regional Rail System (MWRRS)<sup>1</sup> and other developing rail corridors in neighboring states. Ohio's neighboring state DOT's have partnered in the study and contributed to the analysis.

The study examines the potential role that the Ohio Hub could play as part of an interconnected, international network of regional passenger rail services. As shown in Exhibit 1-1, the envisioned regional rail system would integrate the region's air, highway and transit networks and interconnect with New York's *Empire Service*, Pennsylvania's *Keystone Service*, the Northeast Corridor, Canada's *VIA Rail* as well as the MWRRS. The Ohio Hub system would become a critical component of the nation's intercity passenger rail network.

Exhibit 1-1: Regional Rail Corridors Connecting to the Ohio Hub System



<sup>1</sup> The MWRRS calls for the development of a "Chicago Hub," envisioned as a 3,000-mile rail system with eight passenger rail corridors serving 60 million people in a nine-state region. Three MWRRS passenger rail corridors would connect to the Ohio Hub System: Chicago-Detroit, Chicago-Toledo-Cleveland and Chicago-Indianapolis-Cincinnati. The most current MWRRS report was issued in October 2004.

This Ohio Hub Study Update integrates the Midwest Regional Rail System into an overall plan for improving rail service in the Ohio and Lake Erie region. The original Ohio Hub Study, published in October 2004, focused on four interconnected corridors serving a hub in Cleveland:

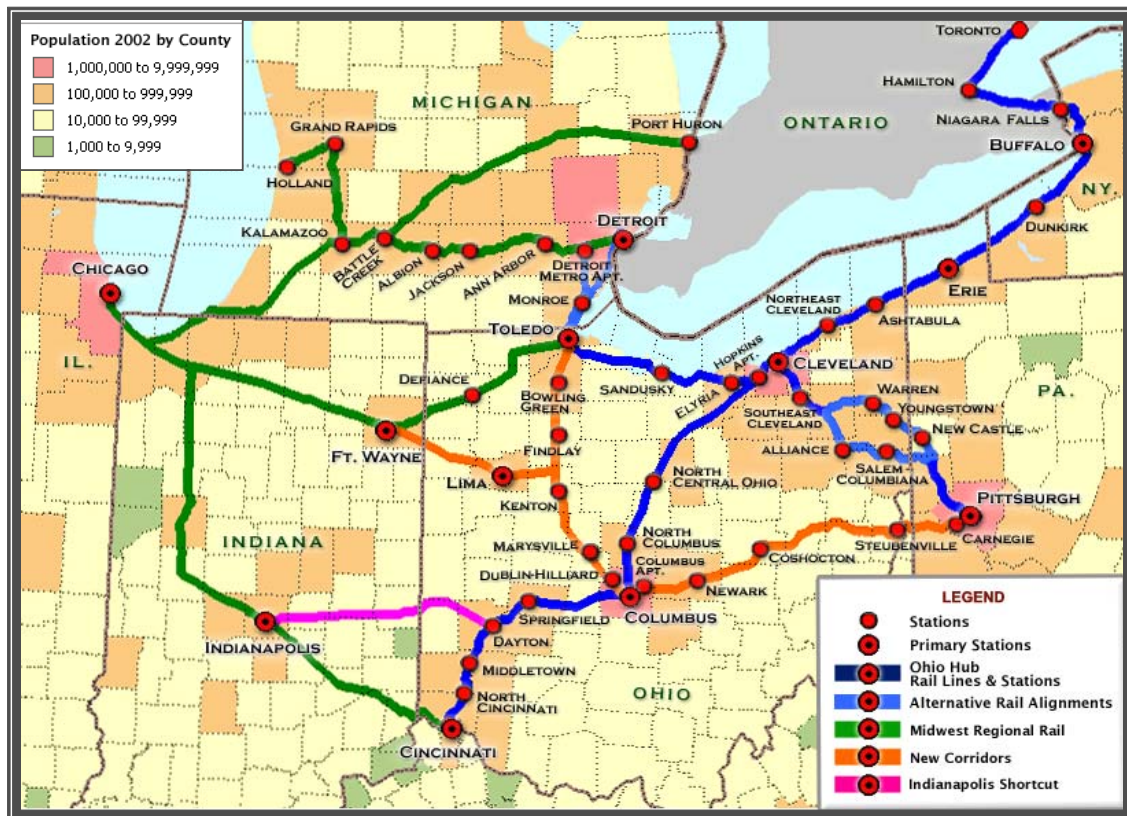
- Cleveland-Columbus-Dayton-Cincinnati
- Cleveland-Toledo-Detroit via the “preferred” route serving Detroit Metro Airport
- Cleveland-Pittsburgh via the “preferred” route serving Youngstown
- Cleveland-Erie-Buffalo-Niagara Falls-Toronto

This updated 2007 study carried the analysis forward by adding three “Incremental” corridors:

- Columbus-Pittsburgh via the “Panhandle” route
- Columbus-Toledo with through service continuing on to Detroit
- Columbus-Lima-Fort Wayne with through service continuing on to Chicago

Exhibit 1-2 shows the envisioned fully-built out MWRRS and Ohio Hub networks, overlaid on a population density map of the Upper Midwest region. The green lines represent the original MWRRS corridors running east from Chicago; the blue lines show the original four Ohio hub corridors (including in light blue, the route alternatives serving Detroit and Pittsburgh); the orange lines are the newly added incremental corridors; and the purple line is the Dayton to Indianapolis segment that was analyzed using the parametric approach.

**Exhibit 1-2: MWRRS and Ohio Hub Rail Systems with Incremental Corridors Added**



## 1.1 System Planning and Feasibility Goals and Objectives

The Ohio Hub Study is a feasibility analysis that envisions the construction and operation of a passenger rail system that is as of yet, unfunded and not negotiated. Therefore, the goal of the study is to determine, at a feasibility level, the financial and economic potential for developing the Ohio Hub System, with its original four Cleveland-based corridors along with the three newly-added Columbus-based corridors.

The study provides a comprehensive technical analysis of the system characteristics and the regional intercity travel market. The purpose of the analysis is to understand in broad terms the railroad engineering and capital requirements, train characteristics and operational issues, service levels, as well as operating and capital cost synergies and economies of scale.

A primary study objective is to determine if the Ohio & Lake Erie Regional Rail system is an appropriate expansion of the federally designated high-speed passenger rail network. Therefore, the study focuses on understanding the regional travel markets and the potential interaction between markets served by the Ohio Hub rail corridors and those served by other emerging corridors.

While the study advances the Ohio Hub as part of a national passenger rail network, it also examines the feasibility of a “stand-alone” operation. The stand-alone system assumes no operating synergies, cost or revenue benefits from interconnecting rail services. In addition, the study incorporates additional rail ridership generated by feeder bus services to outlying towns and cities. The Study examines two passenger rail service options – a *Modern Scenario* and a *High-Speed Scenario*. The Modern Scenario provides for passenger train speeds up to 79-mph; the High-Speed Scenario offers train speeds up to 110-mph.

The earlier 2004 study included an analysis of alternative routes on two of the Cleveland-based corridors: Two Cleveland-Pittsburgh routes were examined – one alternative via Alliance, the other via Youngstown. Two Cleveland-Toledo-Detroit routes were also analyzed – one runs via Wyandotte, Michigan, the other via Detroit Metro Airport. The study compares these routes and provides the estimated capital costs and ridership forecasts for each alternative. Exhibit 1-2 illustrates the Detroit and Pittsburgh corridor alternatives that were analyzed in the study. A primary result of the 2004 study was the finding that the Youngstown and Detroit Metro alternatives were the two routes that generated the best financial performance, so these were the preferred corridors that were advanced into the 2007 update.

While the primary purpose of the study is to assess the feasibility of the Ohio Hub system, the study also advances a *preliminary system plan* for implementing rail service. With respect to the evaluation of alternative routes, the study recommends a *preferred system configuration* with specific routes, however, there remains many railroad, environmental, and project development activities that require further study, analysis, and public and stakeholder input. Production of a *final system plan* is beyond the scope of this feasibility study. A full environmental study that includes freight railroad input, local input and public comment is needed. It is anticipated that the final selection of the Ohio Hub routes will be decided as part of a Programmatic Environmental Impact Statement.

## **1.2 Business Planning Objectives**

In order to maintain consistency among regional rail planning efforts, the Ohio Hub was planned in conjunction with the proposed Midwest Regional Rail System (MWRRS). The Ohio Hub Study uses the same assumptions as the MWRRS with respect to engineering and capital costs, forecasting ridership and revenues, and financial and cost/benefit analyses.

The economic and financial feasibility of the Ohio & Lake Erie Regional Rail – Ohio Hub System is related to the business planning objectives. Ultimately, the business approach, the management team and the administration of the system will determine the success of the operation. The Ohio Hub Study advances a new business model for the provision of passenger rail services. This model serves to challenge the managers of the system to adopt a new commercial approach that should focus on all aspects of potential revenue generation while working effectively to reduce costs. The feasibility analysis assumes that the system will be aggressively managed, that the operator will be capable and that private sector providers of ancillary services will profit and contribute revenues to the system operation.

The significant investment in the infrastructure improvements will serve to re-capitalize the railroad network and offers management the opportunity to run an efficient and reliable service to which the market will respond. The Ohio Hub Study is based on the premise that a paradigm shift in the business of managing a large-scale passenger rail operation is possible and ultimately achievable.

There are currently no state-supported Amtrak trains operating in the Ohio and Lake Erie region. Current long-distance Amtrak passenger trains are presumed to continue during implementation of the Ohio Hub. Over the long-term, the Ohio Hub goal is to eliminate the need for states to provide operating subsidies since taxpayer assistance can take the form of capital grants and stronger routes can cross-subsidize operating losses of the weaker corridors, especially during the early implementation years. Funding for infrastructure and equipment is being used to improve service to the point where revenues cover operating costs, but some direct operating subsidies may still be required during the ramp-up period. These subsidies can be provided either by direct state support, or by financing that is repaid from the operating surplus that will be generated in later years.

Long-distance Amtrak service may benefit from speed and line capacity improvements created by the system. However, the riders, revenue, operating costs and frequencies in the Ohio Hub Business Plan and Technical Memorandum include only those for the Ohio Hub System. Long-distance trains are assumed to be a federal responsibility and are not included in the Ohio Hub financial results.

## **1.3 Study Approach and Methodology**

The analysis for the Ohio Hub Study follows an interactive approach that considers all factors that impact supply and demand-related market issues to ensure a comprehensive analysis of return on investment. The Study utilized TEMS' business planning software that consists of a series of models for conducting an interactive analysis of track investment, train operations, ridership and revenue, financial performance and economic analysis. The infrastructure capabilities determine what train frequencies can be operated. Running times are jointly

dependent on both the infrastructure and train technology capabilities. In turn, these frequencies and running times determine what level of ridership and revenue can be attained. The TEMS' *RightTrack*<sup>™</sup> System is described in detail in the Appendices.

This Business Plan and Technical Memorandum documents the feasibility planning methods and describes the analytic processes used in the Ohio Hub Study and builds upon and consolidates the results of the technical findings. The Study results should support subsequent decision-making by Ohio, Michigan, Pennsylvania, New York, Ontario, Canada and the federal government regarding the advancement of the project.

## 1.4 Railroad Infrastructure Analysis

To a considerable extent, the potential passenger rail system would use existing, privately held railroad rights-of-way and in some cases, passenger and freight trains would co-mingle on the same tracks. Therefore, the approach to planning a passenger rail service must be sensitive to the railroad's capacity and operational needs. New passenger service must not impair railroad operations, create impediments or bottlenecks nor should it constrain future growth; rather, passenger rail improvements must increase capacity and improve the fluidity of railroad operations. Moreover, the railroads should be fairly compensated for the use of their land and facilities.

Clearly, the most important goal in planning the Ohio Hub is to enhance mobility and increase transportation system capacity by improving the railroad system for passenger and freight trains. The underlying planning objectives for improving the railroad infrastructure are:

- To separate freight from passenger operations where possible and to minimize the number of locations where freight and passenger trains must co-mingle on the same tracks
- To improve railroad fluidity and operational efficiency and to expand railroad capacity at those locations where freight and passenger operations must co-mingle on the same tracks
- To utilize low density or abandoned rail rights-of-way where appropriate
- To improve safety, remove impediments to efficient rail operations, increase operating speeds and expand line capacity sufficient to accommodate both freight and passenger needs

Representatives from the freight railroads have participated in and provided critical input into this study. However, the feasibility planning for the Ohio Hub is being advanced prior to negotiations with the freight railroad owners or the identification of specific federal, state or local funding sources. As project planning and design advances, a variety of complex issues will need to be resolved including the cost for access to railroad property and tracks; cost for track maintenance; train dispatching; construction and utility relocation; safety and insurance; and recognition and adoption of the Ohio Hub within the context of the freight railroads' corporate long term strategic plans. These issues will be addressed with the freight railroads as part of the project development process, should the implementation of the project be pursued.

The study used *TRACKMAN*<sup>™</sup> a track management system to analyze the required railroad infrastructure improvements and the capital costs associated with a Modern (79-mph) and a High-Speed (110-mph) Scenarios.

## 1.5 Passenger Train Operations Analysis

The Ohio Hub corridors require significant infrastructure improvements to enable higher train speed operations. Following an engineering assessment of the rail corridors, the required infrastructure improvements were identified. The improvements, as well as the route configurations, were developed in consultation with participating state officials, ORDC staff, Amtrak and railroad representatives. Details of the proposed engineering improvements are described in Section 2 - Engineering Assessment and Capital Cost Estimates.

The study evaluated several different scenarios for Ohio Hub train service patterns. The feasibility of each scenario was examined with regard to its ability to generate ridership and provide cost-effective operations. A train simulation model, which takes both infrastructure and train technology characteristics into account, was used to determine achievable transit times. The TEMS' *LOCOMOTION*<sup>TM</sup> train simulation model is described in the Appendices. Operating strategies, station locations, and fleet requirements are discussed in detail in Section 3.

## 1.6 Travel Demand and Ridership and Revenue Forecasts

The Ohio and Lake Erie Regional Rail Study evaluates different levels of rail service, including train frequency, train speed, (or travel time) and assess the ridership and revenue synergies from interconnecting the Ohio Hub to other existing and planned regional rail service. The ridership model incorporates four intercity travel modes – air, rail, bus and auto – along with socioeconomic, network and trip databases relevant to the region. Survey data was also collected to provide insight into the travel market and travel behavior within the market.

The stated preference survey provided a key input into the modeling system and resulted in an independent assessment of the values of time for business, social and commuter travelers. In addition to values of time, the analysis estimates values of frequency, values of accessibility and the value of reliability. The model allows the ridership and revenue forecasts to be developed for base and forecast years for the different corridors and different system operating scenarios.

The base year for the study is 2000 and ridership and revenue model runs were generated for 2003, 2010, 2012, 2015, 2020, 2025, 2030, 2035 and 2040. The forecast years of 2015, 2020 and 2025 are cited most often in the study. Forecasts for intermediate years could be estimated by interpolating between the above years. The Ohio Hub travel demand and forecasting model, including the data bases, zones, and networks is described in Section 4. The resulting ridership and revenue forecasts are provided in Section 5.

## 1.7 Financial and Economic Feasibility Analysis

The Ohio Hub financial and economics forecasts were carried out to meet Federal Railroad Administration criteria and requirements. For the purposes of the Ohio Hub Study the United States Department of Transportation Federal Railroad Administration (US DOT FRA) Cost Benefit Methodology was adopted. This methodology as set out in the US DOT FRA report “*High Speed Ground Transportation for America*,” September 1997,<sup>1</sup> and is also used in the assessments of the “Maglev Deployment Program,” October 1999<sup>2</sup> provides the most

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<sup>1</sup> The report is available online on [www.fra.dot.gov/Downloads/RRDev/cfs0997all.pdf](http://www.fra.dot.gov/Downloads/RRDev/cfs0997all.pdf)

<sup>2</sup> For more details see: <http://www.fra.dot.gov/us/content/567>

authoritative guide to the US DOT FRA economic evaluation requirements for an intercity rail project to attract federal funds.

It should be noted that the US DOT FRA regards these requirements as the minimum to attract funding. The analysis also recognizes that there are often benefits that it has not considered, e.g. land use impacts. The TEMS' *RENTS*<sup>TM</sup> model is the economic analysis model that was used to synthesize the value of the different route investments, taking into account both a comprehensive financial analysis and an economic analysis of user benefits.

As part of the financial forecasts, the study provides an assessment of the various costs associated with operating the Ohio Hub passenger rail system. The operating costs are described in Section 6 and the economic benefits are quantified in Section 7. The results of the financial and economic viability analysis are also presented in Section 7.

## **1.8 Project Implementation and Funding**

Given the scale of the Ohio and Lake Erie Regional Rail-Ohio Hub system, it is assumed that the implementation of the system will be accomplished in phases. One of the primary purposes of the Implementation Plan is to provide a framework for organizing and analyzing the cash flow in the financial analysis. It is expected that the Implementation Plan will evolve as the project advances into the detailed planning and engineering phases.

The Implementation Plan, described in Section 8 has been refined so that a positive operating cash flow can be assured as early in the implementation schedule as possible. Thus, those corridors with the highest operating returns are implemented in earlier phases of the plan. The phasing, described in Section 8, takes the development of the project through design and manufacture of rolling stock, alternatives analysis, preliminary engineering, final design and construction of the rail system's infrastructure. Project development includes all environmental reviews and/or the steps necessary under the National Environmental Policy Act (NEPA), including public involvement and necessary engineering to obtain a *record of decision* under NEPA requirements. Such an approach allows the states to secure funding and to develop the infrastructure as needed.

The Ohio Hub Study assumes that full privatization of the system will be extremely difficult to achieve, due to the government capital support provided to other modes of transportation, such as highway and air. However, the private sector can play a major role in operating the system, running station and train facilities, and in maintaining the track and equipment.

Recognizing that intercity passenger rail projects are unlikely to be financed simply by the private sector, and requires a public private partnership. The development of Ohio Hub will call for a substantial investment by the state of Ohio and the Federal Government. While it is unclear exactly what the size of the Federal government's contribution will be it is likely to be in the range of 50 to 80 percent of the total investment. The Ohio Hub financial analysis assumes that 80 percent of the capital cost would be paid for by the federal government, and that 20 percent will come from state/private sector match.

## **1.9 Institutional Arrangements for Project Implementation**

As the Ohio and Lake Erie Regional Rail - Ohio Hub Study progresses to more detailed planning and ultimately to securing funding for implementation of the Ohio Hub System, multi-state participation and cooperation becomes necessary for the system's success. With the progression of a series of activities, it is important to define the institutional arrangement that meets the needs of the Ohio Hub Study collective action while minimizing intrusion on the authorities, powers and immunities of each state.

Institutional arrangements, organizational structure, and agreements between participating entities (e.g., states) and the railroad will be needed for undertaking or overseeing project-related activities. Institutional arrangements range from less formal arrangements such as a Letter of Agreement to a more formal multi-state legislated compact arrangement. The level of arrangement selected will reflect the administrative needs of the states and the degree of complexity of the issues being dealt with.

An example of an existing passenger rail compact is the Interstate Rail Passenger Advisory Council (Interstate High-Speed Intercity Rail Passenger Network Compact). Its purpose is to explore the potential for high-speed rail within the Great Lakes region and to encourage a cooperative and coordinated regional approach for planning and development activities. It is the policy of the Compact member states "to cooperate and share jointly the administrative and financial responsibilities of preparing a feasibility study concerning the operation of such a (passenger rail) system connecting major cities in Ohio, Indiana, Michigan, Pennsylvania and Illinois."

The origin of this Interstate Rail Passenger Advisory Council is traced to January 30, 1979, when a bill was introduced in the Ohio legislature to create a high-speed rail compact with Ohio's neighboring states. That bill was signed into law on August 28, 1979, and neighboring states were contacted and urged to join the Compact. By 1981, Michigan, Pennsylvania, Illinois and Indiana had joined the Compact. In the early 1990's, New York and Missouri also became members of the Compact. The Council continues to provide an institutional framework in which state rail transportation officials may work together to advance the Ohio Hub intercity/interstate passenger rail project.

# Preliminary System Plan

