

220 MPH HIGH SPEED RAIL PRELIMINARY FEASIBILITY STUDY

EXECUTIVE SUMMARY

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1. Introduction

In 2009, the U.S. Department of Transportation (U.S. DOT) unveiled a high speed rail vision for America that would complement existing transportation systems (e.g. highways, aviation, and regional and urban public transportation systems). These systems would span between 100 and 600 miles to safely, conveniently, and efficiently connect communities across America. They would create a foundation for economic growth in a more complex global economy, promote energy independence, improve safety and environmental quality, and foster livable communities. The U.S. DOT envisioned collaboration with the states to help plan and develop high speed rail in intercity passenger rail corridors¹.

Governor Quinn shares this vision. His administration and IDOT have worked to bring 110-mph high speed rail service from Chicago to St. Louis via Springfield. This service currently exists between Dwight and Pontiac and will extensively grow from Dwight to Alton in 2015. It will continue northward to Joliet in 2017.

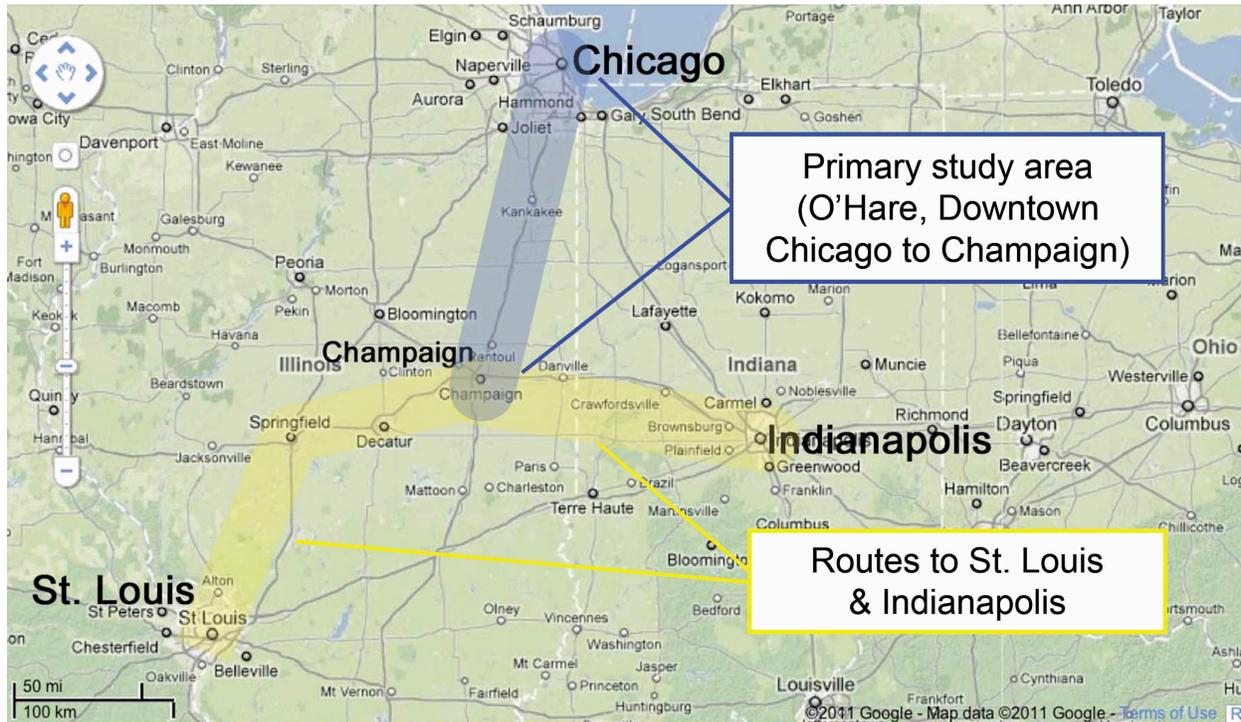
The Governor and IDOT have sought to further develop this high-speed rail vision and are now analyzing whether 220 mph high speed rail service is feasible from O'Hare Airport through downtown Chicago to Champaign-Urbana and on to St. Louis and/or Indianapolis. Governor Quinn selected this corridor for study as part of his vision to more closely connect the University of Illinois to Chicago and link three of this region's key cities with safe, comfortable, state-of-the-art, very-high-speed rail transportation to help Midwestern economic development. This process is part of an incremental approach that has been successfully used in many countries around the world.

IDOT sponsored a research team at the University of Illinois, including the Urbana-Champaign and Chicago Campuses, to study the feasibility of such a project, including engineering, operational, ridership, economic and financial aspects.

2. Overview of the Study Area

The study area as shown in Figure 1 involves approximately 10-mile-wide corridors running roughly north-south between Chicago O'Hare International Airport, downtown Chicago, and Champaign, and then east-west from Champaign to St. Louis and Champaign to Indianapolis. The total length of all corridors is approximately 500 miles, mostly in Illinois, with portions of the corridors extending into Missouri and Indiana.

Figure 1. Overview of a HSR Network Connecting Chicago, Champaign, St. Louis, and Indianapolis



The study team considered several different alignment alternatives using different combinations of existing rail, interstate, or state highway rights-of-way and development of new rail rights-of-way within the general 10-mile-wide corridors. They are not intended to imply where this service would operate relative to existing tracks or to imply where IDOT might acquire properties or rights-of-way.

Any selected alignment in the future is envisioned to have two dedicated, electrified main tracks with an 18-foot track center distance fully grade separated from the other transportation modes. The study team did not assess whether existing rights-of-way could accommodate additional high speed rail tracks or the potential implications of 220 mph service on existing railroad operations. Future refinements of high speed rail alignments near existing railroads will need to carefully consider the railroads' rights-of-way, safety, and operating requirements.

3. Travel Times

Electrified trains with steel-wheel-on-steel-rail technology would use this line. Consistent with current international practice, they would be designed for speeds up to 250 mph, but would generally travel at a maximum speed of 220 mph. They would operate at somewhat lower speeds where there were physical or infrastructure design constraints.

Express high-speed rail trains would take about 45 minutes to travel from downtown Chicago to Champaign; 1 hour 18 minutes to Springfield; and approximately 2 hours to either downtown St. Louis or Indianapolis. They would likely run every half-hour during peak times and hourly at other times. Figure 2 shows the express and local travel time estimates between O'Hare Airport in Chicago and Lambert-St. Louis International Airport via Champaign. Figure 3 shows the express and local travel time estimates between O'Hare Airport in Chicago and Downtown Indianapolis via Champaign.

Figure 2. Travel Time Estimates (in minutes) between Chicago O'Hare International Airport and Lambert-St. Louis International Airport via Champaign-Urbana

| Southbound | | | Miles | Station | Northbound | | |
|------------|-------|-------|-------|---|------------|-----|-----|
| Exp. | Local | Local | | | Exp. | | |
| 0 | 0 | Dp | 0 | O'Hare International Airport | Ar | 154 | 140 |
| 10 | 10 | ↓ | 16 | Chicago Union Station | ↑ | 142 | 128 |
| | 28 | | 47 | University Park | | 124 | ↑ |
| | 40 | | 72 | Kankakee | | 112 | ↑ |
| 55 | 65 | | 145 | Champaign-Urbana | | 87 | 83 |
| | 84 | | 193 | Decatur | | 68 | ↑ |
| 88 | 102 | | 233 | Springfield | | 50 | 50 |
| 127 | 141 | | 330 | St. Louis Downtown | | 10 | 10 |
| 140 | 154 | Ar | | Lambert - St. Louis International Airport | Dp | 0 | 0 |
| | | | 343 | Airport | | | |

Figure 3. Travel Time Estimates (in minutes) between Chicago O'Hare International Airport and Downtown Indianapolis via Champaign-Urbana

| Southbound | | | Miles | Station | Northbound | | |
|------------|-------|-------|-------|------------------------------------|------------|------|-----|
| Exp. | Local | Local | | | Local | Exp. | |
| 0 | 0 | Dp | 0 | O'Hare International Airport | Ar | 140 | 127 |
| 10 | 10 | ↓ | 16 | Chicago Union Station | ↑ | 128 | 115 |
| | 28 | | 47 | University Park | | 111 | ↑ |
| | 40 | | 72 | Kankakee | | 98 | ↑ |
| 55 | 65 | | 145 | Champaign-Urbana | | 73 | 70 |
| | 84 | | 184 | Danville | | 55 | ↑ |
| 117 | 131 | | 280 | Indianapolis International Airport | | 8 | 8 |
| 127 | 140 | Ar | | Indianapolis Downtown | Dp | 0 | 0 |
| | | | 290 | | | | |

4. Capital Cost

Table 1 summarizes the estimated costs of building the HSR system and providing up to 21 train sets (in 2012 dollars). The total cost to build the alignment would range from \$22 billion to \$50 billion (or from \$20 billion to \$39 billion for those portions of the alignment that are within Illinois), depending on the use of elevated track or track on retained fill.

Table 1. Total Capital Cost Estimate Summary for All Segments and Segments Only Within Illinois Using a Sample Alignment

| | TOTAL COST (in Billions \$) | | | |
|---|-----------------------------|------------------------|-------------------------|------------------------|
| | Elevated Track | | Track on Retained Fill* | |
| | All Segments | Illinois Segments Only | All Segments | Illinois Segments Only |
| Chicago-Champaign-St. Louis-Indianapolis (Excluding St. Louis and Indianapolis Airports) | \$50 | \$39 | \$30 | \$24 |
| | \$48 | \$39 | \$28 | \$24 |
| Chicago-Champaign-St. Louis (Excluding St. Louis Airport) | \$37 | \$35 | \$23 | \$20 |
| | \$36 | \$35 | \$22 | \$20 |

* "Retained fill" refers to the use of retaining walls to support fill where tracks are raised above existing grade.

5. Ridership

The study team developed preliminary ridership estimates using a low, medium, and high driving cost scenario for each station combination and fares that would realistically compete with driving for each scenario. Based on these and other conservative assumptions, the preliminary assessment indicates that this corridor is projected to attract at least 8 million to 15 million riders annually by 2035.

6. Economic Benefits

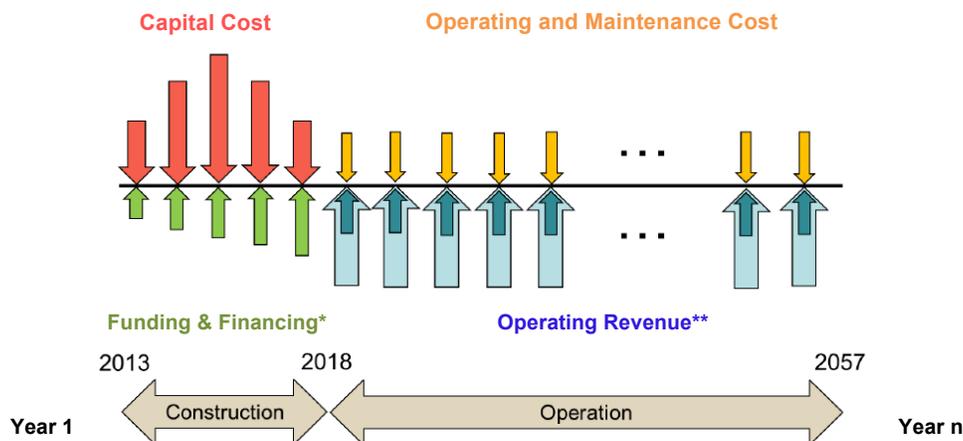
This 220 mph rail system would substantially benefit Illinois. Its construction over five years would create a total of 409,000 to 792,000 job years and its operation would annually create 10,890 to 13,820 jobs during the first 10 years. It would also bring the following residual benefits:

- Regional development,
- Greater energy independence,
- Reduced traffic congestion on highways and at airports,
- Reduced need for highway expansion or new airport capacity,
- Increased productivity for high speed rail passengers that other modes cannot offer,
- Reduced highway accidents, and
- Air pollution reductions.

7. Financial and Implementation Strategies

Figure 4 illustrates typical cost and revenue distributions over a high speed rail system's lifetime. The study team created a financial model to determine how much financing is possible, based on the projected future operating surplus generated under different cost and revenue scenarios. All of these calculations are based on a five-year construction period beginning in 2013 and on a 35-year operating period beginning in 2018.

Figure 4: Typical Project Cash Flow Over a High Speed Rail System's Lifetime
(excluding capital renewal)



* Funding is from public grant sources. Financing is based on surplus revenue to be generated during operation.

** Farebox and non-farebox (e.g. property development, leasing, concession, advertising) revenue

Using their financial model, the study team concluded the following:

1. The 220 mph service should be operationally profitable. None of the scenariosⁱⁱ analyzed would require operating subsidies once the high speed rail system is built.
2. Operating profits can be financed to contribute to construction costs. These profits could potentially be transformed through debt and equity financing to cover between 5% and 23% of total capital expenditures.
3. Value capture from state and local taxes and property development along the project corridor could generate substantial project revenues that would offset capital costs and attract investors. This has been an important revenue source for several successful international high speed rail projects. However, revenues from value capture are presently expected to be modest for U.S. high speed rail projects due to uncertainty over their success here. Further study on how to increase value capture potential and reduce investor uncertainty is needed. Nevertheless, it is evident that additional funding sources will need to be secured.

One way to reconcile these financing challenges may be an incremental or “blended” approach that would upgrade some parts of the existing right-of-way for high speed rail use and integrate them with construction of new, state-of-the-art structures. This approach would yield nearer-term benefits to regional as well as intercity travel and could occur over a longer time period as part of a coordinated, long-term plan to upgrade rail service in the Midwest region. High speed trains would have to travel slower than 220 mph over these blended sections, however. Variations of this incremental approach are how most high speed rail systems have been successfully developed. This approach’s potential value became evident during this project and IDOT should consider studying it further.

8. Conclusions

A high speed rail system linking Chicago, St. Louis, and Indianapolis via Champaign would connect three of the largest Midwestern cities, creating several important links in the Midwest regional rail network. Express high-speed trains would travel from downtown Chicago to Champaign in approximately 45 minutes, to Springfield in approximately one hour and twenty minutes and to St. Louis or Indianapolis in approximately 2 hours. They would likely run every half-hour during peak times and hourly at other times. Rapid, comfortable, low-cost transportation between these urban areas would boost the Illinois economy, create jobs, unite people in the region, enhance personal mobility, increase international competitiveness, and provide safe, modern, sustainable transportation for future generations.

This study indicates that a 220 mph rail system in these corridors would not require an operating subsidy. However, as with many large public transportation projects, the initial cost to build it is substantial. The State should explore use of public-private partnership opportunities with use of public funds to offset the risk. An incremental or blended approach completed over a longer time period could also reduce initial capital costs and provide other nearer-term transportation benefits, while simultaneously improving intercity transportation quality and travel times. This is similar to the approach commonly used internationally and should be studied further.

ⁱ <http://www.fra.dot.gov/eLib/Details/L02833>

ⁱⁱ The scenarios referred to are the combination of all possible outputs of this study’s engineering and ridership teams. The options include high or low capital expenditures; and baseline, optimistic, or pessimistic ridership numbers. The combinations of these options result in distinct scenarios that informed the inputs and outputs of the financial team’s model.