220 MPH HIGH SPEED RAIL PRELIMINARY FEASIBILITY STUDY

EXECUTIVE REPORT

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Summary

IDOT sponsored a research team at the University of Illinois, including the Urbana-Champaign and Chicago Campuses, to study the feasibility of a 220 mph high speed rail service from O'Hare Airport through downtown Chicago to Champaign-Urbana and on to St. Louis and/or Indianapolis, including engineering, operational, ridership, economic and financial aspects.

This report presents the estimated construction, operating, and maintenance costs for various network alternatives, as well as the estimated ridership and revenues. Depending on the type of infrastructure and the implementation phase, the total cost to construct the HSR system would range from $22 billion to $50 billion ($20 billion to $39 billion for segments within Illinois only), in 2012 dollars. Express HSR services from downtown Chicago to Champaign would take about 45 minutes; to Springfield about 1 hour 18 minutes; and to either downtown St. Louis or Indianapolis about 2 hours. The expected annual ridership of the whole system is estimated between 8 million and 15 million people. The HSR trains are envisioned to run every half-hour during peak times and hourly during other times.

Analyses of several different cost and revenue scenarios indicate that the HSR system is expected to be operationally profitable. In addition, operations profits could be transformed through debt and equity to cover from 5 percent to 23 percent of the total construction cost. The economics analysis of the HSR system has been shown to provide substantial benefits to Illinois, including the creation of 409,000 to 792,000 job-years during five years of construction and creation of 10,890 to 13,820 jobs per year during the first 10 years of operation. Public-private partnership (PPP) with substantial investments of public funds should be explored to make the HSR system a reality. 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.

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 corridors[1].

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.

This study's scope focuses on the required physical infrastructure (including potential stations and corridors), operating scenarios and projected ridership, order-of-magnitude costs, economic benefits, and potential financing strategies for the segment from Chicago to Champaign-Urbana. In the future, the study team or their successors would need to engage in further study (e.g. more detailed engineering, ridership and revenue forecasts, and the Environmental Impact Study (EIS)) before any possible implementation. This study's preliminary analyses and results are therefore subject to change in any subsequent studies.

1.1 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 southwest and east, respectively 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.

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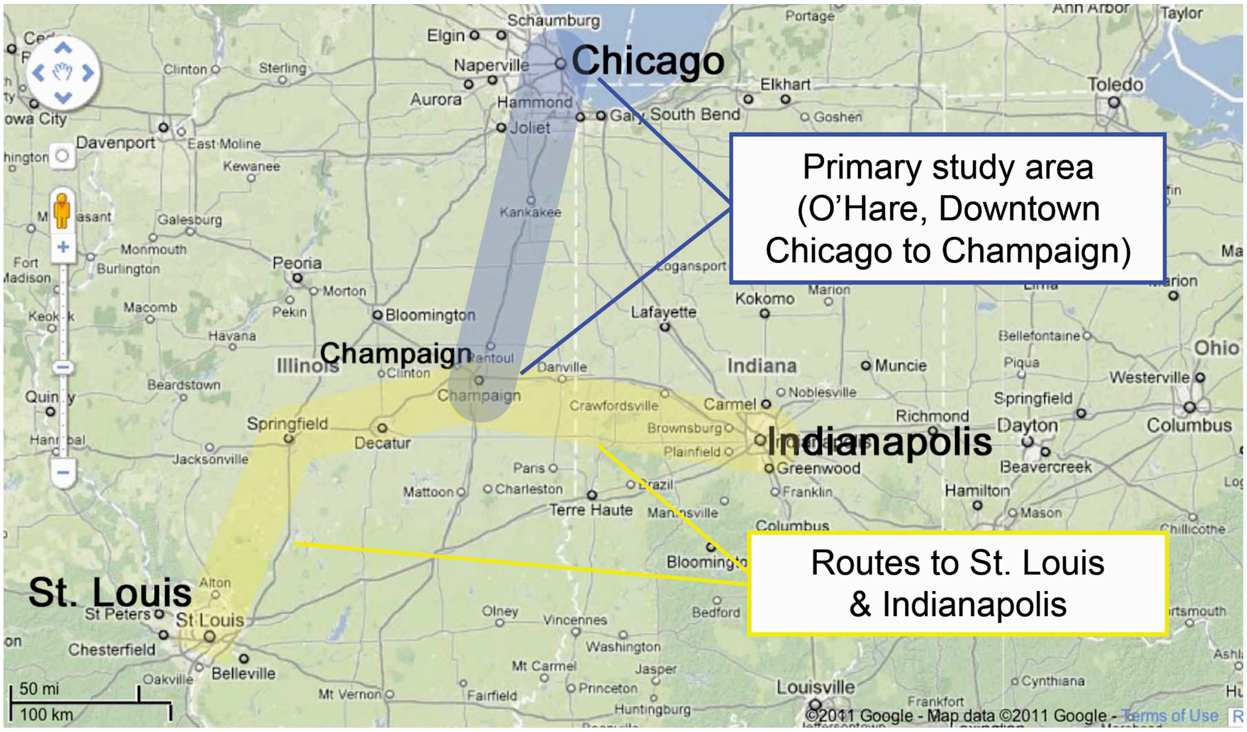
[1] http://www.fra.dot.gov/eLib/Details/L02833

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



Potential stations (all locations are in Illinois unless otherwise specified) considered along the corridors include:

1. Chicago O'Hare International Airport
2. Chicago Union Station
3. University Park (South Suburban Chicago)
4. Kankakee
5. Champaign
6. Decatur
7. Springfield
8. St. Louis Downtown, MO
9. Lambert St. Louis International Airport, MO
10. Danville
11. Indianapolis International Airport, IN
12. Indianapolis Downtown, IN

In addition, McCormick Place was also identified as a possible special event stop. A HSR station was also considered near Peotone because of ongoing plans to build a third Chicago-region airport nearby. An additional south suburban Chicago HSR station may not be needed if a station is planned for or near the proposed South Suburban Airport at Peotone. Future implementation of the HSR system may include, but is not limited to, all the potential stations on the list.

The study team developed the following station evaluation criteria based on the Federal Railroad Administration's planning document, "Station Area Planning for High Speed and Intercity Passenger Rail," dated June 11, 2011, and on guidelines and approaches that the International Union of Railways (UIC) and international HSR developments have used:

1. Estimated Traffic Demand,
2. Population Served,
3. Land Acquisition,
4. Constructability,
5. Environmental Impacts,
6. New and Improved Developments,
7. Accessibility,
8. Interchange/Transfer, and
9. Operational Requirements.

The study team used these criteria to evaluate potential station sites, and met with public officials at major cities in the study area to discuss findings. However, further studies will be needed to identify the actual station locations.

The study team also 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 nor where IDOT might acquire properties or rights-of-way.

Similar to the station site evaluation process, the study team developed the following criteria for route alignment evaluation, based on the Federal Railroad Administration's "Railroad Corridor Transportation Plans: A Guidance Manual" dated July 2005, and on guidelines and approaches that the International Union of Railways (UIC) and international HSR developments have used:

1. Design Criteria,
2. Various Technical Constraints,
3. Environmental Impacts,
4. Traffic Forecast,
5. Horizontal Geometry,
6. Vertical Geometry,
7. Needed Structures,
8. Operations and Maintenance,
9. Land Acquisition,
10. Cost, and
11. Revenue.

However, further studies will be needed to identify the actual route alignments. 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.

1.2 Study Methodology

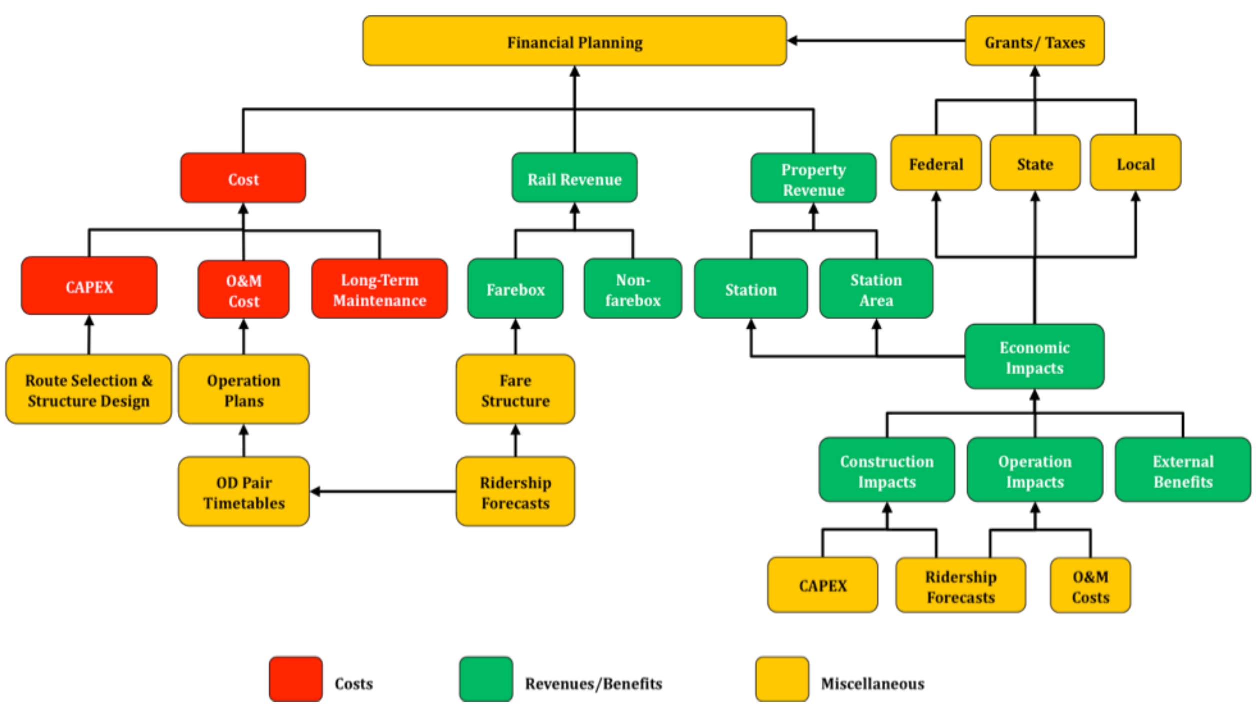
The study team considered five principal elements to conduct this feasibility study:

- Preliminary engineering, including identification of HSR design criteria, HSR operations, and analyses of potential routes and station locations;
- Estimations of capital, operating, and maintenance costs;
- Estimations of potential ridership;
- Economic impacts of HSR construction and operations, including estimations of public benefits and value capture potential; and
- Financial and implementation strategies.

The study team integrated all of these elements to evaluate the proposed HSR system's physical and financial feasibility. Figure 2 illustrates the integration process. In general, they identified the HSR system's conceptual design and route alternatives, station locations, and the system's projected total cost and revenue in this study's initial phase. The total cost includes capital, operating, and maintenance costs based on the engineering conceptual design, and operating plan. The revenue includes farebox revenue based on the ridership analysis, non-farebox revenue, and property revenue based on the value capture concept.

This study's final phase considered the total costs and revenues to identify the long-term potential surplus or deficit to build and operate the HSR system, identified potential funding sources, and evaluated benefits through various economic impact analyses.

Figure 2. HSR Feasibility Study Integration Process



2. Description of the Proposed HSR System

The proposed HSR system is envisioned to use steel-wheel-on-steel-rail, electrified train systems with a design speed of 250 mph and a maximum operating speed of 220 mph, except in areas with constrained geometry or infrastructure design. It would have two fully grade separated, dedicated main tracks with a track center distance of 18 feet. At some locations, segments of the HSR alignments may be located on shared right of way (ROW) or shared corridors[2] with existing railroads. This report provides general descriptions of the route corridors (Figure 1). It neither implies actual locations of HSR operations relative to existing track nor implies plans for acquiring any properties or ROW. This study did not include assessment of existing track capacity to accommodate additional HSR tracks or the implications of HSR on existing railroad operations. Future refinements of HSR alignments near existing railroads will need to consider the railroads' ROW and operating requirements.

2.1 Track Geometry

The basic principle in track geometry considerations is to limit changes in direction and profile to maximize the length of tangent and flat sections. The HSR system should follow international HSR lines' best practices, recommendations from the International Union of Railways (UIC) and guidance from the Manual for Railway Engineering of the American Railway Engineering and Maintenance-of-Way Association (AREMA Manual), where applicable.

2.2 Civil Infrastructure

In general, a HSR system may be built either on an elevated structure or at grade. Tunnels may be needed, especially to access station locations in Chicago. The study team considered the following three concepts for potentially building the HSR system:

1. Elevated structures (viaducts),
2. Track on self-supported earthen embankments (assuming an average 10-foot height for this study), and
3. Track on retained fill (earthen embankments supported by retaining walls on both sides, assuming an average 20- or 30-foot height for this study).

2.3 Train Stations

HSR train stations will consist of ticketing and waiting areas, controlled-access platforms, parking, and tracks. HSR stations could have side or island platforms on the main line; intermediate stations along the line may have platform tracks off the main line to allow passage of non-stop express trains. However, actual station designs are not considered at this preliminary level.

The study team considered connectivity to existing public transportation as one criterion for selecting station sites. They also assumed that most of the HSR train station sites would include space for shopping, offices, business meetings, hotels, or apartments to maximize potential non-fare revenues.

[2] FRA Definition: Shared ROW is dedicated HSR passenger tracks separated from freight or other service tracks by less than 25 feet, while shared corridor is dedicated HSR passenger tracks separated from freight or other service tracks by 25 to 200 feet.

2.4 Trainsets

At the time this study was conducted, the Federal Railroad Administration (FRA) was in the process of finalizing the specifications for Tier III passenger train safety standards for HSR operations with a maximum speed up to 220 mph. The HSR system under consideration is expected to adopt these standards in identifying the type of train equipment to use.

3. Capital Cost Estimation

Developing cost estimates for capital investments needed to implement this proposed HSR service was a key part of this study. The study team presented total capital cost estimates based on possible route alignment alternatives for two potential networks — the overall Chicago-Champaign-St. Louis-Indianapolis network and the Chicago-Champaign-St. Louis network (in 2012 dollars).

3.1 Capital Cost Estimating Methodology

The study team developed a work breakdown structure, estimated quantity and unit costs, and derived total estimated costs. The study team used the Federal Railroad Administration's Standard Cost Categories to develop the work breakdown structure. They divided this project into several macro-activities, further divided each macro-activity into each of its sub-activities, and further divided each sub-activity until they reached each of the sub-activity's unit elements (e.g., a six-span viaduct).

When estimating quantities, the study team gathered data from design drawings, specifications, typical ratios (e.g., 2/3 tie replacement), and previous construction experiences to identify each unit element's quantity. The study team also estimated the quantity of each major structure (e.g., viaducts, bridges, tunnels).
When estimating unit costs, the study team developed a unit cost library, drawing from previous HSR planning or construction projects, including the California High Speed Rail Authority's *Draft 2012 Business Plan*[3] and publicly-available manufacturers' cost information. The study team multiplied these unit costs by estimated quantities to derive total project costs. They also calculated costs per mile.

3.2 Capital Cost Estimates

The study team estimated rolling stock requirements using this report's preliminary ridership level and operating plan discussed in Sections 5 and 6 respectively. They predict that the Chicago-Champaign-St. Louis-Indianapolis network will need 21 trainsets and that the shorter Chicago-Champaign-St. Louis network will need 15 trainsets.

Assuming a unit cost of $33 million per trainset, the total cost would be $693 million for all of the Chicago-Champaign-St. Louis-Indianapolis trains or $495 million for all of the Chicago-Champaign-St. Louis trains. Including the cost of maintenance equipment, the total rolling stock capital cost is expected to be $700 million or $500 million, respectively, for the two networks.

For construction costs, the study team evaluated two possible alignment alternatives within the general 10-mile-wide corridors (Figure 1) with track on elevated structure or retained fill. Table

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[3] *California High-Speed Rail Program Draft 2012 Business Plan*, California High-Speed Rail Authority, November 2011.

1 respectively shows the total construction cost estimates, route lengths, and costs per mile for Alternatives 1 and 2 for the Chicago-Champaign-St. Louis-Indianapolis and Chicago-Champaign-St. Louis networks. Table 2 shows the corresponding capital cost estimates by major cost categories.

Table 1. Summary of Total Capital Cost Estimates

Network	Alternative	Total Capital Cost (million)	Total Length of Route Miles			Cost per Mile (million)
			Slab	Ballasted	Total	
Chicago-Champaign-St. Louis-Indianapolis	1 (Track on elevated structure)	$50,000	493	0	493	$101
	2 (Track on retained fill)	$30,000	29	464	493	$61
Chicago-Champaign-St. Louis	1 (Track on elevated structure)	$37,000	344	0	344	$108
	2 (Track on retained fill)	$23,000	29	315	344	$67

Table 2. Capital Cost Estimates by Major Cost Categories

	TOTAL COST (MILLION)			
	Chicago - Champaign - St. Louis - Indianapolis		Chicago - Champaign - St. Louis	
COST CATEGORY	**Elevated Track**	**Retained Fill Track**	**Elevated Track**	**Retained Fill Track**
10 TRACK STRUCTURES AND TRACK	$27,677	$15,933	$20,331	$12,095
20 STATIONS, TERMINALS, INTERMODAL	$620	$620	$500	$500
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	$195	$195	$195	$195
40 SITEWORK, RIGHT OF WAY, LAND, EXISTING IMPROVEMENTS	$0	$330	$0	$197
50 COMMUNICATIONS AND SIGNALING	$567	$567	$406	$406
60 ELECTRIC TRACTION	$2,090	$1,703	$1,492	$1,106
70 VEHICLES	$700	$700	$500	$500
OTHER COSTS (PROFESSIONAL SERVICES, CONTINGENCY)	$18,150	$9,951	$13,575	$8,002
TOTAL COST	**$50,000**	**$30,000**	**$37,000**	**$23,000**

Figure 3 shows this HSR project's estimated construction costs per mile (in red) that correspond to the weighted average of construction costs per mile for track on elevated structure and track on retained fill. The costs from comparable international HSR systems with roughly comparable geography (in blue) also are shown together with other proposed U.S. systems (in green).

Figure 3. Construction Cost per Mile for Comparable HSR Systems

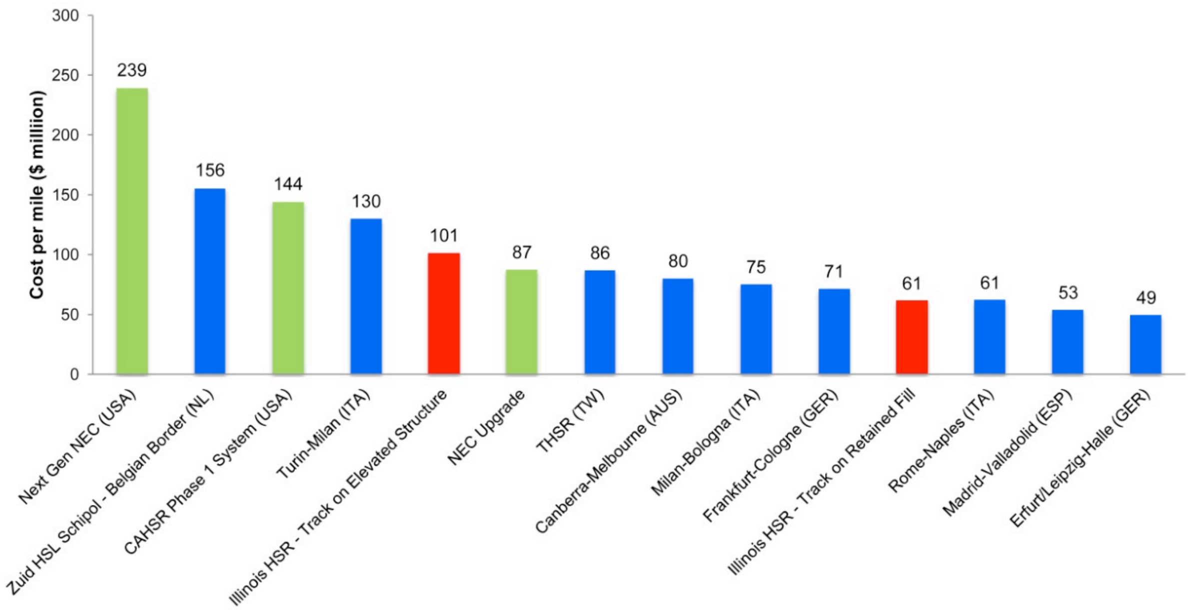


Table 3 shows the summarized capital cost estimates for all track segments and for segments only within the State of Illinois for the Chicago-Champaign-St. Louis-Indianapolis and Chicago-Champaign-St. Louis networks. It also shows capital cost estimates for scenarios when extensions to the airports in St. Louis and Indianapolis are excluded.

Table 3. Summary of Total Capital Cost Estimates for All Segments versus Segments Only Within the State of Illinois

	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	$50	$39	$30	$24
Excluding STL and IND Airports	*$48*	*$39*	*$28*	*$24*
Chicago-Champaign-St. Louis	$37	$35	$23	$20
Excluding STL Airport	*$36*	*$35*	*$22*	*$20*

4. Travel Times between Stations

The study team used the Illinois Passenger Train Performance Calculator[4] to estimate travel times between potential stations based on the same alternative alignments used for the capital cost estimates.

Figures 4 and 5 show the express and local travel time estimates between Chicago O'Hare International Airport and Lambert-St. Louis International Airport and between Chicago O'Hare International Airport and Downtown Indianapolis, respectively, via Champaign for both local and express services.

Figure 4: Travel Time Estimates (in minutes) between Chicago O'Hare International Airport and Lambert-St. Louis International Airport via Champaign

Southbound Exp.	*Southbound* Local		Miles	Station		*Northbound* Local	*Northbound* 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	343	Lambert - St. Louis International Airport	Dp	0	0

[4] The Illinois Passenger Train Performance Calculator (ILPTPC) was developed by the Rail Transportation and Engineering Center (RailTEC) at the University of Illinois at Urbana-Champaign. It is a VBA-supported Excel program to perform coarse, high-level evaluations of passenger train time performance for different infrastructure configurations. ILPTPC previously was validated by Quandel Consultants using its Rail Corridor Alternatives Analysis Tool (RCAATTM) and documented in a technical memorandum "Comparison of Modeled 220MPH and 186MPH Travel Times," Quandel Consultants, LLC, June 1, 2012.

Figure 5: Travel Time Estimates (in minutes) between Chicago O'Hare International Airport and Downtown Indianapolis via Champaign

Southbound Exp.	*Southbound* Local		Miles	Station		*Northbound* Local	*Northbound* 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	290	Indianapolis Downtown	Dp	0	0

5. Ridership Analysis

5.1. Study Overview

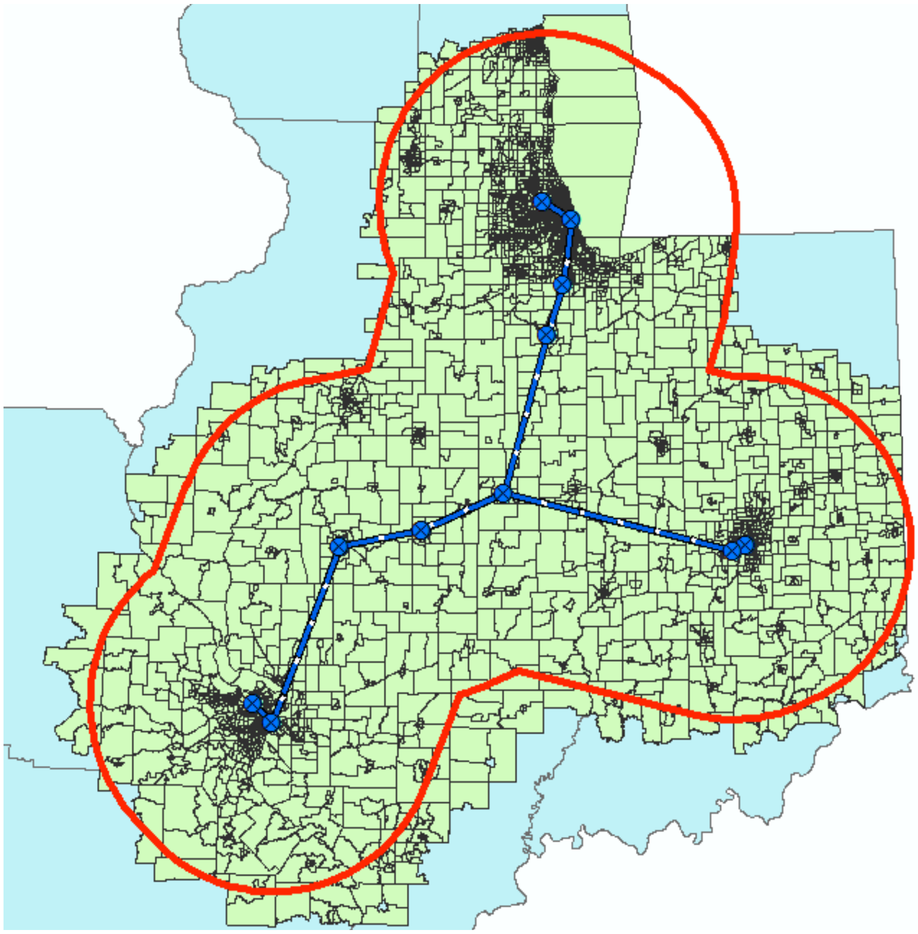
The ridership estimation effort mainly sought to provide reasonably accurate estimates of expected annual ridership under various scenarios. The scope of the project did not include development of investment grade ridership estimations[5]. To meet the project schedule and resource constraints, the study team developed a lean approach that produced sufficiently reliable ridership estimates to assess the feasibility of the proposed HSR system.

Since Illinois does not yet have a statewide travel demand model, the study team developed a new model for inter-regional trips along this study's proposed corridor. The study team used existing travel demand models whenever possible to complement the inter-regional model. The study team's use of existing models and time limitations affected the ability to calibrate the models for certain fine-grained measures such as values of time, i.e. the implied monetary value that travelers place on time spent on traveling, for different modes. Incorporation of this factor would require further analysis.

Figure 6 shows the study area. It consists of the Metropolitan Statistical Areas of Chicago-Joliet-Naperville, Champaign-Urbana, St. Louis, Springfield, and Indianapolis as well as a 75-mile buffer zone around the HSR stations that would serve those metropolitan statistical areas. The study team selected a 75-mile barrier as the HSR system's catchment area, based on access and egress time observations from the intercept surveys that they conducted in the region.

[5] Investment grade traffic analysis is defined as a study "that can form a basis for credit ratings, financing approval, and the sale of capital markets debt" (National Cooperative Highway Research Program Synthesis 364 – Estimating Toll Road Demand and Revenue. Transportation Research Board. Washington, D.C. 2006)

Figure 6. Ridership Study Boundaries



Ridership estimates considered any trips over 75-miles in length from origin to final destination that originates or terminates within the study area boundary, with the exception of trips within the Chicago region. This study includes trips that are shorter than 75 miles if the trip origins and destinations are near the greater Chicago region's HSR stops (i.e. Chicago O'Hare International Airport, Union Station, University Park, and Kankakee.) These are called "intra-regional trips."

This study excludes intra-regional trips within the St. Louis and Indianapolis metropolitan areas, given time and resource constraints. The ridership estimates thus do not include the HSR segments that connect downtown St. Louis and Lambert-St. Louis International Airport and downtown Indianapolis and Indianapolis International Airport.

The ridership figures were estimated for 2010 and 2035. The 2010 ridership estimates served the following two purposes: 1) they validated the model against observed long-distance travel trends; and 2) they serve as the base to calculate the annual growth rate of the HSR ridership for each station-to-station pair. The annual growth rates are used to estimate interim year ridership between the base year and forecast years. The study team assumed that the ridership growth rate for each station-to-station pair is constant from year to year.

For this study's major metropolitan areas, except for Indianapolis, the study team obtained 2035 population and employment projections at the Traffic Analysis Zone[6] level from the appropriate Metropolitan Planning Organization. The Indiana Department of Transportation supplied the data for Indianapolis. For areas outside the metropolitan planning organizations' boundaries, the study team obtained growth factors from the states and applied them to the 2010 base year census data.

The study team took advantage of existing travel demand models to estimate HSR demand for trips that occurred within the greater Chicago region. As shown in Table 4, the study team updated the model Wilbur Smith Associates developed for the Airport Express Study[7] to estimate ridership for the HSR segment connecting Chicago's O'Hare International Airport and Chicago Union Station. The study team also modified the regional travel demand model that the Chicago Metropolitan Agency for Planning developed for their long-range transportation planning effort[8] to analyze other intra-regional trips within the Chicago region.

For inter-regional trips between urbanized areas and for airline passengers using HSR to access Chicago O'Hare International Airport from outside the greater Chicago region, the study team developed entirely new models based on data collected from household and traveler surveys that are described in the next section.

Table 4. Trip Types and Corresponding Modeling Approach

Trips	Model	Approach
Chicago O'Hare International Airport to Downtown Chicago	Modified Airport Express Study Model	Updated travel times, costs, and station locations.
Intra-regional (Trips between Chicago Union Station, University Park, or Kankakee)	Modified Chicago Metropolitan Agency for Planning Model	Estimated diversion from auto to HSR; updated travel time and costs.
Inter-regional (e.g. Champaign to St. Louis)	University of Illinois at Chicago's Illinois HSR Model	Developed a new model covering the HSR corridor.
Air diversion (e.g. A St. Louis resident accessing O'Hare to catch a flight.)	University of Illinois at Chicago's Air Diversion Model	Developed a new model covering the HSR corridor.

[6] "A traffic analysis zone (TAZ) is a special area delineated by state and/or local transportation officials for tabulating traffic-related data" Cartographic Boundary Files Descriptions and Metadata. U.S. Census Bureau (http://www.census.gov/geo/www/cob/tz_metadata.html)
[7] Wilbur Smith Associates. Airport Express Ridership and Revenue Forecast – Final Report. Chicago Department of Transportation. September 2004.
[8] CMAP. Travel Model Documentation – Final Report. Chicago Metropolitan Agency for Planning. 2010

5.2. Survey Data Collection

The study team carried out two different surveys: a traveler intercept survey and a telephone-based personal travel survey.

Intercept Survey

The study team hired the University of Illinois' Survey Research Laboratory to conduct traveler intercept surveys at Chicago Union Station (for Amtrak riders) and at O'Hare, Midway, and Champaign Airports. These surveys provided the study team with data needed to estimate mode choices for the main portions of long-distance trips and for accessing modes to/from HSR stations.

The Survey Research Laboratory and the study team jointly conducted intercept surveys at long-distance (intercity) bus stops at Chicago Union Station and at Champaign's Illinois Terminal. The study team also conducted intercept surveys of automobile travelers at several rest areas and service stations on Interstates 55, 57, and 80/294.

The intercept surveys collected basic demographic data and details regarding the respondents' current trip, their current mode choice (i.e. air, Amtrak, automobile, or long-distance bus), and their willingness to use HSR if it were available under various hypothetical situations. This survey type is called a Stated Preference survey and is often used to collect mode choice data for travel modes that do not currently exist.

The surveyors asked the respondents to consider their trips in totality, including the cost and time associated with accessing each mode. A total of 1,767 respondents across all modes successfully completed the survey, yielding a total of 1,629 valid questionnaires and 6,318 valid stated-preference responses. The response rates, which are the percentage of people who took part in the survey after being approached by the survey team, ranged from 23 percent (for bus riders) to 29 percent (for auto travelers). The sample corresponded well with 2010 census results in terms of key demographic variables.

Personal Travel Survey

The study team hired trained callers, primarily University of Illinois at Chicago students, to call random telephone numbers listed in a database of 45,000 individuals living in the study area. The study team purchased this database from a commercial vendor.

The study team designed the personal travel survey to capture these individuals' general long-distance travel characteristics, primarily focusing on where they travelled, how often they travelled, and the travel mode they usually chose.

The trained callers received usable surveys from 1,217 individuals or 2.7 percent of all individuals called. Since this database already contained basic socio-economic information for each individual called, the study team could assess non-response bias and determine appropriate weighting factors based on 2010 Census distributions.

The surveyed individuals also provided data about 1,136 business and non-business trips made in the year before the survey. The study team used these data to estimate long-distance travel frequency, which was 3.8 round-trips per person per year. Sixty-four percent of these trips occurred outside of the modeled region and 20 percent occurred within the modeled region.

5.3. Ridership and Fare Revenue Forecasts

The ridership models estimate the number of long-range trips expected to be generated between model cities, distributes those trips between cities, and then assigns the results of the distributed travel demand to specific travel modes. From this, the study team can estimate expected ridership on the HSR system. For inter-regional trips, the study team used the survey data to develop statistical models for this study. For intra-regional trips, the team used the models that were developed by the Airport Express study team and CMAP. Many ridership estimates were developed to help robustly assess whether the HSR system is feasible under different conditions. Because the study team found that the cost of driving (consisting of fuel, vehicle maintenance, and tire costs) is one of the key factors that travelers use to consider alternative transportation modes, ridership estimates were developed for three different assumptions with respect to the cost of driving: 15 cents per mile, 20 cents per mile, and 30 cents per mile. For the last 3 years, the cost of driving, estimated each year by AAA, varied from about 17 cents per mile to 20 cents per mile for a medium sedan[9]. This figure excludes costs associated with vehicle ownership and depreciation, which depend on age, type of vehicle and mileage driven. This means driving costs were analyzed within 75 percent to 150 percent of the current level. Since any significant change in driving cost is likely to be accompanied by increases in the costs of other modes that rely on fossil fuel, the driving cost scenarios of 30 cents per mile and 15 cents per mile and the costs of air and bus trips were also increased and decreased by 25 percent, respectively.

For each assumed driving cost, the study team estimated ridership for each of the three HSR fare levels. For each station-to-station pair except for the service between O'Hare Airport and Union Station, the fares were calculated according to a formula that combines base fare levels of $10, $15, and $20, plus $0.20/mile, $0.25/mile, and $0.30/mile of distance charge, respectively (all in base-year dollar value). For the service between O'Hare Airport and Union Station, the fares only included the base fare levels. Then, for each station-to-station pair, the study team identified the HSR fare level among those three that maximized the fare revenue.

The ridership estimates shown in Tables 5 through 7 represent expected demand under the revenue-maximizing HSR fare, determined separately for each station-to-station pair for each of the three driving-cost scenarios. The ridership figures for the St. Louis and Indianapolis metropolitan areas represent combined ridership for two stations in each area. The study team expects approximately 25 percent of riders for each area will be airline passengers who use HSR to access Chicago O'Hare International Airport; 5 percent will be commuters or social/recreational travelers within the Chicago region; and the remainder will be long-distance travelers between cities within the study area.

[9] AAA (2010). Your Driving Costs, 2010 Edition. AAA Heathrow, FL 2010
AAA (2011). Your Driving Costs, 2011 Edition. AAA Heathrow, FL 2011
AAA (2012). Your Driving Costs, 2012 Edition. AAA Heathrow, FL 2012

Table 5. Projected 2035 HSR Ridership – Driving Cost at Current Level

2035 Driving Cost Unchanged Annual Riders (000s)	O'Hare	Union Station	University Park	Kankakee	Champaign	Indianapolis metro	Decatur	Springfield	St. Louis metro	Total
O'Hare		546	4	5	257	737	101	242	799	2,691
Union Station	546		201	5	108	274	36	115	372	1,657
University Park	4	201		18	77	188	41	112	195	836
Kankakee	5	5	18		6	38	4	7	46	128
Champaign	257	108	77	6		60	3	16	73	600
Indianapolis metro	737	274	188	38	60		35	128	256	1,717
Decatur	101	36	41	4	3	35		2	43	266
Springfield	242	115	112	7	16	128	2		75	697
St. Louis metro	799	372	195	46	73	256	43	75		1,860
Total	2,691	1,657	836	128	600	1,717	266	697	1,860	10,451

Table 6. Projected 2035 HSR Ridership – Driving Cost 50 Percent Higher

2035 High Driving Cost Annual Riders (000s)	O'Hare	Union Station	University Park	Kankakee	Champaign	Indianapolis metro	Decatur	Springfield	St. Louis metro	Total
O'Hare		560	9	11	362	948	239	459	954	3,541
Union Station	560		239	9	201	463	54	206	501	2,233
University Park	9	239		23	77	306	57	129	250	1,090
Kankakee	11	9	23		7	63	3	13	71	199
Champaign	362	201	77	7		91	5	23	117	882
Indianapolis metro	948	463	306	63	91		43	178	472	2,565
Decatur	239	54	57	3	5	43		3	43	447
Springfield	459	206	129	13	23	178	3		106	1,117
St. Louis metro	954	501	250	71	117	472	43	106		2,514
Total	3,541	2,233	1,090	199	882	2,565	447	1,117	2,514	14,588

Table 7. Projected 2035 HSR Ridership – Driving Cost 25 Percent Lower

2035 Low Driving Cost Annual Riders (000s)	O'Hare	Union Station	University Park	Kankakee	Champaign	Indianapolis metro	Decatur	Springfield	St. Louis metro	Total
O'Hare		538	1	2	138	410	77	184	342	1,691
Union Station	538		181	6	133	252	33	109	321	1,573
University Park	1	181		15	76	191	40	84	171	759
Kankakee	2	6	15		7	38	2	10	41	120
Champaign	138	133	76	7		86	5	17	68	530
Indianapolis metro	410	252	191	38	86		29	115	218	1,339
Decatur	77	33	40	2	5	29		3	29	219
Springfield	184	109	84	10	17	115	3		86	608
St. Louis metro	342	321	171	41	68	218	29	86		1,276
Total	1,691	1,573	759	120	530	1,339	219	608	1,276	8,115

6. Operating and Maintenance Costs

6.1 Methodology

The study team entered train running times into the Train Performance Calculator models described in Section 4 to develop an operating plan. They used the results from this process to prepare conceptual train schedules and determine what train equipment (including backup maintenance spares) would be needed to service those schedules.

The study team combined ridership, fares, and operating plans with corresponding labor, material, and other cost requirements to prepare 10-year financial pro forma models for 12 alternative combinations. These alternative combinations included two operating scenarios (the overall Chicago-Champaign-St. Louis-Indianapolis and the Chicago-Champaign-St. Louis networks), two infrastructure alternatives (slab track or mostly ballasted track using concrete ties), and three maximum revenue cases (baseline, high, and low). The use of slab track is called the high capital expenditure alternative and the use of mostly ballasted track is called the low capital expenditure alternative.

This study's pro forma models show revenue estimates by station and by origin-destination pair and 10 years of estimated balance sheets, cash flows, debt service, profit-and-loss details, and other operating and financial performance statistics. As inputs change, it is a simple matter to re-calculate costs to see those changes' effects.

6.2 Operating Plan Alternative

The study team developed two different operating plan alternatives. The first alternative consists of operations between Chicago O'Hare International Airport and Lambert-St. Louis

International Airport, with intermediate stops at Chicago Union Station, University Park, Kankakee, Champaign, Decatur, Springfield, and downtown St. Louis. McCormick Place is noted as a special event stop; however, these operating plan alternatives do not consider regularly-scheduled stops at McCormick Place. The second alternative adds service to and from Danville, Indianapolis International Airport, and downtown Indianapolis to the first alternative. Trains under this alternative would connect with the Chicago-St. Louis Line at Champaign.

For the first alternative, the study team proposes the following operating plan, which consists of single six-car trainsets operating each weekday (excluding holidays) on the following schedule:

1. Initial departures from Chicago O'Hare and Lambert-St. Louis Airports at 6 a.m.;
2. Departures every half hour between 7 a.m. and 9 a.m.;
3. Departures every hour between 9 a.m. and 4 p.m.;
4. Departures every half hour between 4 p.m. and 7 p.m.; and
5. Final departures at 8 p.m.

Weekend and holiday service would depart hourly from 7 a.m. through 7 p.m. from each end point.

A different operating plan is required to maximize single-seat services between originating and terminating stations under the second alternative, given that most passengers to and from Indianapolis would likely board or alight at or north of Champaign. The most practical alternative is to run two smaller trainsets, coupled together, between Chicago and Champaign. Southbound trains (from Chicago O'Hare Airport) would split at Champaign. One section would run to Indianapolis and the other to St. Louis. Similarly, trains from Indianapolis and St. Louis would be scheduled to meet at Champaign and run together as a single train to Chicago's O'Hare Airport. Passengers between Indianapolis and St. Louis would still have to change trains at Champaign, but the estimated number of passengers subject to this inconvenience is much smaller than the number of people moving between Chicago and Indianapolis.

The proposed operating timetable for the second alternative is shown in Table 8. Since traffic potential was not high enough to justify half-hourly schedules during rush hour on the Champaign-Indianapolis segment, some trainsets would have to remain at Champaign for peak-period trains returning from St. Louis. If the first alternative were operated, the timetable would be similar, except that trains would depart St. Louis nine minutes later (since there would not be any Indianapolis trains to meet at Champaign).

Table 8. Proposed 220 MPH Train Service Timetable

Southbound - Read Down — Train Number

Station		1	3	5	7	9	11	13	15	17	19	21	23	25	27	29	31	33	35	37	39	41
O'Hare	Dpt	6:00 AM	7:00 AM	7:30 AM	8:00 AM	8:30 AM	9:00 AM	9:30 AM	10:00 AM	11:00 AM	12:00 PM	1:00 PM	2:00 PM	3:00 PM	4:00 PM	4:30 PM	5:00 PM	5:30 PM	6:00 PM	6:30 PM	7:00 PM	8:00 PM
Union Station		6:10 AM	7:10 AM	7:40 AM	8:10 AM	8:40 AM	9:10 AM	9:40 AM	10:10 AM	11:10 AM	12:10 PM	1:10 PM	2:10 PM	3:10 PM	4:10 PM	4:40 PM	5:10 PM	5:40 PM	6:10 PM	6:40 PM	7:10 PM	8:10 PM
University Park		6:28 AM	7:28 AM	7:58 AM	8:28 AM	8:58 AM	9:28 AM	9:58 AM	10:28 AM	11:28 AM	12:28 PM	1:28 PM	2:28 PM	3:28 PM	4:28 PM	4:58 PM	5:28 PM	5:58 PM	6:28 PM	6:58 PM	7:28 PM	8:28 PM
Kankakee		6:40 AM	7:40 AM	8:10 AM	8:40 AM	9:10 AM	9:40 AM	10:10 AM	10:40 AM	11:40 AM	12:40 PM	1:40 PM	2:40 PM	3:40 PM	4:40 PM	5:10 PM	5:40 PM	6:10 PM	6:40 PM	7:10 PM	7:40 PM	8:40 PM
Champaign		7:05 AM	8:05 AM	8:35 AM	9:05 AM	9:35 AM	10:05 AM	10:35 AM	11:05 AM	12:05 PM	1:05 PM	2:05 PM	3:05 PM	4:05 PM	5:05 PM	5:35 PM	6:05 PM	6:35 PM	7:05 PM	7:35 PM	8:05 PM	9:05 PM
Decatur		7:26 AM	8:26 AM	8:56 AM	9:26 AM	9:56 AM	10:26 AM	10:56 AM	11:26 AM	12:26 PM	1:26 PM	2:26 PM	3:26 PM	4:26 PM	5:26 PM	5:56 PM	6:26 PM	6:56 PM	7:26 PM	7:56 PM	8:26 PM	9:26 PM
Springfield		7:44 AM	8:44 AM	9:14 AM	9:44 AM	10:14 AM	10:44 AM	11:14 AM	11:44 AM	12:44 PM	1:44 PM	2:44 PM	3:44 PM	4:44 PM	5:44 PM	6:14 PM	6:44 PM	7:14 PM	7:44 PM	8:14 PM	8:44 PM	9:44 PM
St. Louis		8:24 AM	9:24 AM	9:54 AM	10:24 AM	10:54 AM	11:24 AM	11:54 AM	12:24 PM	1:24 PM	2:24 PM	3:24 PM	4:24 PM	5:24 PM	6:24 PM	6:54 PM	7:24 PM	7:54 PM	8:24 PM	8:54 PM	9:24 PM	10:24 PM
Lambert	Arr	8:36 AM	9:36 AM	10:06 AM	10:36 AM	11:06 AM	11:36 AM	12:06 PM	12:36 PM	1:36 PM	2:36 PM	3:36 PM	4:36 PM	5:36 PM	6:36 PM	7:06 PM	7:36 PM	8:06 PM	8:36 PM	9:06 PM	9:36 PM	10:36 PM
Danville		7:26 AM	8:26 AM		9:26 AM		10:26 AM		11:26 AM	12:26 PM	1:26 PM	2:26 PM	3:26 PM	4:26 PM	5:26 PM		6:26 PM		7:26 PM		8:26 PM	9:26 PM
Indy Airport		8:13 AM	9:13 AM		10:13 AM		11:13 AM		12:13 PM	1:13 PM	2:13 PM	3:13 PM	4:13 PM	5:13 PM	6:13 PM		7:13 PM		8:13 PM		9:13 PM	10:13 PM
Indianapolis	Arr	8:22 AM	9:22 AM		10:22 AM		11:22 AM		12:22 PM	1:22 PM	2:22 PM	3:22 PM	4:22 PM	5:22 PM	6:22 PM		7:22 PM		8:22 PM		9:22 PM	10:22 PM

Northbound - Read Up — Train Number

Station		2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42
O'Hare	Arr	8:13 AM	9:13 AM	9:43 AM	10:13 AM	10:43 AM	11:13 AM	11:43 AM	12:13 PM	1:13 PM	2:13 PM	3:13 PM	4:13 PM	5:13 PM	6:13 PM	6:43 PM	7:13 PM	7:43 PM	8:13 PM	8:43 PM	9:13 PM	10:13 PM
Union Station		8:01 AM	9:01 AM	9:31 AM	10:01 AM	10:31 AM	11:01 AM	11:31 AM	12:01 PM	1:01 PM	2:01 PM	3:01 PM	4:01 PM	5:01 PM	6:01 PM	6:31 PM	7:01 PM	7:31 PM	8:01 PM	8:31 PM	9:01 PM	10:01 PM
University Park		7:43 AM	8:43 AM	9:13 AM	9:43 AM	10:13 AM	10:43 AM	11:13 AM	11:43 AM	12:43 PM	1:43 PM	2:43 PM	3:43 PM	4:43 PM	5:43 PM	6:13 PM	6:43 PM	7:13 PM	7:43 PM	8:13 PM	8:43 PM	9:43 PM
Kankakee		7:31 AM	8:31 AM	9:01 AM	9:31 AM	10:01 AM	10:31 AM	11:01 AM	11:31 AM	12:31 PM	1:31 PM	2:31 PM	3:31 PM	4:31 PM	5:31 PM	6:01 PM	6:31 PM	7:01 PM	7:31 PM	8:01 PM	8:31 PM	9:31 PM
Champaign		7:04 AM	8:04 AM	8:34 AM	9:04 AM	9:34 AM	10:04 AM	10:34 AM	11:04 AM	12:04 PM	1:04 PM	2:04 PM	3:04 PM	4:04 PM	5:04 PM	5:34 PM	6:04 PM	6:34 PM	7:04 PM	7:34 PM	8:04 PM	9:04 PM
Decatur		6:45 AM	7:45 AM	8:15 AM	8:45 AM	9:15 AM	9:45 AM	10:15 AM	10:45 AM	11:45 AM	12:45 PM	1:45 PM	2:45 PM	3:45 PM	4:45 PM	5:15 PM	5:45 PM	6:15 PM	6:45 PM	7:15 PM	7:45 PM	8:45 PM
Springfield		6:27 AM	7:27 AM	7:57 AM	8:27 AM	8:57 AM	9:27 AM	9:57 AM	10:27 AM	11:27 AM	12:27 PM	1:27 PM	2:27 PM	3:27 PM	4:27 PM	4:57 PM	5:27 PM	5:57 PM	6:27 PM	6:57 PM	7:27 PM	8:27 PM
St. Louis		5:48 AM	6:48 AM	7:18 AM	7:48 AM	8:18 AM	8:48 AM	9:18 AM	9:48 AM	10:48 AM	11:48 AM	12:48 PM	1:48 PM	2:48 PM	3:48 PM	4:18 PM	4:48 PM	5:18 PM	5:48 PM	6:18 PM	6:48 PM	7:48 PM
Lambert	Dpt	5:37 AM	6:37 AM	7:07 AM	7:37 AM	8:07 AM	8:37 AM	9:07 AM	9:37 AM	10:37 AM	11:37 AM	12:37 PM	1:37 PM	2:37 PM	3:37 PM	4:07 PM	4:37 PM	5:07 PM	5:37 PM	6:07 PM	6:37 PM	7:37 PM
Danville		6:46 AM	7:46 AM		8:46 AM		9:46 AM		10:46 AM	11:46 AM	12:46 PM	1:46 PM	2:46 PM	3:46 PM	4:46 PM		5:46 PM		6:46 PM		7:46 PM	8:46 PM
Indy Airport		5:59 AM	6:59 AM		7:59 AM		8:59 AM		9:59 AM	10:59 AM	11:59 AM	12:59 PM	1:59 PM	2:59 PM	3:59 PM		4:59 PM		5:59 PM		6:59 PM	7:59 PM
Indianapolis	Dpt	5:51 AM	6:51 AM		7:51 AM		8:51 AM		9:51 AM	10:51 AM	11:51 AM	12:51 PM	1:51 PM	2:51 PM	3:51 PM		4:51 PM		5:51 PM		6:51 PM	7:51 PM

6.3 Fleet Requirements

After the study team manually plotted train availability after each run, including additional time for service and cleaning, they determined that 12 six-car trainsets would be required to implement the proposed schedule for the first alternative (Chicago-St. Louis) and 18 five-car trainsets for the second alternative (Chicago-St. Louis-Indianapolis). These alternatives would each need three additional similarly-sized trainsets as maintenance spares. These trainset details are shown in Table 9.

Table 9. Trainset Details

Network Scenario	Alternative 1 (Chicago-St. Louis Only)	Alternative 2 (Chicago-St. Louis-Indianapolis)
Total Trainsets	15	21
Cars per Trainset	6	5
Total Cars	90	105
Total Seats per Car	80	80
Total Seats per Trainset	480	400

6.4 Pro Forma Model

This study's pro forma model is divided into five input worksheets, five output worksheets, and a separate worksheet that calculates depreciation. Inputs to the model are all at "base year" (2012) levels. Users can then specify the first year of construction and the first year of revenue operations. Inflated revenue, costs, and ridership outputs are automatically adjusted.

The number of full-time equivalent employees for the second alternative with mostly ballasted track (low capital expenditure alternative) and maximum baseline revenues and ridership is shown in Table 10. Employment for the 11 other modeling options result in more or fewer employees.

**Table 10. Number of Full-Time Equivalent Employees
Alternative 2 (Chicago-St. Louis-Indianapolis) and Low Capital Expenditure**

Year	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Maintenance of Way and Structures	322	322	335	349	364	381	398	416	436	456
Maintenance of Equipment	96	96	96	96	96	96	96	96	96	96
Transportation	244	244	244	244	244	244	244	244	244	244
Marketing and Sales	93	95	96	98	100	102	104	106	108	110
General and Administrative	46	30	47	31	48	32	49	33	50	34
Total	801	786	818	818	852	854	890	894	933	940

6.4.1 Key Revenue Findings

Table 11 shows each station's average fare, its percentage of system-wide ticket sales, and its percentage of system-wide boardings. The rows marked in green have an above-average percentage of system-wide ticket sales and the rows marked in blue have a below-average percentage of system-wide ticket sales. These key revenue findings are similar for all three revenue cases. Revenues for stations at McCormick Place and Danville were not studied, since ridership was not determined for these stations.

Table 11. Average Fares in 2025 and Percentages of System-wide Ticket Sales and Boardings for Alternative 2 (Chicago-St. Louis-Indianapolis)

	Average Fare in 2025	Percentage of Systemwide Ticket Sales	Percentage of Systemwide Boardings
O'Hare International Airport	$87.81	24%	25%
Chicago Union Station	$72.02	13%	16%
University Park	$71.38	6%	8%
Kankakee	$79.48	1%	1%
Champaign	$74.78	5%	6%
Decatur	$75.12	2%	3%
Springfield	$92.76	7%	7%
St. Louis	$111.17	19%	15%
Lambert International Airport	$114.55	3%	3%
Indianapolis International Airport	$99.47	12%	11%
Downtown Indianapolis	$104.80	6%	6%

Indicates Largest Percentage of Ticket Sales

Indicates Lowest Percentage of Ticket Sales

The study team believes that the following origin-destination pairs will generate the most fare revenues in 2025. The numbers inside the parentheses are projected total fare revenues and the percentage of total system-wide fare revenues that each origin-destination pair is expected to generate.

a. Chicago O'Hare International Airport and St. Louis — ($132 million, 16 percent)
b. Chicago O'Hare International Airport and Indianapolis International Airport — ($97 million, 12 percent)
c. Chicago Union Station and St. Louis — $70 million, 9 percent)
d. Chicago O'Hare International Airport and Springfield — ($51 million, 6 percent)
e. Chicago Union Station and Indianapolis International Airport — ($35 million, 4 percent)

The maximum revenue base case for the first alternative (Chicago-St. Louis) would use six-car trainsets with a total of 480 seats. The highest average ratio of passengers to available seats is 68 percent between Kankakee and Champaign in 2025. This would likely increase to 76 percent in 2034. The lowest percentage is between St. Louis and Lambert-St. Louis International Airport with 5.4 percent in 2025 and in 2034.

The maximum revenue base case for the second alternative (Chicago-St. Louis-Indianapolis) would use five-car trainsets with a total of 400 seats. The highest average ratio of passengers to available seats is 85 percent between Champaign and Decatur in 2025, increasing to

94 percent in 2034. The lowest percentage is between St. Louis and Lambert-St. Louis International Airport with 9 percent in 2025 and 2034.

6.4.2 Profit-and-Loss Findings

The study team can present estimated profit-and-loss findings in several ways, ranging from full details by functional categories of revenues and expenses to basic totals of revenues, expenses, and net contributions to capital replacement and fixed costs. In Table 12, the study team summarized profit and loss findings for the maximum baseline revenue case.

Table 12. Profit-and-Loss Estimates, Maximum Baseline Revenues

YEAR	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Alternative 1 (Chicago – St. Louis), Low Capital Expenditures (Mostly Ballasted Track)										
Total Revenues	$536,287	$562,381	$589,825	$618,693	$649,063	$681,019	$714,648	$750,043	$787,301	$826,528
Total Operating Exp, Incl. Deprn	$692,757	$699,062	$703,851	$713,478	$722,643	$728,327	$739,547	$750,346	$757,138	$770,482
Total Operating Exp, Excl. Deprn	$162,748	$169,053	$173,842	$183,469	$192,634	$198,308	$209,606	$220,406	$227,198	$240,552
Net Income Excluding Deprn	$373,539	$393,328	$415,982	$435,223	$456,429	$482,711	$505,042	$529,637	$560,103	$585,975
Alternative 1 (Chicago – St. Louis), High Capital Expenditures (Slab Track)										
Total Revenues	$536,287	$562,381	$589,825	$618,693	$649,063	$681,019	$714,648	$750,043	$787,301	$826,528
Total Operating Exp, Incl. Deprn	$958,303	$963,985	$967,218	$975,137	$982,424	$986,041	$995,016	$1,003,315	$1,007,352	$1,017,658
Total Operating Exp, Excl. Deprn	$145,577	$151,258	$154,491	$162,410	$169,698	$173,308	$182,335	$190,634	$194,671	$204,989
Net Income Excluding Deprn	$390,710	$411,123	$435,333	$456,283	$479,366	$507,711	$532,313	$559,408	$592,630	$621,539
Alternative 2 (Chicago-St. Louis-Indianapolis), Low Capital Expenditures (Mostly Ballasted Track)										
Total Revenues	$852,469	$893,772	$937,208	$982,892	$1,030,950	$1,081,511	$1,134,712	$1,190,702	$1,249,632	$1,311,669
Total Operating Exp, Incl. Deprn	$932,293	$937,711	$951,036	$959,625	$974,418	$984,040	$1,000,382	$1,011,166	$1,029,565	$1,041,704
Total Operating Exp, Excl. Deprn	$236,562	$241,979	$255,304	$263,893	$278,687	$288,291	$304,763	$315,547	$333,947	$346,108
Net Income Excluding Deprn	$615,907	$651,793	$681,904	$719,000	$752,263	$793,220	$829,949	$875,154	$915,686	$965,560
Alternative 2 (Chicago-St. Louis-Indianapolis), High Capital Expenditures (Slab Track)										
Total Revenues	$852,469	$893,772	$937,208	$982,892	$1,030,950	$1,081,511	$1,134,712	$1,190,702	$1,249,632	$1,311,669
Total Operating Exp, Incl. Deprn	$1,309,524	$1,314,043	$1,325,143	$1,331,290	$1,343,400	$1,350,071	$1,363,207	$1,370,418	$1,384,882	$1,392,688
Total Operating Exp, Excl. Deprn	$211,835	$216,354	$227,454	$233,601	$245,711	$252,365	$265,593	$272,804	$287,268	$295,091
Net Income Excluding Deprn	$640,634	$677,418	$709,753	$749,292	$785,239	$829,145	$869,120	$917,898	$962,364	$1,016,577

The study team made the following observations for Alternative 1 (Chicago-St. Louis) versus Alternative 2 (Chicago-St. Louis-Indianapolis) for either low or high capital expenditures:

- Optimistic maximum revenues are approximately 27 percent higher than maximum baseline revenues in 2025. These revenues are approximately 42 percent higher in 2035. The corresponding impact on net earnings (excluding depreciation) is greater at approximately 37 percent in 2025, increasing to approximately 55 percent in 2035.
- Pessimistic maximum revenues are approximately 12 percent less than base maximum revenues in 2025. They deteriorate to approximately 22 percent less by 2035. The negative impact on earnings is even greater, at approximately negative 17 percent in 2025, deteriorating to about minus 28 percent in 2035.

There is a large synergistic benefit of adding the Indianapolis leg to the Chicago-St. Louis operation in Alternative 2. Although capital costs are 30 percent higher for the low capital expenditure option (36 percent higher for the high capital expenditure option), Alternative 2 increases revenues approximately 59 percent compared to Alternative 1 for all three revenue cases. Alternative 2 also increases net income 65 percent each year (excluding depreciation, capital replacement, and debt service).

7. Economic Analysis

7.1 Methodology

The study team conducted four separate analyses to assess the HSR system's economic impacts. The study team's analyses of construction and operating impacts relied on a series of assumptions about route choices, infrastructure options, ridership levels, and financial implementation. The public-benefits evaluation was based on ridership data and estimates of the HSR system's contributions to a small set of environmental indicators. The value capture analysis included on-site interviews with operations personnel in Japan, Hong Kong, and Taiwan that revealed some of the potential enhancements to revenue that could be obtained from value capture. However, the conditions in those countries were different from those in Illinois and the final analysis suggests that at least initially, the value capture benefits are likely to be modest.

7.2 Construction Impacts

The construction-impacts analysis focused on four different geographic areas: the State of Illinois and the cities of Chicago, Kankakee, and Champaign. Two types of methods of constructing the HSR infrastructure are presented: (1) elevated structure (viaduct); (2) at grade (track on embankment or retained fill). The study team considered these impacts for Alternatives 1 (Chicago-St. Louis) and 2 (Chicago-St. Louis-Indianapolis).

The study team estimated construction costs (initial impacts) for each geographic area under each scenario. They entered these estimates into a regional economic model to determine how these expenditures would directly or indirectly impact employment, income, and output.
A representative impact on Illinois' economy is shown in Table 13 for Alternative 2 built with at-grade construction.

Table 13. Construction Impacts

	Output ($m)					Income ($m)					Employment ('000)					
	2014	**2015**	**2016**	**2017**	**2018**	**2014**	**2015**	**2016**	**2017**	**2018**	**2014**	**2015**	**2016**	**2017**	**2018**	**2014**
Resources	38	82	117	92	50	16	35	50	40	22	0	1	2	1	1	5
Construction	1,857	4,133	6,125	4,952	2,778	835	1,853	2,730	2,205	1,234	17	38	56	45	25	181
Nondurables	499	1,102	1,619	1,301	726	65	144	212	170	95	1	2	3	2	1	9
Durables	660	1,455	2,139	1,717	957	189	414	604	481	266	3	6	9	7	4	29
TCU	232	508	744	596	331	63	138	202	161	90	1	2	3	3	2	11
Trade	399	884	1,305	1,053	590	152	332	484	385	212	4	9	14	11	6	45
FIRE	241	533	784	631	353	68	147	214	170	94	1	3	4	3	2	13
Services	673	1,493	2,203	1,779	998	285	634	939	761	428	7	16	24	19	11	78
Government	39	87	129	104	58	198	434	635	506	280	4	8	12	9	5	38
Total	**4,638**	**10,277**	**15,164**	**12,225**	**6,841**	**1,870**	**4,131**	**6,070**	**4,880**	**2,721**	**39**	**86**	**126**	**101**	**56**	**409**
Direct	1,922	4,291	6,376	5,165	2,904	783	1,743	2,575	2,082	1,168	16	35	51	41	23	166
Indirect	2,716	5,986	8,787	7,059	3,937	1,087	2,388	3,495	2,798	1,553	24	52	75	60	33	244
Multiplier	2.41	2.40	2.38	2.37	2.36	2.39	2.37	2.36	2.34	2.33	2.51	2.49	2.47	2.45	2.44	2.47

TCU = Transportation Communications and Utilities
FIRE = Finance, Insurance, and Real Estate

Note that while the impacts are heavily concentrated in the construction sector, significant spillover affects the economy's remaining sectors. The impacts' distribution results from the value chain associated with the construction expenditures themselves (concrete, re-bar, I-beams, grading machinery, etc.) and with the variety of goods and services that people working on this project would produce or provide.

To summarize the impacts from various scenarios, the concept of a job-year was used. A job-year is a full-time equivalent position an individual holds for one year. Since many of the positions will extend for the lifetime of the construction project, the study team believed that it was a more suitable measure than adding to the yearly job totals.

The results revealed that construction of this HSR system will generate a maximum of 792,000 job-years and a minimum of 409,000 job-years in the Illinois economy given the type of scenarios. It would also create a maximum of 124,000 job-years and a minimum of 79,000 job-years in the Chicago area by 2018; a maximum of 27,000 job years and a minimum of 14,000 job years in the Kankakee area by year 2018; and a maximum of 81,000 job years and a minimum of 25,000 job years in the Champaign area by 2018.

7.3 Operations Impacts

The study team estimated the operating impacts in a similar fashion for the State of Illinois and Chicago, Kankakee, and Champaign. The study team again considered Alternatives 1 (Chicago-St. Louis) and 2 (Chicago-St. Louis-Indianapolis).

The study team estimated operating expenses (initial impacts) for each geographic area under each scenario. They entered these estimates into a regional economic model to determine how these expenditures would directly and indirectly affect employment, income, and output. A sample output for the State of Illinois is provided in Table 14.

Table 14. Scenario Chicago-Champaign-St. Louis Network: Employment Impacts

Employment ('000)

	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	**Average**
Resources	0.11	0.11	0.11	0.10	0.10	0.10	0.10	0.09	0.09	0.09	0.10
Construction	3.33	3.31	3.29	3.28	3.28	3.28	3.28	3.26	3.25	3.25	3.28
Nondurables	0.21	0.21	0.20	0.19	0.19	0.19	0.18	0.18	0.18	0.18	0.19
Durables	0.60	0.59	0.57	0.55	0.54	0.52	0.51	0.50	0.48	0.47	0.53
TCU	0.43	0.43	0.42	0.41	0.41	0.40	0.40	0.39	0.38	0.38	0.40
Trade	1.01	0.99	0.97	0.95	0.93	0.92	0.91	0.89	0.88	0.86	0.93
FIRE	0.36	0.35	0.35	0.34	0.33	0.33	0.32	0.32	0.31	0.31	0.33
Services	4.16	4.15	4.15	4.13	4.14	4.13	4.14	4.14	4.15	4.15	4.14
Government	1.04	1.02	1.01	0.99	0.97	0.96	0.95	0.94	0.93	0.92	0.97
Total	**11.27**	**11.15**	**11.06**	**10.94**	**10.89**	**10.82**	**10.79**	**10.71**	**10.66**	**10.61**	**10.89**
Direct	4.71	4.69	4.69	4.69	4.70	4.70	4.71	4.70	4.70	4.70	4.70
Indirect	6.56	6.46	6.37	6.25	6.19	6.12	6.07	6.01	5.97	5.92	6.19
Multiplier	2.39	2.38	2.36	2.33	2.32	2.30	2.29	2.28	2.27	2.26	2.32

TCU = Transportation Communications and Utilities
FIRE = Finance, Insurance, and Real Estate

The study team assumed that the life of the HSR system would exceed 30 years, but assumed a 10-year operating phase to provide a sense of its impacts. For the State of Illinois, the HSR operation would generate a maximum average of 13,820 jobs per year and a minimum average of 10,890 jobs per year. The study team anticipates that the HSR system would create an average of 1,080 jobs per year in the Chicago area, an average of 620 jobs per year in the Kankakee area, and between 970 and 1,610 jobs per year in the Champaign area. These operating impacts are sensitive to service frequencies, rolling stock and track maintenance costs, and the potential scope of an eventual Midwest HSR network.

7.4 Public Benefits Valuations

The HSR system's benefits accrue to users of other transportation modes (e.g., less highway congestion) and improvements to the environment as a broader public benefit of the project. Wider economic impacts relate to the net multiplier effect of the HSR construction, operation and other possible investments. The net benefits require some estimation of the opportunity costs and benefits of directing a similar level of investment into another bundle of private or public goods. With public-private partnerships, this evaluation becomes more difficult since there may be a possibility of the project not being considered without some form of cost-sharing (see discussion in Section 10).

HSR not only provides mobility benefits to its users, but also environmental benefits to the public at large. Automobile emissions are an important source of air pollution that can affect human health, and they also are a contributor to greenhouse gas emissions. Vehicle miles traveled (VMT) is correlated with these emissions. Although automobile fuel economy is projected to increase in the future, VMT are also projected to increase. The U.S. Department of Energy forecasts a VMT increase of 59 percent between 2005 and 2030, while the population is projected to grow by 23 percent.[10]

This study found that person miles traveled (PMT) on other transportation modes, especially automobile travel, would be higher without HSR (Table 15). VMT will be larger without HSR as well, assuming the same vehicle occupancy rate for both cases. These forecasts indicate that without HSR, there will be more VMT and correspondingly more greenhouse gas emissions.

Table 15. Person Miles Traveled (PMT) with and without HSR between 2018 to 2027 (in Miles)

Driving Cost Assumptions	PMT with HSR	PMT without HSR	PMT Reduced
Base ($0.2/mile)	44,880,338,506	51,537,858,571	**6,657,520,065**
High Driving Cost ($0.3/mile)	36,208,587,326	44,516,044,541	**8,307,457,214**
Low Driving Cost ($0.15/mile)	52,389,481,716	58,252,293,672	**5,862,811,956**

The study team estimated the impacts of greenhouse gas emissions on the environment using PMT and VMT data[11]. Table 16 summarizes the greenhouse gas emission reduction over a 10-year operational period, showing a benefit of over one million tons of greenhouse gas emissions in terms of CO_2 equivalent.

Table 16. Estimated Total Reduction in Greenhouse Gas Emissions from 2018 to 2027 (in tons of CO_2 equivalent)

Base ($0.2/mile)	1,093,000
High Driving Cost ($0.3/mile)	1,453,000
Low Driving Cost ($0.15/mile)	1,030,000

[10] Energy Information Administration. Annual Energy Outlook 2007. Department of Energy. Washington, DC. February 2007. pp 149

[11] World Resources Institute, *GHG Protocol tool for mobile combustion*, Version 2.2, 2008.

The HSR system's largest impacts on the environment would result from reduction in automobile trips (compared to the base case without HSR). Smaller impacts could also be expected related to reduced traffic congestion costs and highway pavement replacement costs (as the lifetime of the pavement would be extended as a result of the reduction in use) as well as reductions in traffic accidents. However, these latter benefits are likely nominal.

7.5 Value Capture

An extensive body of literature has explored the impact that public facilities have on surrounding land uses. In some cases, these impacts enhance property values, while in other cases, the impacts may be negative. Examples of positive impacts include public transportation facilities (subways, HSR stations, and termini) and public amenities (such as open space, forest preserves, and lakes). Waste treatment plants are an example of negative impacts.

Value capture refers to the options that a public agency could use to share some of the benefits that would accrue to a set of sites that would benefit from an enhancement, such as a HSR line. Most of these benefits would accrue to land and buildings at or near station sites or termini; there would be little in the way of value capture along the right-of-way between stations.

Value capture is a tangible way of recovering a stream of revenue that is separate from farebox revenue but may be closely associated with the patronage of the public transportation system. An example of this is the economic development associated with the newly renovated EUROSTAR terminal in St. Pancras Station in London, England. The concourse is filled with retail shops and restaurants, ATM machines, and other conveniences for the traveling public. The rents derived from these businesses will help defray the costs of the renovation. Without the walk-in traffic generated by passengers these businesses would have much more limited patronage. These private gains (sales and profits) were generated by investment in the high-speed train network linking London to the European continent. Numerous other examples of similar development and corresponding benefits can be found at HSR stations throughout the world. Successful examples can also be found in the U.S., such as Washington Union Station, and other stations on the Northeast Corridor. In general, substantial private land and property values may be generated from public investment in transit, rail, and airport systems. A means of capturing this value should be integral part of a development and financing plan for an Illinois HSR project.

The government (or private financier in some cases) would be able to capture some of these incremental values from the private sector to finance the transportation project. Value capture as a public financing mechanism can help the government retire bond obligations that financed the transportation infrastructure.

In the remainder of this report, the study team will assume that the government (local, state, or federal) is the financing source. Most studies have evaluated value capture in the context of transit investments, but the study team believes that this methodology is equally applicable to HSR. However, the capture opportunities might be more spatially limited, given fewer stations. The impacts, in many cases, may also be incremental since existing facilities and services may have already generated some private-sector values.

The study team evaluated value-capture strategies from Japan, Hong Kong, and Taiwan. As much as 30 percent of operating revenue was derived from value capture in Japan and Hong Kong, while approximately 10 to 12 percent of operating revenue was derived in Taiwan. The multiplicity of value-capture instruments, especially tax increment financing districts in Chicago and the limited availability of developable land in downtown Chicago distinguish Illinois from Japan, Hong Kong, and Taiwan.

Additional complications stem from multiple land ownership of adjacent parcels. The rail operators in Japan (JR East, focused on Shinagawa, Shinjuku, and Tokyo stations) and Hong Kong received land for development (either jointly with a private developer or with a separate entity within the rail company).

The HSR system's incremental benefit for riders at Union Station would not likely generate the amount of value experienced in Japan and Hong Kong. Taiwan's case, however, is similar to this project since they have a single HSR line connecting the island. Although Taiwan set aside land adjacent to most of their stations, value capture is more difficult to identify than in Japan and Hong Kong. Taiwan has begun to benefit from mixed-use developments near some of their stations. However, they will likely need to wait a long time before realizing their HSR line's full benefits and will not likely reach the levels experienced in Japan and Hong Kong. This is one option, therefore, that needs to be carefully and thoughtfully considered since value-capture strategies may not generate significant revenue during the first decade of operations.

8. Financial and Implementation Strategies

The study team used inputs from the estimation of costs, operating scenarios, ridership numbers, and economic impacts to evaluate and propose potential financial and implementation plans for building this proposed HSR system in Illinois. They divided this task into the following three phases:

1. A case study review evaluating foreign HSR development, financing, and project delivery methods and a case study review evaluating financing and implementation approaches used for the California HSR project and other domestic transportation projects;
2. Evaluation of the availability of public and private funds for project delivery during its construction and operations; and
3. Development of financial plans based on the study team's cost and revenue projections to reflect information gathered during this task's first two phases.

8.1 Case Study Outcomes

The study team's review of HSR developments from the first line of the Japanese Shinkansen to Western Europe's latest developments in public-private partnership delivery revealed three funding and construction trends for HSR development. The first trend or phase consisted of early projects in Japan and Western Europe, most notably France. Public entities funded and managed these projects, which achieved financial success. The Tokaido Shinkansen and the Paris-Lyon TGV were able to recover their full construction costs within the first decade of operations – extraordinary for assets with 100-year lives.

The second phase of HSR development began with a European Union directive (EU 91/440) passed in 1991 requiring liberation of rail services within the member states. Infrastructure owners were required to provide unimpeded access for all operators. This directive sought to deliver better values to passengers through cross-border competition and operations. Different countries implemented the EU requirement in various ways, but in general it led to separation of the rail infrastructure organizations from the operating companies. A typical pattern is a state-owned infrastructure company and one or more train operating companies that compete for franchises to operate trains over different routes on the network.

The separation of infrastructure ownership and rail operations also occurred in Japan because the Japanese government privatized system operations. In 1987, Japan National Railways was forced to reorganize because of financial insolvency following years of aggressive expansion projects. Operations were spun off into private railway companies with defined service territories. The Japanese government, however, continued to build new rail lines and retained ownership of infrastructure already in place via its Japan Railway Construction, Transport and Technology Agency.

Though Western Europe and Japan were spurred to separate infrastructure ownership and rail operations for different reasons, a common outcome has emerged. Both areas have examples of financially successful public and private rail operators. However, complex cost-allocation methodologies, governmental subsidies, and credit support make it difficult to discern the degree to which specific lines or systems are actually recouping their infrastructure's full cost.

Projects in which private companies have directly participated in construction through public-private partnerships represent the third stage of HSR development. Some projects that have used a public-private partnership have also relied on private equity and debt sources to help finance construction. Some Spanish and French projects that are currently being planned or built have relied on private partners to finance construction. In some cases, private consortia have secured up to 50 percent of project costs through equity and debt. Often there are state and EU credit guarantees in place to act as a backstop if operating revenues are insufficient for repaying shareholders and lenders.

Two projects advanced that were structured to be 100 percent privately funded and financed. The Taiwanese High-Speed Rail Corporation won the bid to design, build, operate, and maintain the line with a plan to finance construction through farebox revenues, i.e. the projected operating surplus of passenger revenues less operating costs. During construction, however, it became clear that governmental credit support would be necessary to finance the project. The Taiwanese completed their rail line in 2007, and ridership has steadily increased. As of this report's completion, the Taiwanese High-Speed Rail Corporation has posted its first operating profits. Some people believe that their operating surpluses will ultimately pay down the initial capital.

The Channel Tunnel project was the first HSR line that was structured to use 100 percent private funding sources. It has fared much worse than the Taiwanese High-Speed Rail Corporation. Throughout construction in the 1980s and 1990s, the Eurotunnel Group (the private consortium handling the project's construction and financing) was forced several times to seek additional governmental funding. When the project opened, it was clear that the Eurotunnel Group would need some type of restructuring to continue operating the tunnel. Through restructuring, banks holding debt in the Channel Tunnel have seen their prospects for timely and full repayment dwindle, and the tunnel's financial problems have often led to closure threats. Public equity for the Eurotunnel Group is worth fractions of its original issue price. No dividends have been paid to shareholders.

One might draw the following lessons from this third phase of HSR development elsewhere in the world:

1. In some countries private capital has supported a substantial portion of construction costs especially when paired with strong credit guarantees from government agencies.

2. Projects could be structured to incorporate private financing and public financial support through direct grants or credit and loan guarantees.
3. Projects that do not seek public support should be structured to avoid the risk of unanticipated bailouts at later project stages.

Sponsors of HSR in Illinois should keep in mind that controlling the risk of future financial difficulties is key.

8.2 Public and Private Funding Outlook

Considering lessons learned during the case study process – especially that most HSR projects have had high levels of public support – it is vital to first establish a project sponsor's available options to publicly fund HSR projects. The study team therefore discusses public funding at the federal, state, and local levels in the following pages, along with prospects for securing private funding using projected future operating surpluses. Operating surpluses result when total passenger revenues and other system-generated revenues (e.g. advertising and concessions) exceed total operating expenses. They are important for attracting private financial participation to build a potential HSR line in Illinois.

Federal

Illinois HSR could apply for grants and credit support at the federal level. This credit support could come as loans, credit lines, or credit/loan guarantees. The study team will describe each of these programs in this subsection and predict their future viability under the recently passed federal transportation reauthorization, *Moving Ahead for Progress in the 21st Century* (MAP-21).

The *Passenger Rail Investment and Improvement Act of 2008* was passed under the Bush Administration, but High-Speed Intercity Passenger Rail program funding was first made available through the *American Recovery and Reinvestment Act* that Congress passed in 2009. A total of $10.1 billion has been committed to HSR projects across the United States, though far less than the $75 billion worth of projects applied for by 39 states, the District of Columbia, and Amtrak. Now, the funds from the High-Speed Intercity Passenger Rail program are mostly exhausted. Congress would need to reauthorize and appropriate additional funding.

The federal government is also putting renewed emphasis on its Transportation Infrastructure Finance and Innovation Act program, which offers the following assistance:

1. Secured loans with a 35 year maximum repayment term and the ability to start repayment up to 5 years after the project's completion;
2. Loan guarantees that federally back the project's third-party loans. Loan repayments to third-parties must begin within 5 years of project completion; and
3. Standby credit that provides optional operating assistance within a 10-year window of project completion.

The outlook for future availability of direct federal funding is unclear. In July 2012, President Obama signed the new federal surface transportation reauthorization, MAP-21, into law. MAP-21 has some provisions that will positively and negatively impact future HSR developments in the United States. However, it offers no new funding for such investments.

The current political climate makes it unlikely that the High-Speed Intercity Passenger Rail program will receive substantial funding in the foreseeable future. Even if the program was renewed, judging by the 2009 applicant demand there is likely to be great competition for the funding. Congress' severe limitation on earmarks, moreover, will work against efforts to secure specialized land or monetary grants from the federal government through special legislation.

MAP-21 did feature a large increase in the Transportation Infrastructure Finance and Innovation Act program. For FY 2012, the Transportation Infrastructure Finance and Innovation Act program was able to provide approximately $1.2 billion in loans and credit support. MAP-21 increases that amount to $17.5 billion in loans and credit assistance for FY2013 and FY2014. This sharp increase in funding holds promise for future projects looking for supplementary loans, guarantees, or credit lines for operations. Financial assistance from the Transportation Infrastructure Finance and Innovation Act will be available for HSR as well as for eligible highway and transit projects.

State

Considering the outlook for direct grants from the federal government, the burden may fall upon Illinois to provide the public funding for future HSR investments. The State currently has access to several types of funding sources – each with many options – that could fund some of this potential HSR system's construction costs.

Were Illinois HSR to access current transportation funding programs, the State could tap into its motor fuel taxes or motor vehicle registration and license fees as well as sales tax, income tax, and gaming revenues. The State could also tap into the following revenue funds to help pay for construction: the General Revenue Fund, Capital Projects Fund, Road Fund, and State Construction Account Fund. However, all of these potential sources currently are either oversubscribed or dedicated, through legislation, to activities unrelated to rail construction.

The State could also engage in a new bond program through existing bonding authority or though the Illinois Finance Authority. The Illinois Finance Authority can issue tax exempt debt in the form of Private Activity Bonds for projects involving private entities and could, therefore, be a tool to facilitate private investment in this project. As with direct grant sources of support noted in the preceding paragraph, the availability of resources for new bonding is not evident.

Local

HSR projects in many countries have relied heavily on local financial support, via grants or other instruments, to help construct stations and infrastructure. The project sponsor for HSR in Illinois could, through careful organization, coordinate municipalities and regional governments within the service area to help fund construction. This could be done through monetary or land grants or even through value capture tactics such as TIF districts or other geographically based special assessments.

Contributions from local partners would need to be justified through local positive impacts generated by HSR development.

Private

Throughout this project, the study team researched the development of HSR projects that involved or attempted to involve private funding at early stages. For example, they reviewed many documents, news releases, and other material generated by the California High-Speed Rail project that is currently authorized to begin construction.

Government availability payments and system-generated operating surpluses can serve as future cash flows for repaying private financing. Much of the study team's effort focused on private financing secured by operating surpluses because it is self-sustaining. The study team found there are few precedents for such a financing and considerable skepticism that such a financing could be undertaken prior to the commencement of operations, since passenger demand for HSR in the US is untested outside the Northeast Corridor.

From the study team's reviews of the California High Speed Rail business plan documents and releases, it is clear that without federal credit support, operating surplus financing could only be undertaken after operations begin and ridership revenues had been demonstrated. Because Illinois HSR is expected to generate operating surpluses and because this is the primary system-generated cash flow to support financing, the study team explored various types of debt financing instruments.

8.3 Model Outcomes and Financial Plan Options

As the following discussion explains, all the models run to assess how much of the capital construction cost might be covered by tapping future surplus operating revenues left a substantial (multi-billions of dollars) shortfall that would have to be funded through public sources.

The study team performed an initial financial analysis of all 12 system scenarios[12] using the Simple Discounted Cash Flow (Simple DCF) method. The study team applied an 11 percent discount factor to the future "operating surpluses less capital renewal costs" to derive a net present value that can be used to support construction costs.

California used this same 11 percent rate in its HSR business plan released in April 2012, assuming that financing would occur after operations began. Because the study team model assumed financing to support construction before operations began, a higher discount factor may arguably be appropriate.

In addition to the Simple DCF method the team modeled two other financing structures to discern if higher capital support could be achieved. The two alternate financing structures were current interest (CI) bonds that pay an annual coupon payment, which is a combination of interest and principal and capital appreciation bonds (CAB) which only pay a lump sum at the time of maturity. The holder of the capital appreciation bond does not receive annual coupon payments, but instead purchases the bond at a deep discount to face value. The difference between purchase price and maturity value represents the amount of interest earned.

Table 17 shows the range of capital costs, ridership revenues, amount financeable from revenues, and the difference between capital cost and financeable revenue amount (hereafter referred to as the funding gap) for three of the twelve construction scenarios and with each of the three financing scenarios.

[12] The 12 scenarios referred to are the combination of all possible outputs of the engineering and ridership teams. The options are: Partial System (Alternative 1) or Full System (Alternative 2); High or Low Capital Expenditures; and baseline, optimistic, or pessimistic ridership numbers. The combinations of these options result in 12 distinct scenarios that informed the inputs and outputs of the financial team's model.

Table 17. Amount of Capital Cost Financeable

Illinois High Speed Rail
Illustration of amount financeable from operating surplus
Surplus cash flows for operations beginning in year 2018 from "HSR MODEL 25"
Simple Discounted Cash Flow (DCF) Calculated at an 11% discount factor
Capital Renewal costs funded using debt issued for a term equal to the life of the asset
($ in millions)

Scenario	Capital Available	Funding Gap	Construction Cost	Percent Financeable
CHI to STL, Low CAPEX, Baseline Revenue, Simple DCF	$1,852	$21,148	$23,000	8%
CHI to STL, Low CAPEX, Baseline Revenue, CAB only	$2,762	$20,238	$23,000	12%
CHI to STL, Low CAPEX, Baseline Revenue, CAB/CI mix	$2,549	$20,451	$23,000	11%
Full System, High CAPEX, Baseline Revenue, Simple DCF	$3,331	$46,669	$50,000	7%
Full System, High CAPEX, Baseline Revenue, CAB only	$5,088	$44,912	$50,000	10%
Full System, High CAPEX, Baseline Revenue, CAB/CI mix	$4,694	$45,306	$50,000	9%
Full System, Low CAPEX, Optimistic Revenue, Simple DCF	$4,343	$25,657	$30,000	14%
Full System, Low CAPEX, Optimistic Revenue, CAB only	$6,800	$23,200	$30,000	23%
Full System, Low CAPEX, Optimistic Revenue, CAB/CI mix	$6,249	$23,751	$30,000	21%

For all scenarios the lowest funding gap is still more than $20 billion. Assuming a federal/non-federal split of 80 percent / 20 percent for a standard public plan, this would still leave non-federal authorities (including the State of Illinois, regional authorities, and local authorities) responsible for more than $4 billion in upfront capital costs. The federal government would supply the remaining $16 billion. Without a new commitment from the federal government, it is difficult to imagine $16 billion coming from federal sources. In this scenario, the amount financeable through operating surpluses is only 11 percent of the total capital cost or $2.6 billion.

The most optimistic scenario in terms of total percentage covered by system revenue financed to cover capital costs is 23% (Full System build, Low CAPEX, and optimistic revenue projections using capital appreciation bonds) but that still leaves a funding gap of about $23.7 billion.

Availability payments, which are a form of public funding, support the best examples of public-private partnership structures. This type of structure has been seen in projects such as the Denver Eagle P3 project, in which funds from local, state, and federal sources will go toward periodic payments to the private consortium constructing, operating and maintaining a new rail line. Government payments ultimately secure the private financing. Although public-private partnerships may not support construction costs, the public-private partnership structure may still offer policy makers important benefits, such as the potential to accelerate project delivery, shift risk to private entities, and achieve other policy considerations.

In summary, reviews of the various public-private partnership approaches that might be used, and the analysis of simple and more complex financing structures provide important guidance on how to best finance and deliver a HSR project in Illinois. The study team observed the following:

1. Illinois HSR is anticipated to be operationally profitable. None of the scenarios analyzed will require government operating subsidies once the HSR system is built.
2. Operating profits can be financed to contribute to construction costs. These profits could potentially be transformed through debt and equity financings to cover between 5 percent and 23 percent of total capital expenditures.
3. Value captures from state and local taxes and property development along this project's corridor could also generate project revenues. However, the study team does not expect them to significantly narrow the funding gap for construction.

For a state that has never committed more than $1 billion in state resources to one major infrastructure project, $20-plus billion is a daunting number. Assuming there might be a federal HSR program that would be large enough to pick up the standard share of 80 percent of the total cost – and such a program currently does not exist – the state and local governments would still have to provide more than $4 billion.

Considering limited funding availability in Illinois and at the federal level, public-private partnerships that provide equity and debt financing merit serious consideration. There are many examples of public-private partnerships that have successfully delivered HSR projects, but most of these projects have required substantial investments of public funds that are similar in magnitude to the funding requirements of the Illinois project. In those that were not initially structured to rely upon public financial support, the financial outcomes are mixed.

When faced with similar financial challenges, California took an incremental approach to construction and operation to lower its initial capital costs. In that situation, there is an implementation plan that will introduce HSR in phases. This approach has been widely used internationally.

9. 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.