Evaluation of a Second Daily Intercity Passenger Rail Frequency between Minnesota and Chicago

Executive Summary of Amtrak Feasibility Report

and

State Partners Conclusions and Recommendations

Minnesota Department of Transportation

Wisconsin Department of Transportation

July 2015

Table of Contents

I. Executive Summary of the Feasibility Report on Proposed Amtrak Service Chicago-Milwaukee-La Crosse-Twin Cities-(St. Cloud) 2
Background 2
Purpose of the Study 2
Overview of Corridor and Existing Conditions 2
Feasibility Study Process and Assumptions 3
Train Schedule Options 4
Equipment Needs 5
Financial Results 6
Ridership, Revenue, and Operating Support 6
Capital Investment Needs 7
Summary 7
II. State Partners Conclusions and Recommendations 8
Conclusions 8
Recommendations 8
Next Steps and Timing 10

I. Executive Summary of the Feasibility Report on Proposed Amtrak Service Chicago-Milwaukee-La Crosse-Twin Cities-(St. Cloud)

Background

The Minnesota Department of Transportation, in partnership with the Wisconsin Department of Transportation (WisDOT) and La Crosse County, Wisconsin (WI), requested Amtrak to complete a feasibility study of adding a second daily intercity passenger train between the Twin Cities (or St. Cloud, Minnesota (MN)) and Chicago, Illinois (IL). The proposed service would generally follow the existing *Empire Builder* route through Illinois and Wisconsin, but could terminate in Minnesota at Union Depot in St. Paul, Target Field Station in Minneapolis, or at the Amtrak station in St. Cloud. The purpose of a second daily train is to offer more options to travelers in the corridor by providing better eastbound reliability and increased train frequency. Potential mobility benefits of the proposed service include:

- Increased schedule options from the existing one daily round-trip to two daily round-trips between the Twin Cities, Chicago and intermediate stations
- More reliable service with better on-time performance (particularly eastbound)
- More convenient travel times for shorter, regional trips
- More seating capacity on the corridor relieving pressure during peak periods
- Improved connections between other trains, intercity buses, local public transit, and air service

Purpose of the Study

The project sponsors asked Amtrak to prepare a feasibility study that develops a high level, order-of-magnitude assessment of schedules, ridership, revenue, infrastructure investments, operating costs, and equipment needs (railcars and locomotives) associated with adding a second daily train between St. Cloud, the Twin Cities and Chicago. This assessment will assist the project sponsors in determining whether or not to move the project to the next steps toward implementation.

As required in Section 209 of the Passenger Rail Investment and Improvement Act of 2008 (PRIIA), all corridors less than 750 miles require state sponsorship (state operating support) to cover any operating losses. The 2nd daily train service would be a regional "state-supported" Section 209 corridor, as opposed to an Amtrak long-distance train (like the *Empire Builder)* that is funded through Amtrak's federal appropriation. The information in this report is not intended to be the sole basis of an agreement between the partners, Amtrak or hosts railroad, but rather serves as a basis for understanding the ridership and financial implications of starting such a service. This study is a first step toward deciding whether or not to establish a second round-trip frequency following the same route as the *Empire Builder*.

Overview of Corridor and Existing Conditions

The corridor is currently serviced once a day in each direction by Amtrak's *Empire Builder* long distance train between Seattle, Washington/Portland, Oregon and Chicago. This is the only passenger rail service that serves the Twin Cities-Chicago corridor in its entirety. The *Empire Builder* primarily uses the BNSF Railway between St. Cloud and St. Paul, the Canadian Pacific Railway between St. Paul and Rondout, IL, and Metra between Rondout, IL and Chicago, IL. The *Empire Builder* makes station stops in St. Cloud,

MN, St. Paul, MN; Red Wing, MN; Winona, MN; La Crosse, WI; Tomah, WI; Wisconsin Dells, WI; Portage, WI; Columbus, WI; Milwaukee, WI; Glenview, IL and Chicago, IL. Eastbound *Empire Builder* service often experiences delays that negatively affect on-time performance due to freight congestion west of St. Cloud, MN. In addition, the single round-trip frequency provides little schedule flexibility to travelers in the corridor. Despite these issues, the majority of passengers getting on or off at stations in Minnesota, Wisconsin, and Illinois are going to or coming from stations within the Chicago-Twin Cities corridor segment, indicating demand for regional travel. Ridership on the *Empire Builder* within the Chicago-Twin Cities corridor segment is relatively high, often exceeding 100,000 annually.

Feasibility Study Process and Assumptions

Per the request of the project partners, the study assumes the second round-trip frequency would serve the same station stops as the *Empire Builder* service between Chicago and St. Paul with the addition of the Milwaukee Airport Rail Station. The study examines four route and terminal station scenarios west of St. Paul. These options include:

- Scenario 1: Chicago-St. Cloud with stops at Union Depot in St. Paul and Minneapolis' Target Field Station.
- Scenario 2: Chicago-St. Cloud with stops at Union Depot in St. Paul and Fridley Northstar Station
- Scenario 3: Chicago-Target Field Station with a stop at Union Depot in St Paul.
- Scenario 4: Chicago-Union Depot in St. Paul

Figure 1 displays the corridor encompassing all four route scenarios, with station stops and the host railroads.

Figure 1: Corridor Map

Train Schedule Options

Schedules for the second round-trip frequency service are designed to complement the current *Empire Builder* schedule, with arrival and departure times at the endpoints that maximize ridership potential. The elapsed time schedule is similar to that of the current *Empire Builder*, with second frequency departure times from the points of origin generally 4-6 hours before or after current *Empire Builder* departure times. Schedules were developed for all four station scenarios with two alternative departure times for the eastbound train from Union Depot in St. Paul. The study evaluated departure times from Union Depot at 2:25 PM (Option A) and 12:25 PM (Option B) for impact on ridership and revenue. The market demand results suggest the earlier 12:25 PM departure (Option B) is forecast to produce the higher ridership and revenue. Figure 2 shows the schedule options for the Second Frequency, including the origins and endpoints to differentiate the route alternatives.

Figure 2: Route Origin/Endpoint Alternatives & Schedule Options

Westbound	**Scenario 1: Chicago-St. Cloud via Minneapolis** ***Schedule Option A and B***	**Scenario 2 Chicago-St. Cloud via Fridley** ***Schedule Option A and B***	**Scenario 3 Chicago-Minneapolis** ***Schedule Option A and B***	**Scenario 4 Chicago-St. Paul** ***Schedule Option A and B***	***Empire Builder Train #7***
Chicago, IL Union Station	***9:25 AM***	***9:25 AM***	***9:25 AM***	***9:25 AM***	*2:15 PM*
St. Paul, MN Union Depot	***4:42 PM***	***4:42 PM***	***4:42 PM***	***4:52 PM***	*10:03 PM*
Minneapolis, MN Target Field Station	5:27 PM	--	5:32 PM	--	--
Fridley, MN	--	5:38 PM	--	--	
St. Cloud, MN	7:00 PM	6:45 PM	--	--	*12:34 AM*

*Intermediate stations are not shown. See the Amtrak Feasibility Report for intermediate station times.

Eastbound	**Scenario 1: Chicago-St. Cloud via Minneapolis**		**Scenario 2 Chicago-St. Cloud via Fridley**		**Scenario 3 Chicago-Minneapolis**		**Scenario 4 Chicago-St. Paul**		***Empire Builder Train #8***
	Schedule Option A	***Schedule Option B***	***Schedule Option A***	***Schedule Option B***	***Schedule Option A***	***Schedule Option B***	***Schedule Option A***	***Schedule Option B***	
St. Cloud, MN	12:22 PM	10:22 AM	12:37 PM	10:37 AM	--	--	--	--	*5:14 AM*
Fridley, MN	--	--	1:38 PM	11:38 AM	--	--	--	--	--
Minneapolis, MN Target Field Station	1:45 PM	11:45 AM	--	--	1:45 PM	11:45 AM	--	--	--
St. Paul, MN Union Depot	***2:25 PM***	***12:25 PM***	***2:25 PM***	***12:25 PM***	***2:25 PM***	***12:25 PM***	***2:25 PM***	***12:25 PM***	*8:00 AM*
Chicago, IL Union Station	***9:54 PM***	***7:57 PM***	***9:54 PM***	***7:57 PM***	***9:54 PM***	***7:57 PM***	***9:54 PM***	***7:57 PM***	*3:55 PM*

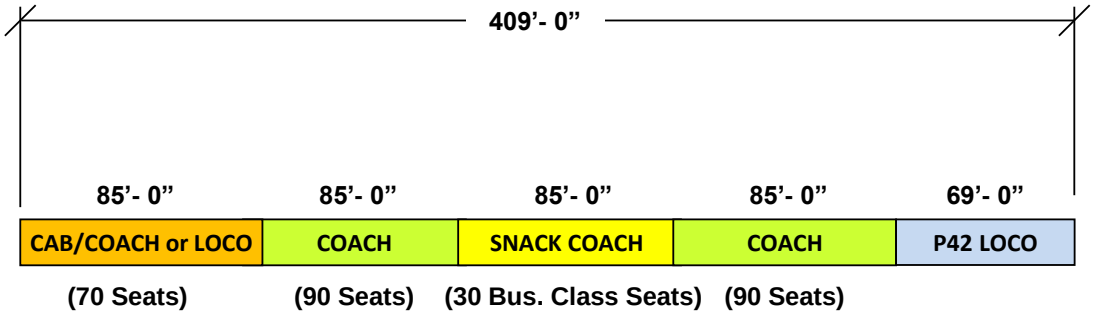
Route alternatives and schedule options were modeled using Train Performance Calculator (TPC) and Rail Traffic Controller (RTC) programs. The modeling process indicated that a third schedule, similar to schedule option B but with slightly different departure times, was the most operationally efficient schedule. This "optimized" schedule required the least amount of infrastructure improvements to achieve appropriate performance for passenger and freight trains. The schedule has a westbound departure from Chicago at 10:15 AM and from eastbound from St. Paul at 11:46. Details of the "optimized" schedule can be found in Figure 6. The "optimized" schedule was not part of the Amtrak ridership and financial evaluations; however capital costs for this scenario were generated.

Equipment Needs

The second round-trip frequency as proposed would require two train consists, which would include a total of two diesel locomotives, four bi-level coaches, two bi-level snack coaches, and two bi-level cab coaches. All route alternatives assume train consists will be in "push-pull mode", with 1 locomotive and 1 cab/coach (or a second locomotive). The equipment consist will include a food service car (café/ business class) but will not include a full service diner. The study assumes the train consist will utilize bi-

level Superliner-type equipment, similar to that currently used on the *Empire Builder*. Figure 3 describes the proposed equipment consist with dimensions and seating capacity.

Figure 3: Train Consist



Source: Amtrak Total Capacity = 280 seats.

For the purpose of developing estimates of required capital investment, it was presumed that the states would acquire the cars and locomotives. This is in part due to the fact that Amtrak cannot guarantee that it will have equipment available. If Amtrak-owned equipment becomes available, the states would determine whether to acquire new equipment, or operate the service with Amtrak equipment.

Financial Results

Ridership, Revenue, and Operating Support

Figure 4 below shows forecast ridership, revenue, and operating support for each route and schedule scenario. The annual ridership for all scenarios compares favorably with annual ridership on existing state-supported intercity passenger rail routes in other states with one round-trip per day.

The state operating support and payment estimates are total for all states supporting the route. These are high-level planning estimates. More detailed estimates will be required in the next phase of study. The funding split among the states will also be determined during or after the next phase of study.

Figure 4: Ridership, State Operating Support, and State Payment

Route Scenario	Scenario 1: Chicago-St. Cloud via Minneapolis		Scenario 2: Chicago-St. Cloud via Fridley		Scenario 3: Chicago-Minneapolis		Scenario 4: Chicago-St. Paul	
Schedule Option	***Schedule Option A***	***Schedule Option B***	***Schedule Option A***	***Schedule Option B***	***Schedule Option A***	***Schedule Option B***	***Schedule Option A***	***Schedule Option B***
Ridership	143,300	185,100	143,200	180,300	137,000	177,600	117,800	155,500
Revenue	$7,459,000	$9,083,000	$7,455,000	$8,688,000	$7,001,000	$8,513,000	$5,522,000	$6,811,000
Operating Cost	$13,337,000	$13,715,000	$13,309,000	$13,618,000	$12,618,000	$12,976,000	$12,131,000	$12,448,000
States Operating Support	$5,878,000	$4,632,000	$5,855,000	$4,930,000	$5,617,000	$4,460,000	$6,609,000	$5,637,000
Equipment Capitalized Maintenance*	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000
Total Estimated States Payment	$6,878,000	$5,632,000	$6,855,000	$5,930,000	$6,617,000	$5,460,000	$7,609,000	$6,637,000
**Order of Magnitude Conceptual Estimate*								

Capital Investment Needs

Implementing the 2nd *Empire Builder* round-trip frequency service would require capital investment for railroad infrastructure capacity improvements, potential train equipment acquisition, and a layover facility in Minnesota. Figure 5 shows high-level conceptual estimates of capital investment needs to implement the 2nd frequency for each route and schedule scenario. The infrastructure capacity improvements that drive the estimated infrastructure costs are conceptual and order-of-magnitude. The analysis for estimating these infrastructure improvements and costs was not intended to arrive at an optimal set of improvements, but rather to provide a high-level order of magnitude estimate for planning purposes. The analysis used a broad list of projects provided by stakeholders and selected from that list those projects that could reduce delays. The next phase of study will look in more detail at alternative improvements that may be more cost effective and test those using simulation modeling. The equipment acquisition estimates are from the Illinois DOT procurement of bi-level cars and locomotives for existing routes. If Amtrak equipment is used, the equipment acquisition cost would be eliminated.

Figure 5: Conceptual Planning-level Capital Investment Need Estimates

Route Scenario	Length (miles)	Capital for Railroad Infrastructure Improvements Conceptual Estimates			Layover Facility	Equipment Procurement*
		Low ("optimized" schedule)	Medium (Schedule Option B)	High (Schedule Option A)		
Scenario I: Chicago-St. Paul-Minneapolis-St. Cloud	489	$210,000,000	$257,000,000	$290,000,000	$650,000	$46,400,000
Scenario 2: Chicago-St. Paul-Fridley-St. Cloud	486	$194,000,000	$241,000,000	$274,000,000	$650,000	$46,400,000
Scenario 3: Chicago-St. Paul-Minneapolis	424	$114,000,000	$161,000,000	$194,000,000	$300,000	$46,400,000
Scenario 4: Chicago-St. Paul	411	$95,000,000	$142,000,000	$175,000,000	$300,000	$46,400,000
**Assumes purchase of bi-level cars and locomotives for service. If existing Amtrak equipment is used, these costs would not be incurred.*						
Key						
Low	Optimized Schedule (from railroad capacity modeling): Depart St. Paul 11:46 AM, Depart Chicago 10:15 AM					
Medium	Schedule Option B: Depart St. Paul 12:25 PM, Depart Chicago 9:25 AM					
High	Schedule Option A: Depart St. Paul 2:25 PM, Depart Chicago 9:25 AM					

Summary

While the route scenarios terminating in St. Cloud and Minneapolis Target Field Station had lower state operating payment, the high-level conceptual analysis of infrastructure capacity needs indicates that they would have higher capital requirements. Scenario 4 terminating in St. Paul had the lowest capital infrastructure costs. For all scenarios, the level of capital investment would likely require federal funding. If federal funds come from a grant, this would likely amount to 80% of total capital costs with a 20% state/stakeholder funding match.

A benefit-cost analysis was not included as part of the feasibility study. This will be a required component of the next phase of work.

II. State Partners Conclusions and Recommendations

Conclusions

The *Feasibility Study on Proposed Amtrak Service Chicago-Milwaukee-La Crosse-Twin Cities-(St. Cloud)* results indicate favorable ridership and revenue for all route scenarios evaluated. The results compare favorably with annual ridership on similar corridors across the country. The state operating payment estimates are planning level only, but are in line with other services. There will be capital infrastructure needs on the corridor to accommodate the additional trains while not unduly impairing freight traffic. These capital improvements will also improve reliability of both passenger and freight rail traffic. The estimates for infrastructure improvements in the feasibility report are not intended to arrive at an optimal set of improvements or costs, but rather to provide a high-level order-of-magnitude estimate for preliminary planning purposes. The next phase of study will look in more detail at alternative improvements that may be more cost effective and test those using simulation modeling.

Ridership and revenue are higher for the St. Cloud and Minneapolis route scenarios (Scenarios 1, 2, and 3), resulting in lower state operating payments. However, the capital costs are significantly higher. The complexity of railroad operations and infrastructure issues are considerably greater west of St. Paul because of the number of host railroads, rail congestion, and capacity issues in the Twin Cities area. For these reasons, Scenario 4, with service terminating in St. Paul, is the most feasible route scenario for an initial start-up service, with potential extensions to Minneapolis and St. Cloud in the future.

Recommendations

Based on the results of the technical report, MnDOT and WisDOT staff recommend moving forward with the next phase of study to determine infrastructure improvements and cost through additional simulation modeling and fulfill environmental requirements in order to be eligible for federal funding. This includes further operations modeling and railroad coordination, environmental clearance of the yet-to-be determined infrastructure improvements, and a service development plan. Staff recommend the following for the next phase of work:

- Complete next phase of study on an initial start-up service between Chicago and St. Paul Union Depot, serving all existing stations plus the Milwaukee Airport Rail Station.
- Advance the "optimized schedule" into the next phase of study. Figure 6 shows the "optimized schedule" that was modeled by MnDOT's Consultant. The "optimized schedule" minimizes infrastructure needs and has departure/arrival times similar to Amtrak's schedule "option B". It can be used as a basis for more detailed modeling and schedule development. ***Note***: The schedule is planning level only. Schedules will be refined during further study.
- Determine how the trains will be operationally integrated with the *Hiawatha Service* between Milwaukee and Chicago in the next phase of study.
- As part of the next phase of work, determine cost sharing of the state operating support and capital costs.
- Further refine capital needs through coordination with the Federal Railroad Administration (FRA) and the host railroads.

- Continue forward with at least the following two options for equipment; 1) acquisition of new locomotives and bi-level cars as part of the Midwest equipment pool, 2) utilization of existing Amtrak equipment. Other options may also be explored.
- Consider additional study of extensions to Minneapolis Target Field Station and/or St. Cloud after fulfilling the study requirements for a start-up Chicago-St. Paul service.

Figure 6: "Optimized" Schedule Modeled by MnDOT Consultant

Westbound Schedule		Eastbound Schedule	
Station	**Departure time**	**Station**	**Departure time**
Chicago, IL Union Station	10:15 AM	St. Paul Union Depot	11:46 AM
Glenview, IL	10:37 AM	Red Wing, MN	12:34 PM
Milwaukee Airport Rail Station	11:29 AM	Winona, MN	1:43 PM
Milwaukee Intermodal Station	11:49 AM	La Crosse, WI	2:20 PM
Columbus, WI	12:56 PM	Tomah, WI	3:05 PM
Portage, WI	1:35 PM	Wisconsin Dells, WI	3:48 PM
Wisconsin Dells, WI	1:55 PM	Portage, WI	4:06 PM
Tomah, WI	2:34 PM	Columbus, WI	4:35 PM
La Crosse, WI	3:17 PM	Milwaukee Intermodal Station	5:45 PM
Winona, MN	4:01 PM	Milwaukee Airport Rail Station	5:55 PM
Red Wing, MN	5:03 PM	Glenview, IL	6:46 PM
St. Paul Union Depot	6:15 PM	Chicago, IL Union Station	7:14 PM

Note: Schedule is planning level only. Schedules will be refined during further study.

Figure 7 below displays the estimated ridership, revenue, and costs of the route scenario and schedule option recommended for further study.

Figure 7: Conceptual planning-level estimated capital costs, ridership, revenue, and operating support for the recommended scenario

Conceptual Capital Cost for Infrastructure Improvements Estimate	$95 million
Equipment	$46.4 million*
Layover facility	$.3 million
Ridership	155,500**
Revenue	$6.8 million**
Operating Cost	$12.4 million**
Annual capitalized maintenance costs	$1 million
Combined estimated annual total operating support for all states*	***$6.6 million***

*Assumes acquisition of new equipment. If existing Amtrak equipment is able to be used, the $46.4 million cost would not be incurred and the total capital and start-up cost estimate would be $95.5 million.

**Estimated operating support for the optimized schedule was not modeled by Amtrak. However, due to the similarity between the optimized schedule and Amtrak schedule option B, schedule option B operating costs and ridership/revenue forecasts are used as a proxy for the optimized schedule. These estimates are planning level only.

Next Steps and Timing

DOT staff have identified the following next steps and timeframes to advance the next phase of work for the 2nd *Empire Builder* frequency:

- Work with FRA to determine the appropriate NEPA and service planning action for the next phase of work. *Spring 2015.*
- Develop scope and complete procurement for the next phase of work. *Summer 2015*
- Complete the next phase of study, funded jointly by MnDOT and WisDOT. The outcome of the study should be eligibility for federal funding for final design, construction, and implementation of the service. *Summer 2015 – Fall 2016.*

If the states decide to implement the service and secure funds for operating support, the next steps following completion of environmental clearance and service development planning would be to apply for federal funding for capital improvements and secure matching funds. If federal funding is secured, this would be followed by final design and construction.