Transportation Infrastructure Modeling and Economic Development

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Recent Research Projects

- DOE/Nipsco
  - Variable Load Leveling & Production Scheduling
- CCTR
  - Coal Transportation
- GLMRI
  - Reduction of Truck Volumes on congested Interstate Highways

CCTR Project History

Coal to Port of Indiana

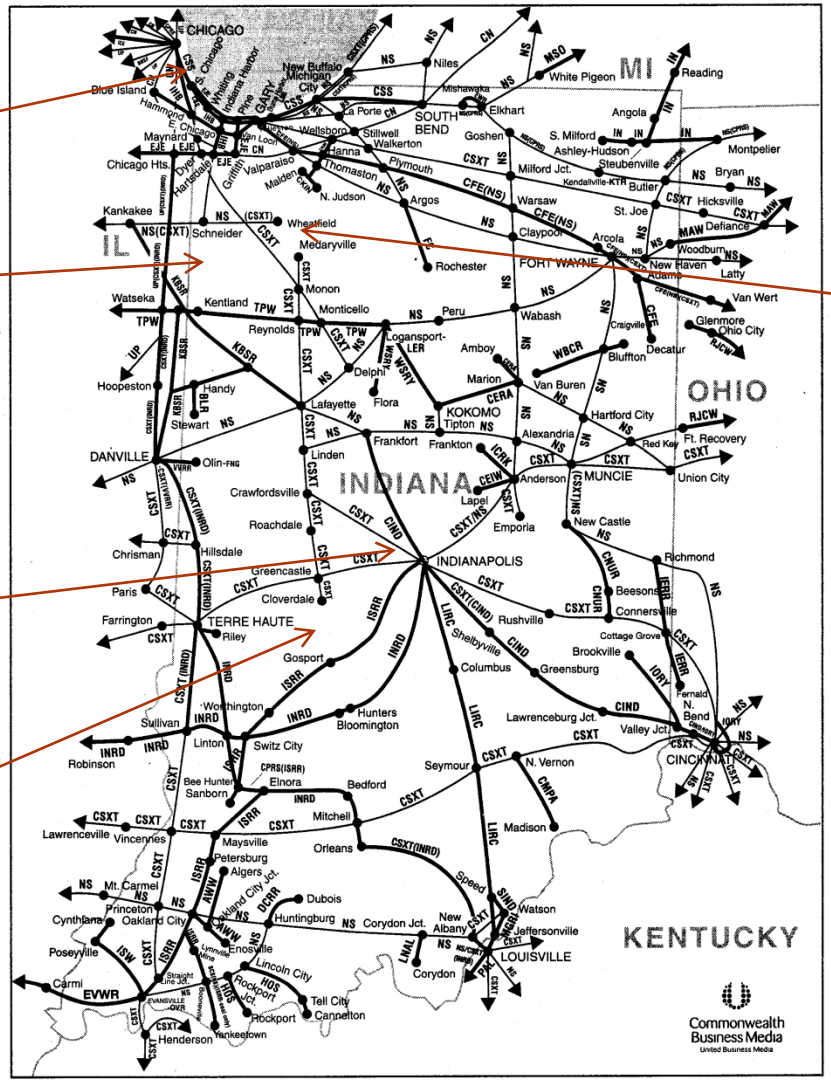
Scenario 3

Scenario 2

Scenario 4 Light Rail

Scenario 1

Base 10X10



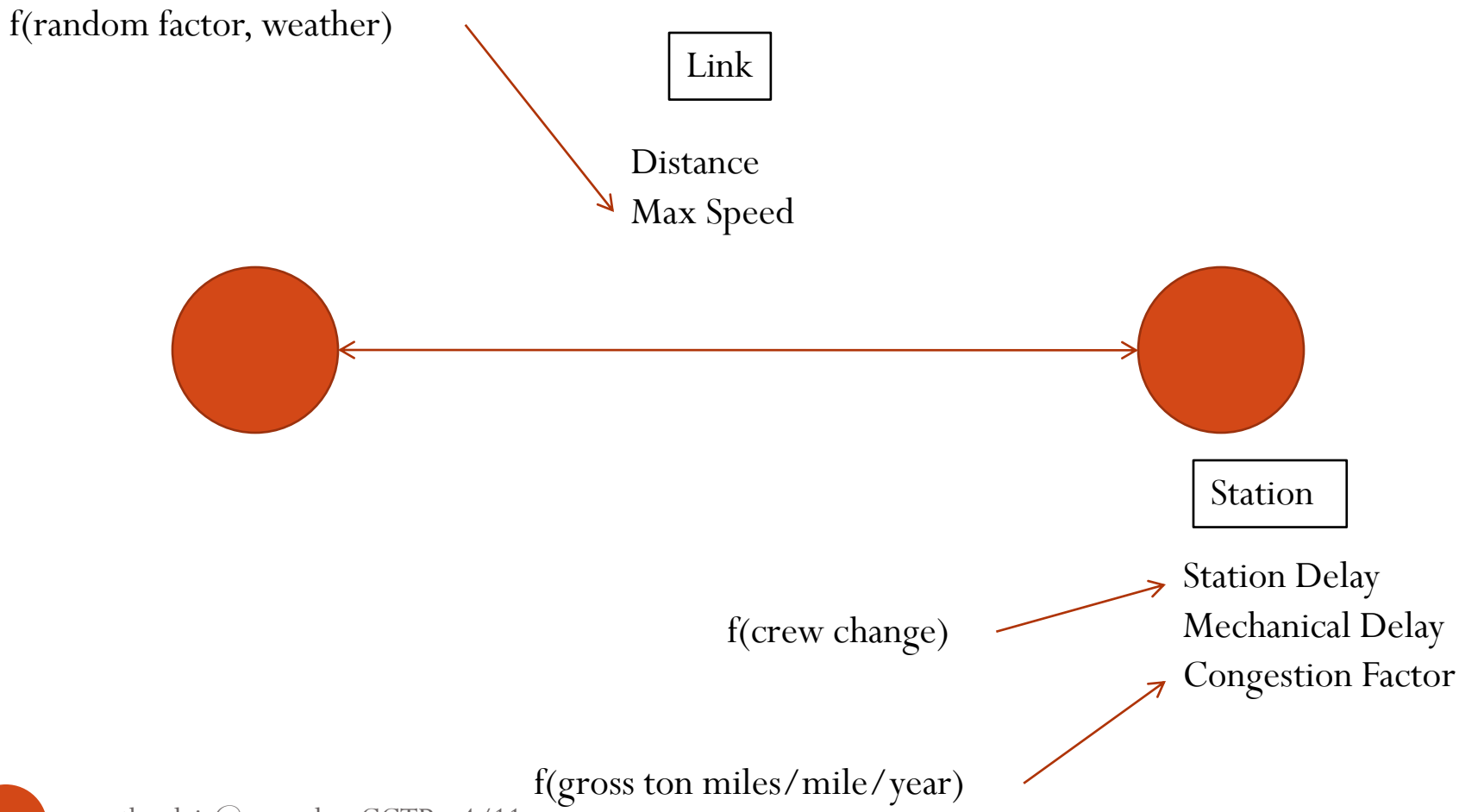
Discrete Event Simulation

- The imitation of a dynamic system using a computer model in order to evaluate and improve system performance
- The modeling of a system in such a way that the model mimics the response of the actual system to events that take place over time

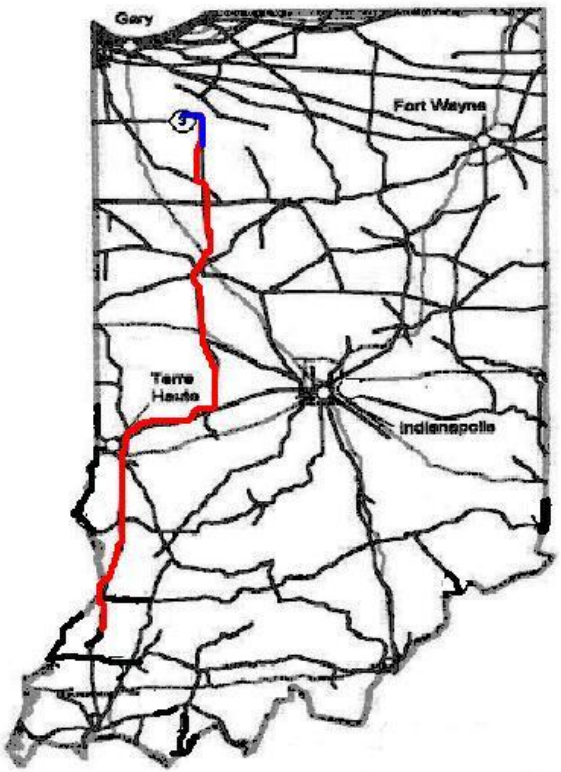
Discrete Event Simulation

- Fundamental laws are not available
  - Capacity is hard to estimate
- Many procedural elements are involved which are difficult to describe and represent
  - Trackage rights, signaling systems
- Policy inputs are necessary which may be hard to describe
  - Right of Ways
- Random components are significant
  - Speed, congestion, weather, delays, maintenance, equipment failures
- Human decision making is an integral part of the system
  - Train Control

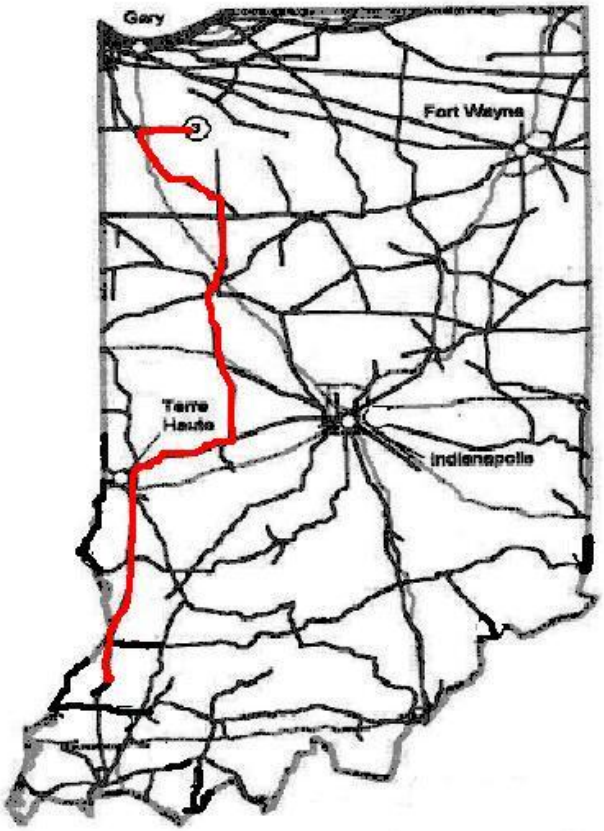
Rail/Transportation Modeling Platform



Prosperity Coal to Schahfer

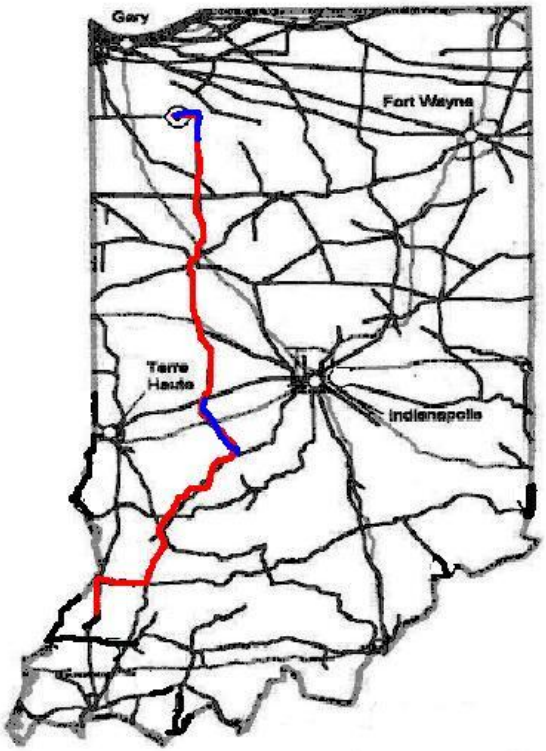


Scenario 6: Prosperity to Schahfer vis West link with North link

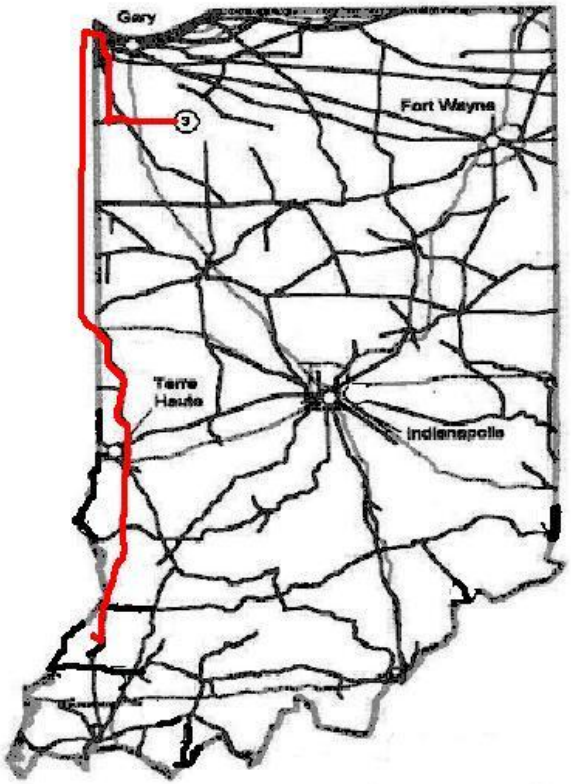


Scenario 5: Prosperity to Schahfer via West link

Prosperity Coal to Schahfer

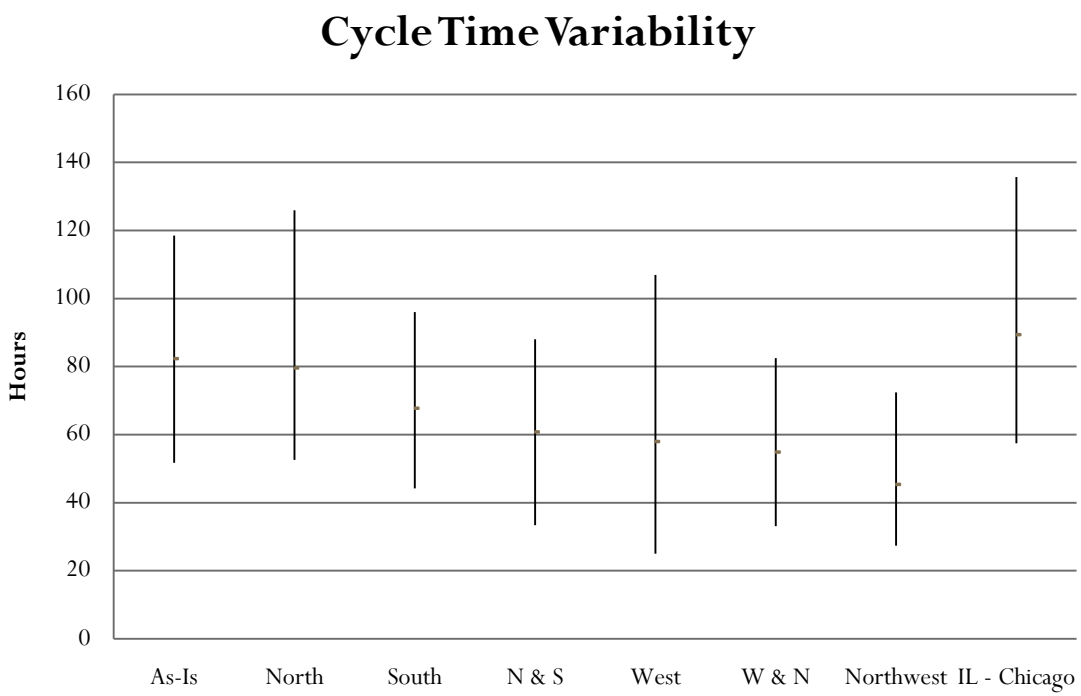


Scenario 4: Prosperity to Schahfer with hypothetical North and South links



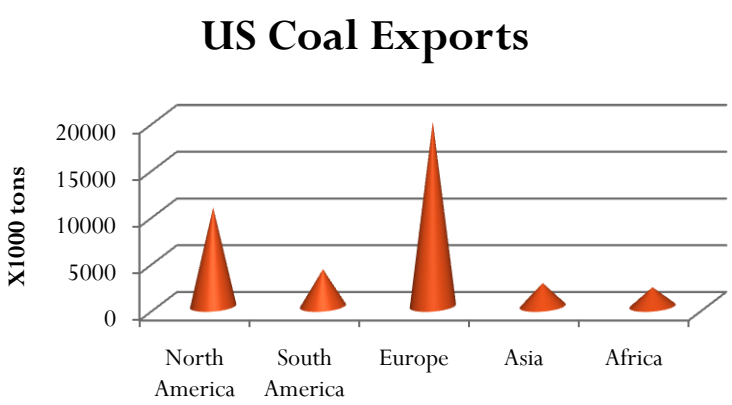
Scenario 11: Eastern Illinois through Chicago

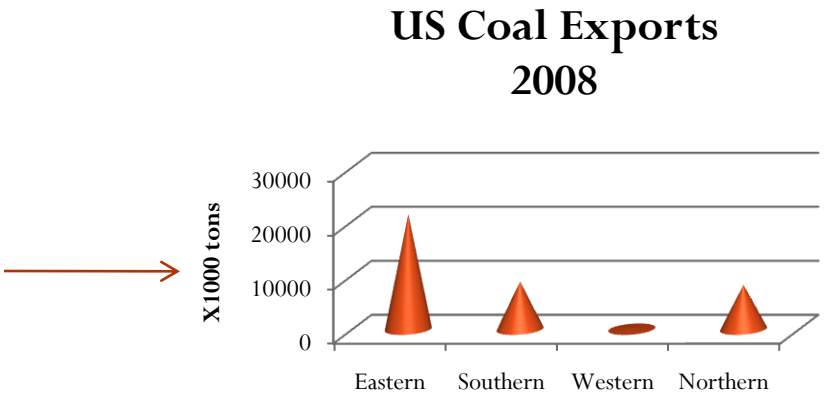
Some Results

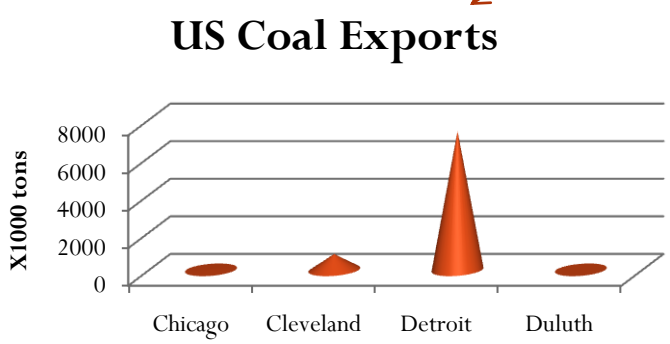


Port Rationale

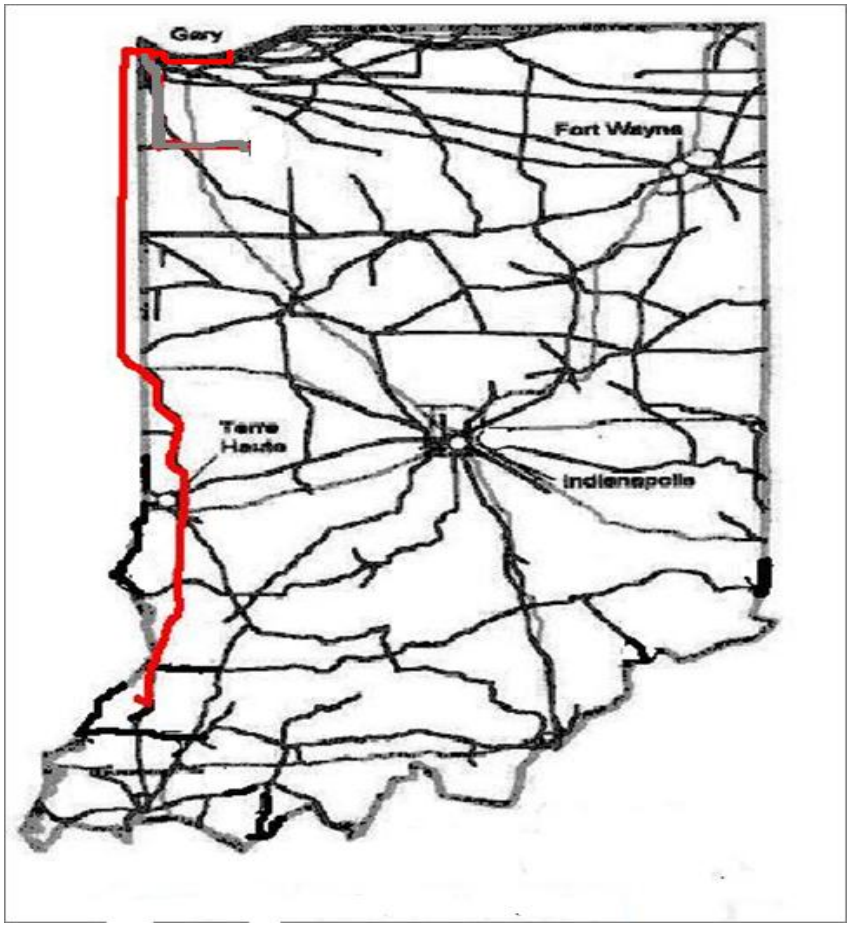
- Coal exports up 26% in 2008
- Michigan & Wisconsin import 98%+ coal requirements
  - MI imported 38.5 million tons worth 1.36 billion in 2007, 82% from PRB
  - "A large portion of that coal is transported by rail to the western end of Lake Superior, where it is loaded into freighter ships for delivery to power plants largely located along Great Lakes shorelines"
- Indiana has an international port on Great Lakes
- "How do we get southern Indiana coal to these markets competitively?"


US Coal Exports
X1000 tons
20000
15000
10000
5000
0
North America
South America
Europe
Asia
Africa


US Coal Exports 2008
X1000 tons
30000
20000
10000
0
Eastern
Southern
Western
Northern

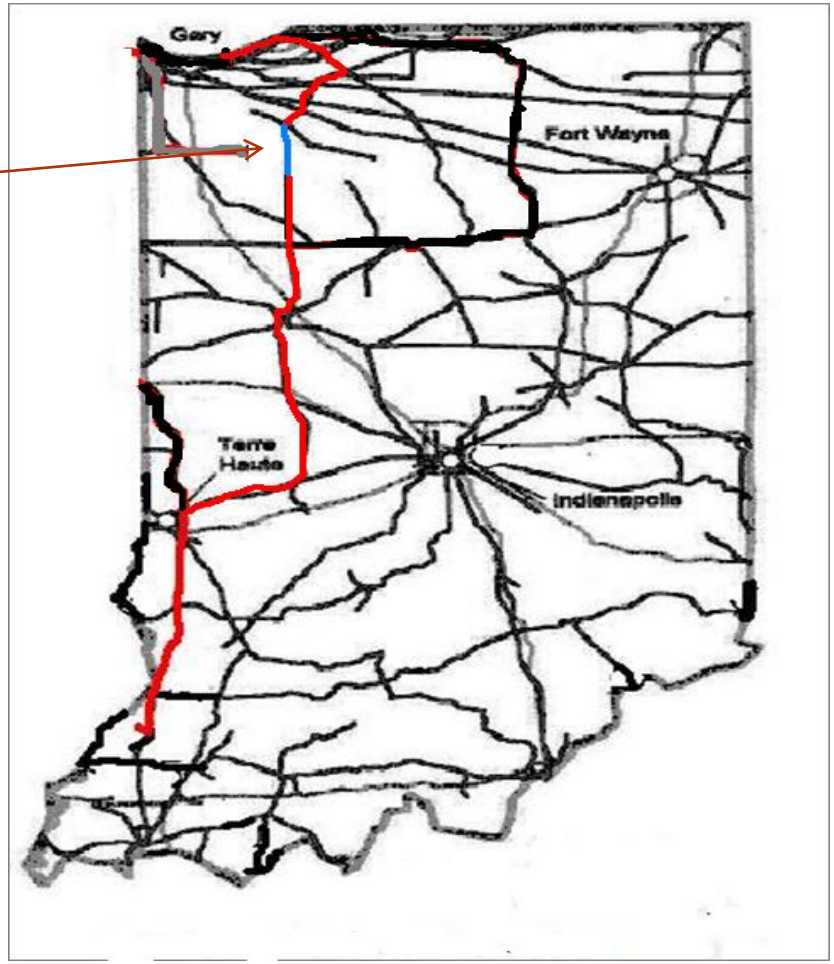

US Coal Exports
X1000 tons
8000
6000
4000
2000
0
Chicago
Cleveland
Detroit
Duluth

West Scenario

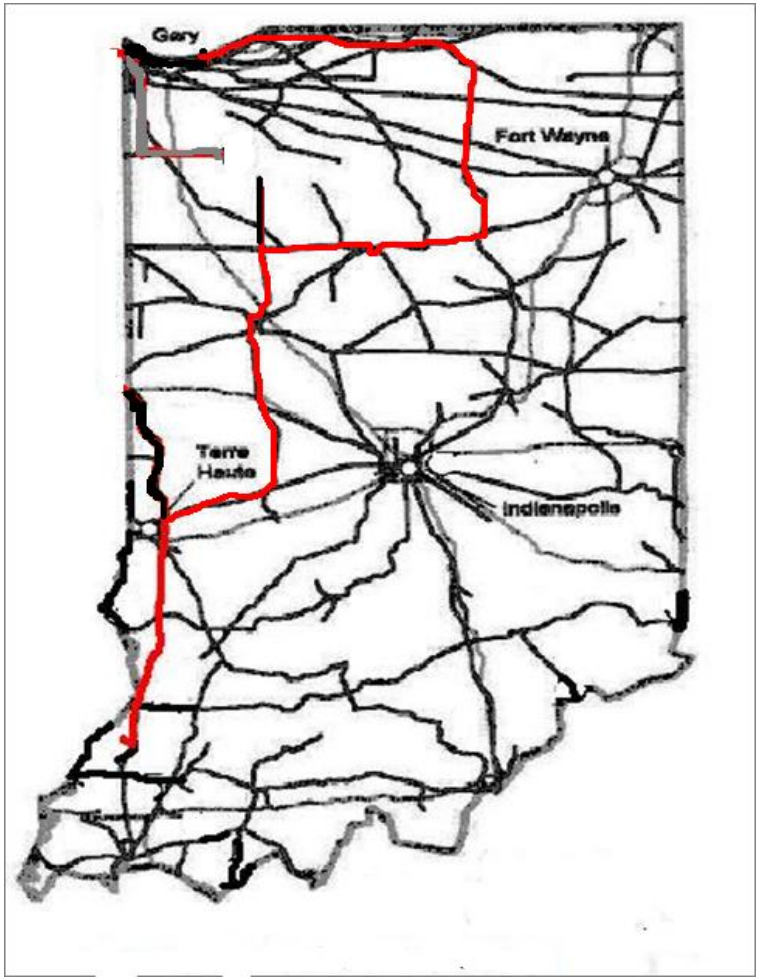


Central Scenario

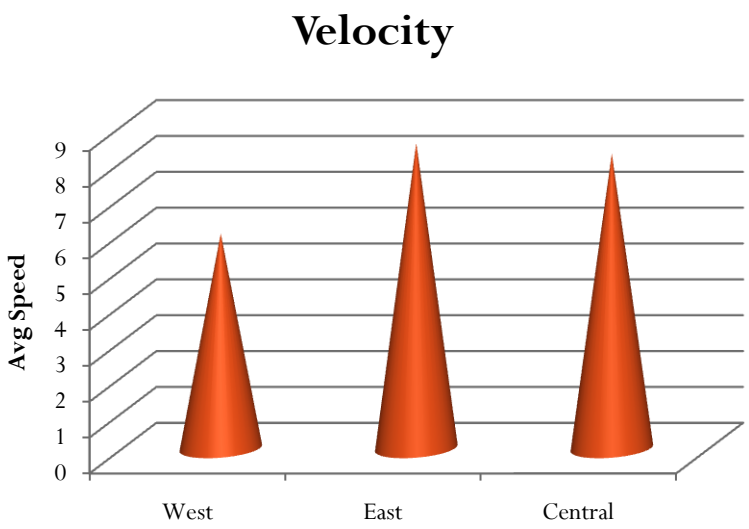
New Rail

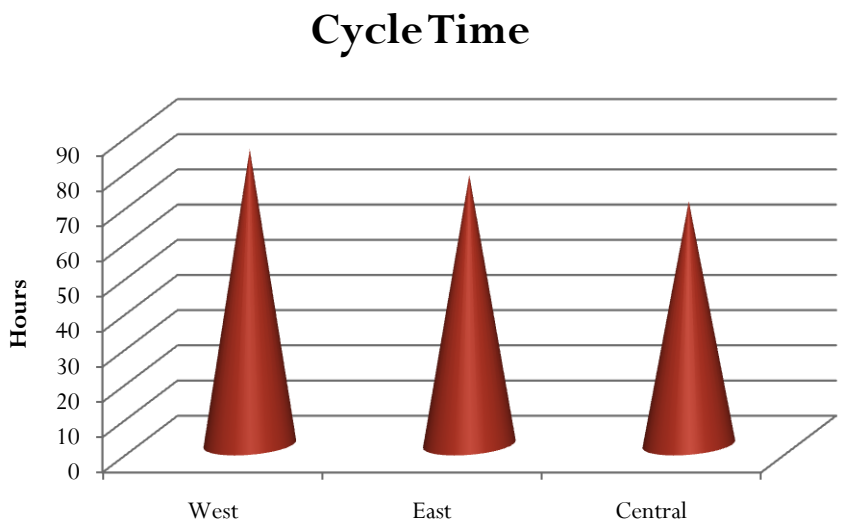


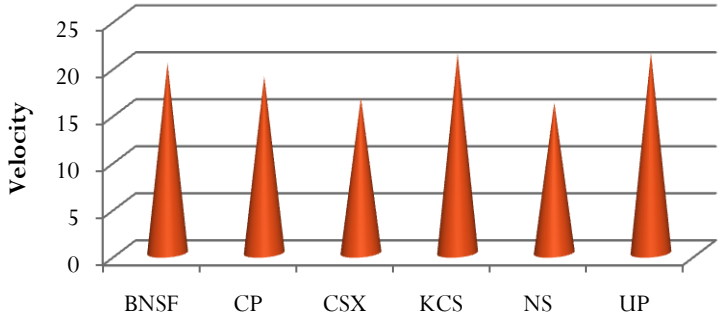
East Scenario



Some Results







The Business Case for a Cross-Lake Truck Ferry

- Funded by the Great Lakes Maritime Research Institute
  - University of Wisconsin-Superior & University of Minnesota Duluth
  - October 2010 – September 2011

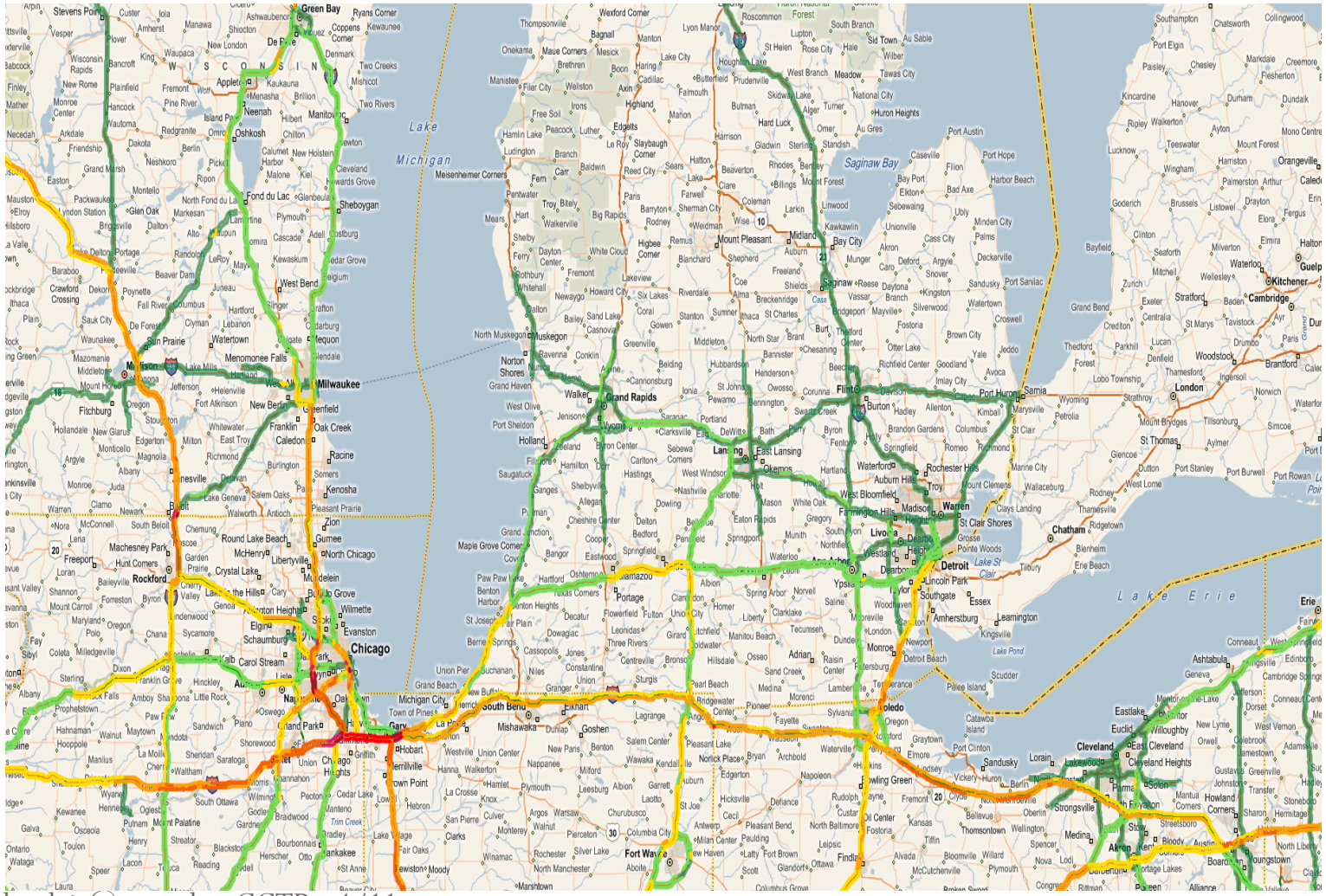
Great Lakes Maritime Research Institute

A University of Wisconsin - Superior and University of Minnesota Duluth Consortium

Research Objective

The objective of this research is to compare door to door truck service with a truck ferry operation which would link the Ports of Milwaukee and Muskegon. The proposed truck ferry operation is intended to reduce truck traffic through the heavily congested Chicago traffic corridors. Three important aspects of the proposed operation will be evaluated: transit times, frequency of service and per unit cost.

Great Lakes region traffic congestion



A closer look

Some relevant facts

- Chicago is ranked 3rd in terms of overall congestion
  - Travel Time Tax is 16.7%
- The Chicago area has 4 of the nation's top 25 congested corridors
  - "If you drive this stretch, you'll spend more than 1 month stuck in traffic and could ride a bike faster than if you drive"
  - 56 million hours of annual delay
- Chicago is ranked 7th in long haul freight density
- Indiana is ranked 3rd is state freight density
- Chicago has 6 of the top 20 bottlenecks in the United States
  - Average speed is 14.2
- Freight trucks travel approximately 371 million miles per day
  - On 6,000 miles of the National Highway Systems trucks account for one in every four vehicles
  - Almost 16,000 miles of the National Highway System handle more than 8,500 trucks per day

Congestion Implications

- Job creation affects congestion
- Congestion is a magnet
- Freight mobility is a national issue
- To 'win the future', solving the congestion problem is paramount
- Operation of the transportation system is the biggest 'force multiplier'

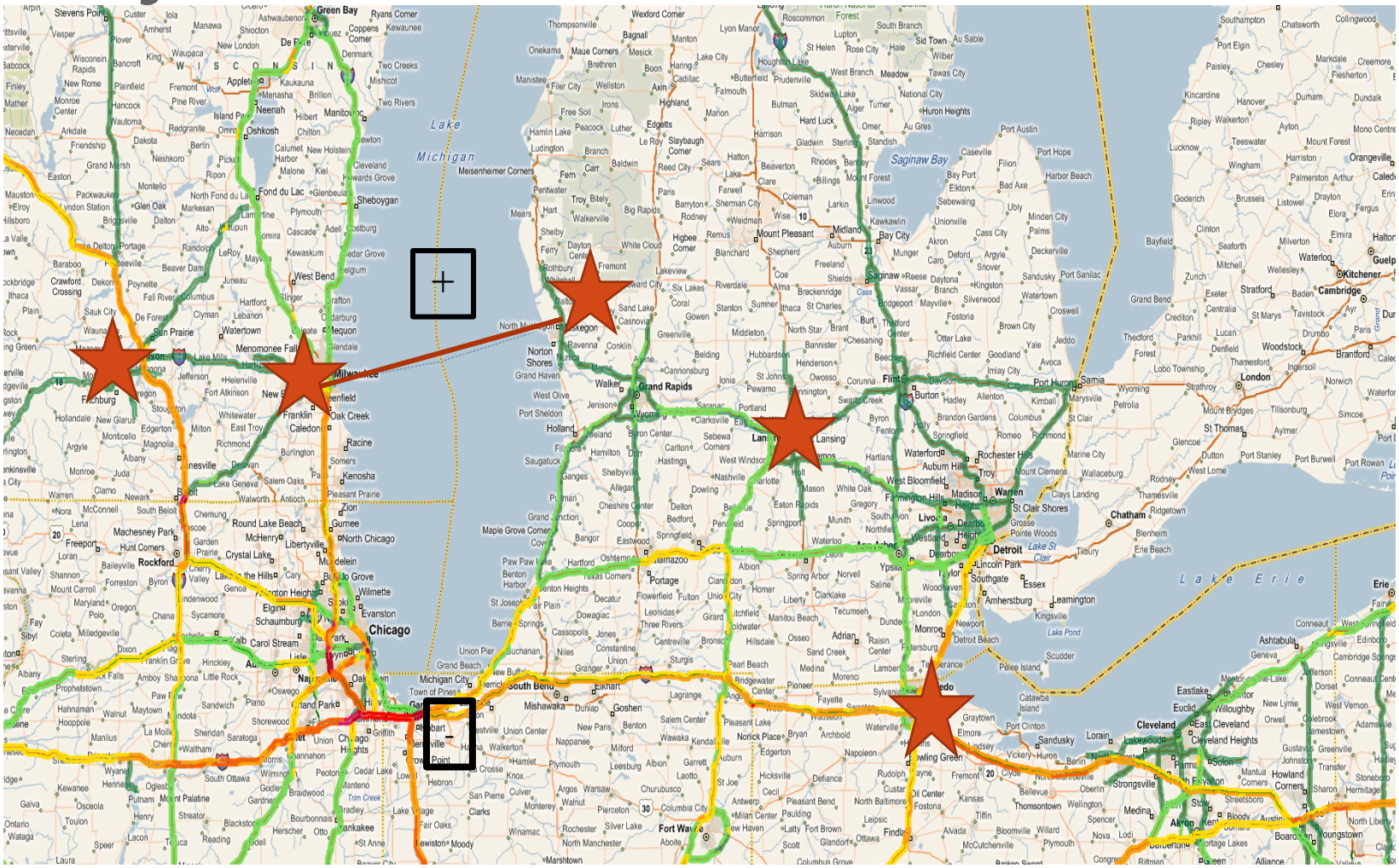
Short Sea Shipping Advantages

- Geographical advantages, such as a readily useable waterway system and ability to access existing population centers
- Financial advantages, such as lower transportation rates charged to shippers
- Energy advantages, such as reduced energy consumption by transportation activities
- Environmental advantages, such as fewer vehicle emissions, traffic accidents, and related social costs, and less need to build roads and rail facilities
- Human resource advantages, such as reduced truck driver shortages and shorter operating periods for drivers
- Capacity advantages, such as improved utilization of water systems with considerable room for expansion
- Positive effects in ancillary activities, such as increased investment and employment in shipbuilding, intermodal transportation services, etc.

Research Work Plan

- Research current/past ferry operations
- Assess trucking costs between points East and West of Lake Michigan
  - Madison, Milwaukee, and Minneapolis
  - Muskegon, Lansing, and Toledo
- Develop conceptual Roll-On, Roll-Off ferry operation
  - Sensitivity to fuel costs(Cost of Barrel of Oil)
  - Highway congestion impact
  - Find 'tipping point'

Project Goal



Milwaukee Region Trucks

Origin: Milwaukee CSA	TRUCK	
Destination State	Tons	Ave. Units
Wisconsin	41,925,880	1,164,608
Illinois	5,730,590	159,183
Ohio	1,875,930	52,109
Michigan	1,431,260	39,757
Indiana	677,990	18,833
Pennsylvania	322,700	8,964
New York	183,470	5,096
Total	***52,147,820***	***1,448,551***

Destination: Milwaukee CSA	TRUCK	
Origin State	Tons	Ave. Units
Wisconsin	37,286,510	1,035,736
Illinois	4,970,980	138,083
Indiana	1,681,490	46,708
Ohio	669,570	18,599
Michigan	493,930	13,720
Pennsylvania	339,760	9,438
New York	260,130	7,226
Total	***45,702,370***	***1,269,510***

Size of Opportunity

Origin: Milwaukee CSA	TRUCK	
Destination State	Tons	Ave. Units
Illinois	5,730,590	159,183
Ohio	1,875,930	52,109
Michigan	1,431,260	39,757
Indiana	677,990	18,833
Pennsylvania	322,700	8,964
New York	183,470	5,096
Total	***10,221,940***	***283,943***
Daily Equivalent		1,127
5% Share		56

Destination: Milwaukee CSA	TRUCK	
Origin State	Tons	Ave. Units
Illinois	4,970,980	138,083
Indiana	1,681,490	46,708
Ohio	669,570	18,599
Michigan	493,930	13,720
Pennsylvania	339,760	9,438
New York	260,130	7,226
Total	***8,415,860***	***233,774***
Daily Equivalent		928
5% Share		46


SCANIA


FERRY SERVICE

Questions/Comments?