The Economics of a Bi-State Ferry

Principal Investigator:

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Co-Investigator:

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Prime Focus LLC

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UMD Reaching Higher

University of Wisconsin Superior

Basis for Research Project

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- Current equilibrium price of oil
- General traffic congestion at Crossroads of America
  - NIRPC Freight Study, Cambridge Systematics, 8/10
- Ferry Studies
  - Port of Milwaukee Lake Michigan Trailer Ferry Study, The Roethle Group, 6/07
  - "Ferries Across the Great Lakes – What does the Future Hold", The Mariport Group, 1/03
  - "Bi-State Domestic Freight Ferries Study", NYU/Rutgers, 9/06

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Research Objective

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- Compare the door to door service of a roll-on, roll-off truck ferry operation linking the Ports of Milwaukee, WI and Muskegon, MI
  - Transit Time
  - Frequency and Reliability
  - Cost

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Principal Resources Utilized

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- Indiana Economic Development Corporation
  - Leigh Morris, Drew Levenfeld
- Port of Indiana
  - Peter Lamm, Executive Director
- Port of Milwaukee
  - Eric Reinhelt
- Wisconsin DOT
  - Dennis Leong, Dan Thyes
- Michigan DOT
  - Jesse Gwilliams, Freight Movement Specialist
- Chicago Metropolitan Agency for Planning
  - Tom Murtha, Senior Planner
- Indiana DOT
  - Keith Bucklew
- Muskegon, MI
  - Sand Products Corp., Corp.,Chuck Canestraight, Max McKee, Scott Musselman

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Task 1: Literature Review of Truck Ferry Models

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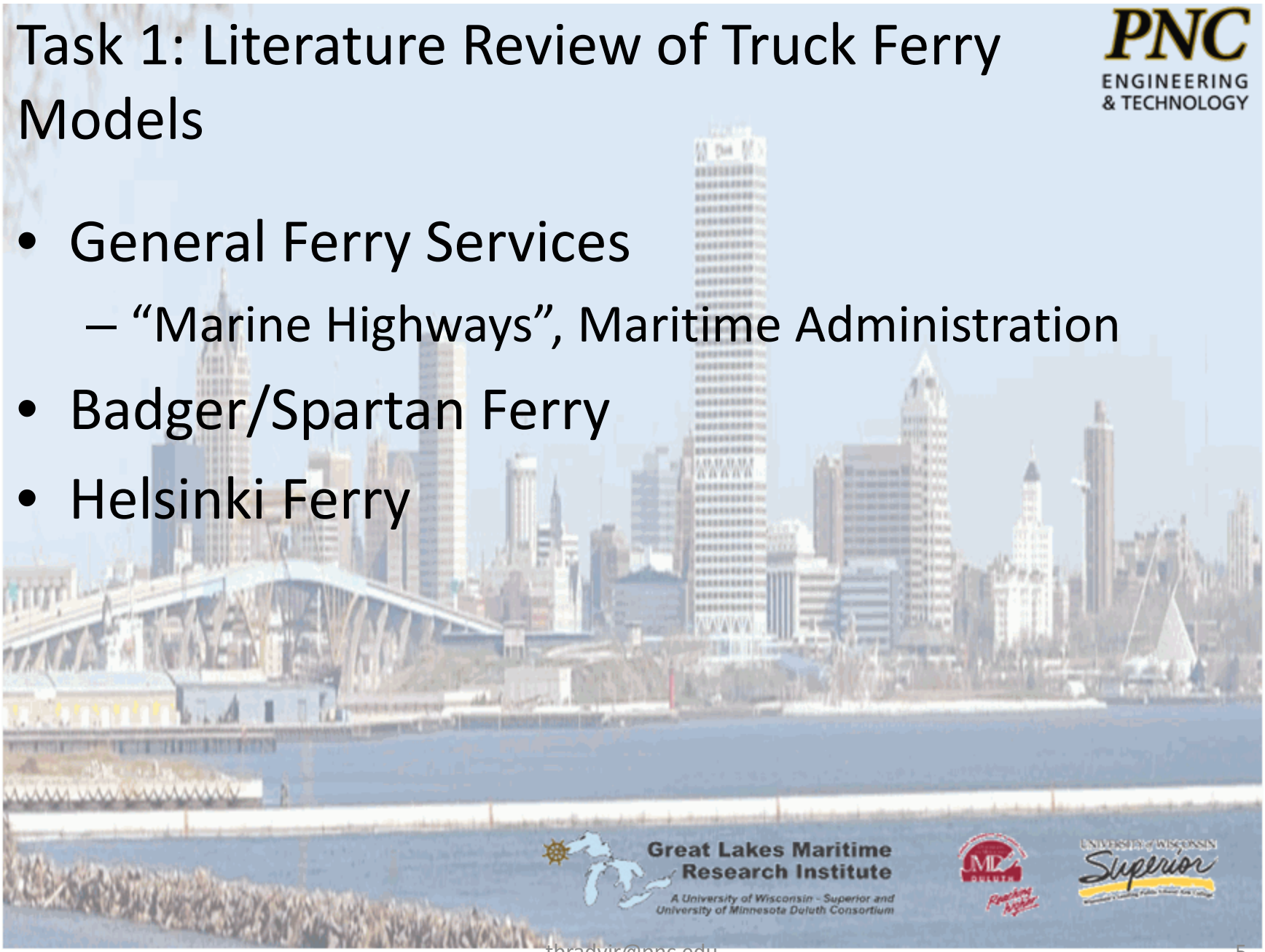
- General Ferry Services
  - "Marine Highways", Maritime Administration
- Badger/Spartan Ferry
- Helsinki Ferry



Task 2: Assess trucking costs between points East and West of Lake Michigan

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							Dry Van OTR			Intermodal		
Origin City	Origin State	Origin Zip	Dest City	Dest State	Dest Zip	Miles	RPM	Linehaul	Total Fuel	RPM	Linehaul	Total Fuel
Minneapolis	MN	55402	Muskegon	MI	49440	598	$ 2.16	$1,293.78	$ 304.98	1.79	1072.83	167.44
Minneapolis	MN	55402	Lansing	MI	48910	629	$ 2.09	$1,312.90	$ 320.79	1.67	1050.62	176.12
Minneapolis	MN	55402	Toledo	OH	43606	654	$ 2.06	$1,347.61	$ 333.54	1.78	1164.84	183.12
Madison	WI	53705	Muskegon	MI	49440	341	$ 2.67	$ 910.72	$ 173.91	1.95	665.82	95.48
Madison	WI	53705	Lansing	MI	48910	373	$ 2.50	$ 931.48	$ 190.23	1.73	643.89	104.44
Madison	WI	53705	Toledo	OH	43606	397	$ 2.43	$ 964.54	$ 202.47	1.91	757.83	111.16
Milwaukee	WI	53203	Muskegon	MI	49440	286	$ 2.88	$ 823.34	$ 145.86	2.28	650.73	80.08
Milwaukee	WI	53203	Lansing	MI	48910	317	$ 2.66	$ 842.46	$ 161.67	1.98	628.53	88.76
Milwaukee	WI	53203	Toledo	OH	43606	333	$ 2.59	$ 862.40	$ 169.83	2.22	740.28	93.24
Muskegon	MI	49440	Minneapol	MN	55402	601	$ 1.86	$1,118.45	$ 306.51	1.48	888.60	168.28
Lansing	MI	48910	Minneapol	MN	55402	635	$ 1.79	$1,134.30	$ 323.85	1.36	861.59	177.80
Toledo	OH	43606	Minneapol	MN	55402	657	$ 1.73	$1,138.75	$ 335.07	1.30	856.63	183.96
Muskegon	MI	49440	Madison	WI	53705	342	$ 2.03	$ 695.30	$ 174.42	1.93	660.93	95.76
Lansing	MI	48910	Madison	WI	53705	376	$ 1.89	$ 711.15	$ 191.76	1.69	633.92	105.28
Toledo	OH	43606	Madison	WI	53705	398	$ 1.80	$ 715.60	$ 202.98	1.58	628.96	111.44
Muskegon	MI	49440	Milwaukee	WI	53203	285	$ 2.09	$ 595.74	$ 145.35	2.26	645.30	79.80
Lansing	MI	48910	Milwaukee	WI	53203	319	$ 1.92	$ 611.58	$ 162.69	1.94	618.28	89.32
Toledo	OH	43606	Milwaukee	WI	53203	333	$ 1.81	$ 602.91	$ 169.83	1.84	611.13	93.24

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Task 3: Compare truck only and truck-ferry costs and service

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- Investigate product flows
  - Determine volume/type of commodity flows
- Select origination/destination points
  - Minneapolis, Madison, Milwaukee
  - Lansing, Toledo, Detroit
- Develop analysis methodology
  - Computer Simulation

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Data Analysis

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- Michigan – 2007 Transearch database
  - Ontario volume
- Wisconsin
  - Port of Milwaukee, 800,000 trucks with ferry potential
- Chicago
  - Potential market
  - Freeway congestion
- Ferry Design

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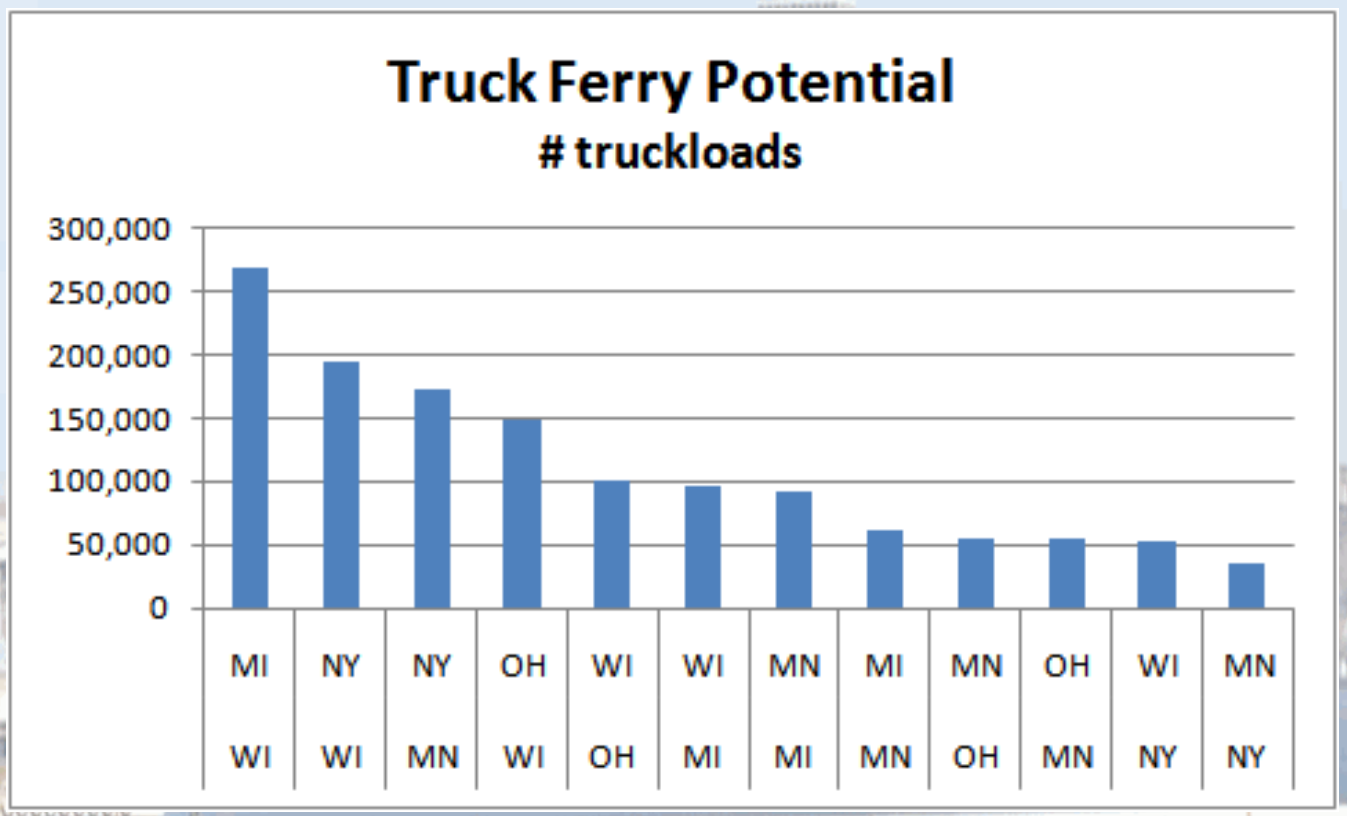
CMAP Data

Transearch 2007



Truck Ferry Potential

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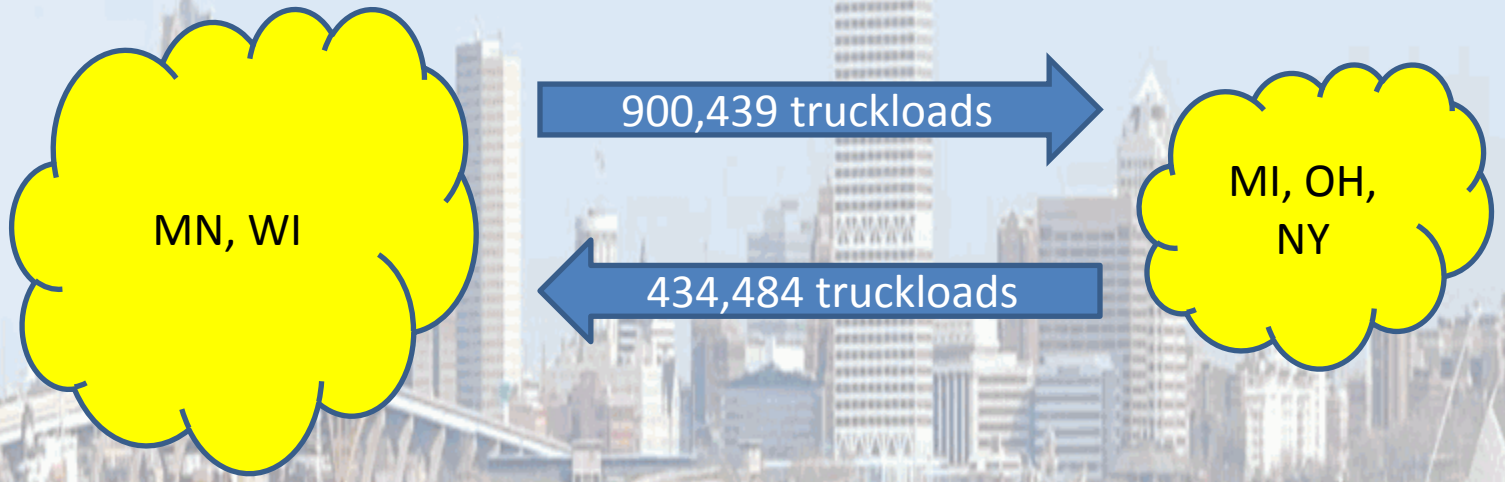
"The analysis I completed last year for the Port of Milwaukee indicated That over 800,000 trucks drove routes that may have ferry potential"
Dan Thyes, WIDOT



"If I had a flat deck, I could load 100 trailers today"
Peter Lamm, Port of Indiana

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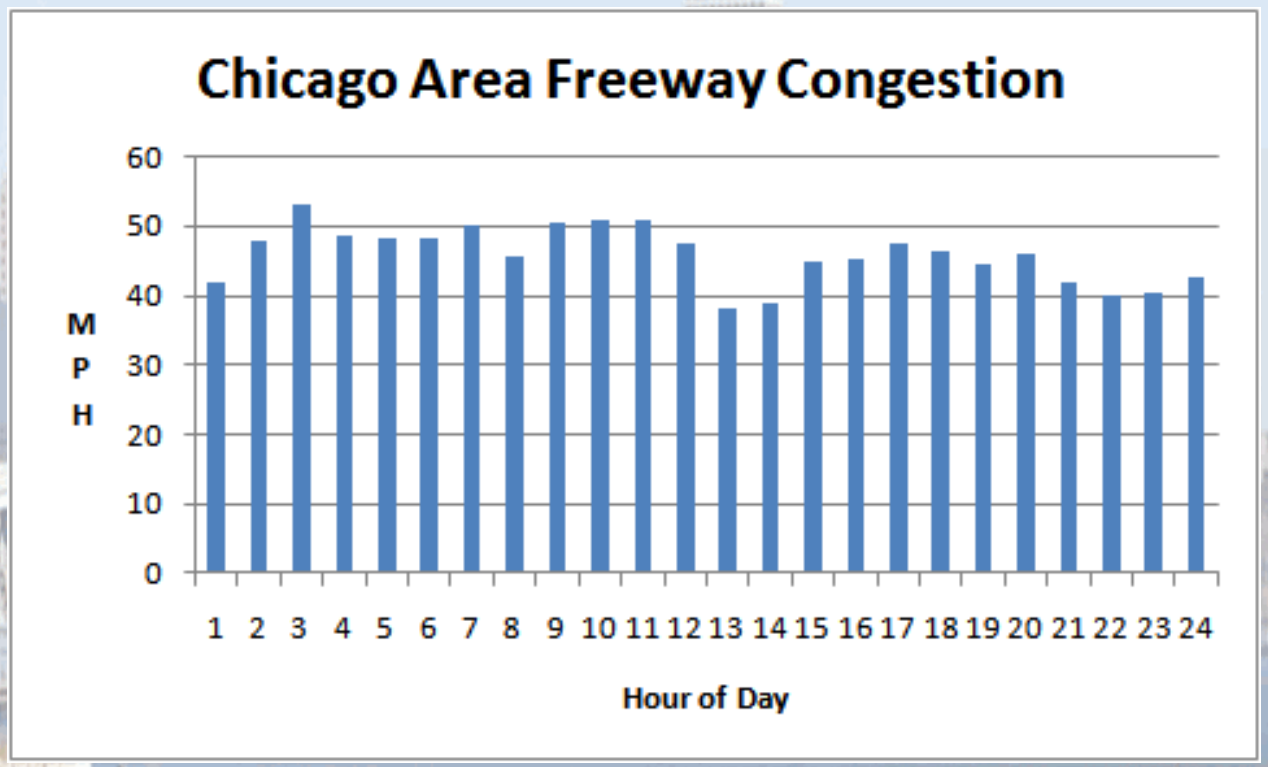
CMAP Data


Chicago Area Freeway Congestion
MPH
60
50
40
30
20
10
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Hour of Day

Ferry Design

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- Physical Characteristics
  - 70 foot wide by 350 feet long
  - 6 lanes wide by 6-7 lanes deep
  - Capacity of 36 – 42 units
- Operational Characteristics
  - Operate 300 days/year
  - 1 tug/2 barges

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Proposed Ferry Operational Costs[1]

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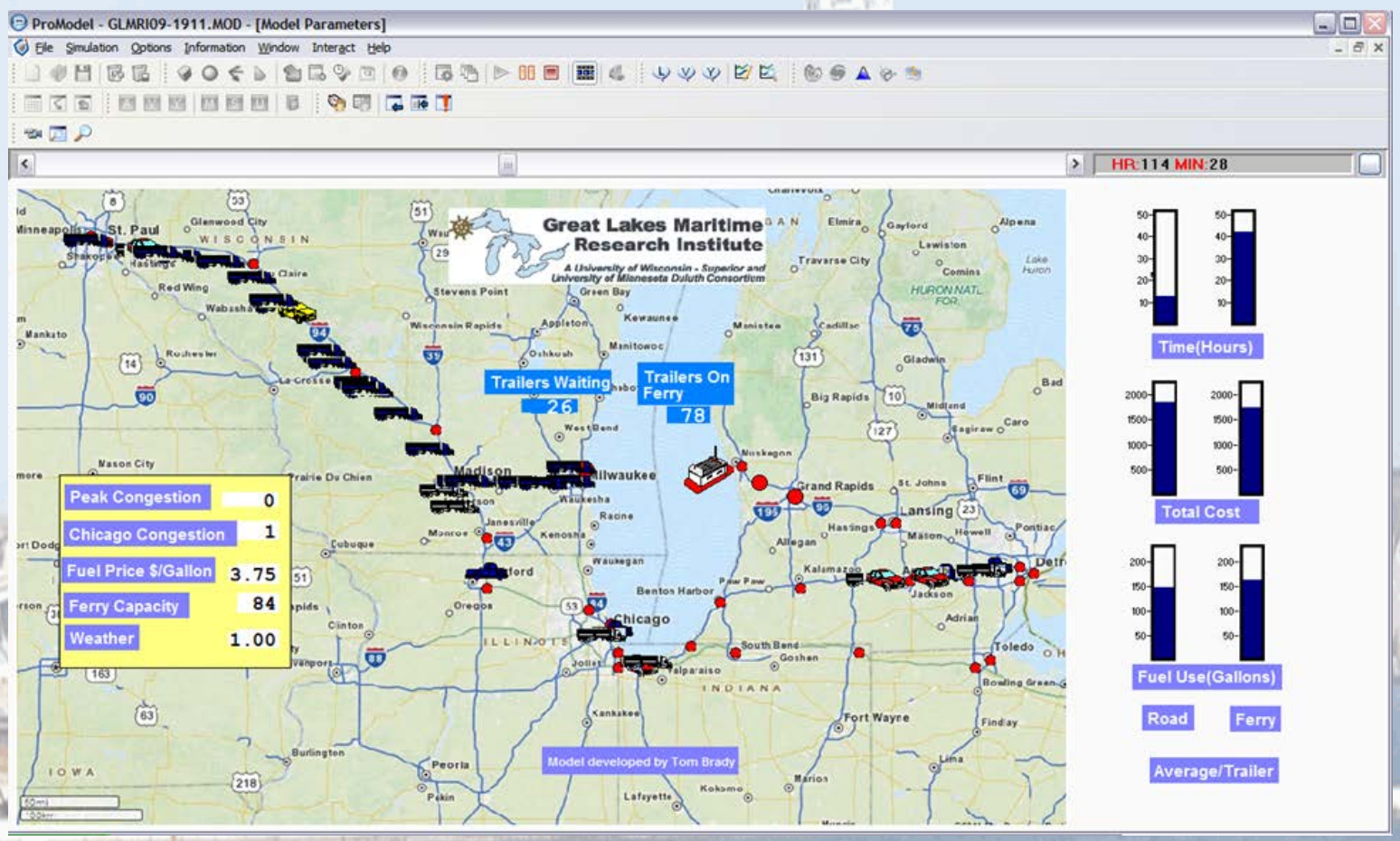
Muskegon-Milwaukee Tug/Barge Operation

	Forecast January	Forecast February	Forecast March	Forecast April	Forecast May	Forecast June	Forecast July	Forecast August	Forecast September	Forecast October	Forecast November	Forecast December	Forecast Total	Cost Per Day
Full Crew Days	0	0	25	30	31	30	31	31	30	31	30	31	300	
Layup Crew Days	31	28	6	0	0	0	0	0	0	0	0	0	65	
Crew Travel Days	0	0	0	0	0	9	0	0	0	9	0	0	18	
Operating Expense														
Management Fee	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	120,000	400
Charter Hire-Tug	67,739	67,739	67,739	67,739	67,739	67,739	67,739	67,739	67,739	67,739	67,739	67,739	812,869	2,710
Charter Hire-Barge	119,014	119,014	119,014	119,014	119,014	119,014	119,014	119,014	119,014	119,014	119,014	119,014	1,428,170	4,761
Labor, Benefits and Taxes-sailing	0	0	82,839	99,407	102,721	99,407	102,721	102,721	99,407	102,721	99,407	102,721	994,074	3,314
Labor, Benefits and Taxes-layup	17,205	15,540	3,330	0	0	0	0	0	0	0	0	0	36,075	120
Galley	0	0	3,850	4,620	4,774	4,620	4,774	4,774	4,620	4,774	4,620	4,774	46,200	154
Labor-Travel	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	18,000	60
Supplies	0	0	6,250	7,500	7,750	7,500	7,750	7,750	7,500	7,750	7,500	7,750	75,000	250
Regulatory, Compliance and other	500	500	500	500	500	500	500	500	500	500	500	500	6,000	20
User / Professional Fees	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	18,000	60
O/S Power and Fleeting	3,100	2,800	600	0	0	0	0	0	0	0	0	0	6,500	22
Fuel & Lubes	0	0	329,711	395,654	408,842	395,654	408,842	408,842	395,654	408,842	395,654	408,842	3,956,537	13,188
Insurance	16,667	16,667	16,667	16,667	16,667	16,667	16,667	16,667	16,667	16,667	16,667	16,667	200,000	667
Total Monthly Operating Expenses	**237,225**	**235,260**	**643,501**	**724,101**	**741,007**	**724,101**	**741,007**	**741,007**	**724,101**	**741,007**	**724,101**	**741,007**	**7,717,424**	25,725
Cumulative total	**237,225**	**472,485**	**1,115,986**	**1,840,087**	**2,581,093**	**3,305,194**	**4,046,201**	**4,787,208**	**5,511,309**	**6,252,316**	**6,976,417**	**7,717,424**		
Maintenance														
Hull Maintenance	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	120,000	400
Machinery Maintenance	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	120,000	400
Drydock / Overhaul Accrual	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	240,000	800
Total Maintenance Expenses	**40,000**	**40,000**	**40,000**	**40,000**	**40,000**	**40,000**	**40,000**	**40,000**	**40,000**	**40,000**	**40,000**	**40,000**	**480,000**	1,600
Cumulative total	**40,000**	**80,000**	**120,000**	**160,000**	**200,000**	**240,000**	**280,000**	**320,000**	**360,000**	**400,000**	**440,000**	**480,000**		
TOTAL MONTHLY	**277,225**	**275,260**	**683,501**	**764,101**	**781,007**	**764,101**	**781,007**	**781,007**	**764,101**	**781,007**	**764,101**	**781,007**	$ 8,197,424	$ 27,325

1. Data from Sand Products Corp.

Task 4: Develop a concise visual animated computer simulation model of cross lake ferry service



Task 4: General System Environmental Factors Favoring Simulation Analysis

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- Variability
  - Travel times
  - Driver to MPG relationship
- Dependent Events
  - Congestion to distance
- Complexity
  - Volume of traffic

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Task 4: General System Environmental Factors Favoring Simulation Analysis

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- The computer simulation model will provide *expected long term performance estimates* of system behavior
  - Time per Trailer
  - Total Cost per Trailer
  - Fuel Use per Trailer

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Task 4:

Computer Simulation Details

- Truck Elements
  - Destination
  - Speed
  - MPG
  - Driver
- Link Elements
  - Distance
  - Congestion
  - Toll
- Ferry Elements
  - Capacity
  - Load/Unload Time
  - Speed/Cost
- Other Elements
  - Weather
  - Chicago congestion

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Task 4: Computer Simulation Details
Chicago Congestion

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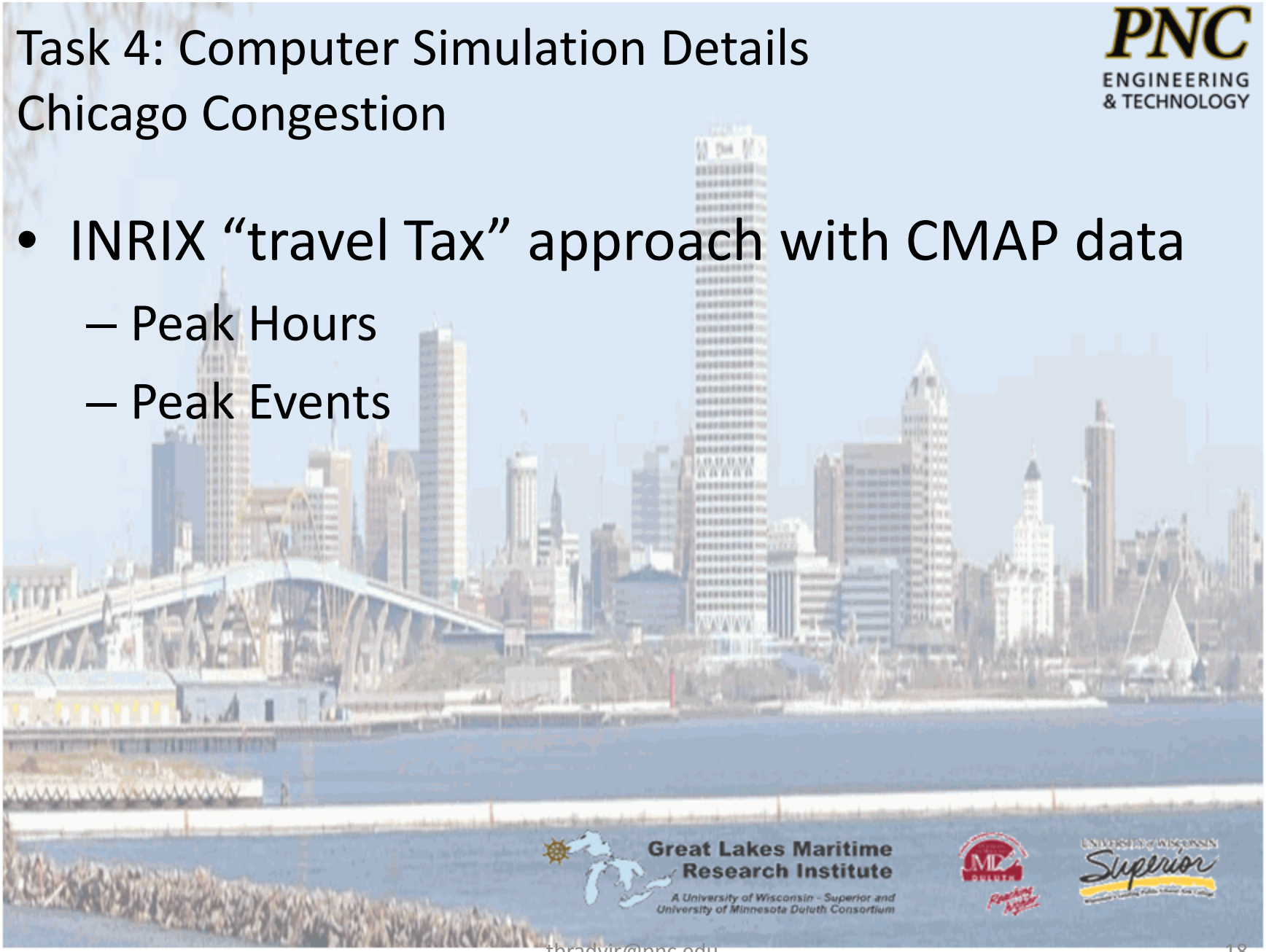
- INRIX "travel Tax" approach with CMAP data
  - Peak Hours
  - Peak Events



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Task 4: Develop a concise visual animated computer simulation model of cross lake ferry service

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- Main Simulation Parameters
  - Fuel Price/Gallon
  - Ferry Capacity

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Task 5: Analyze and report on projected tipping point between truck and truck ferry operations linking users in the Upper Midwest

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- Simulation Model Results
  - General Results
  - Transit Time Variability
  - Tipping Point

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General Simulation Results

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				Time(Hrs)		Cost		Fuel	
Scenario	Fuel Cost	Ferry Cap	Trailers/Ferry	Truck	Ferry	Truck	Ferry	Truck	Ferry
Base	$3.75	42	37	13.9	39.5	$1,550	$1,532	$123	$147
1	$3.00	42	37	13.9	39.5	$1,457	$1,423	$123	$147
2	$4.50	42	37	13.9	39.5	$1,643	$1,642	$123	$147
3	$5.25	42	37	13.9	39.5	$1,737	$1,753	$124	$147
4	$2.25	42	37	13.9	39.5	$1,365	$1,313	$124	$147
5	$3.75	84	74	13.9	39.5	$1,548	$1,396	$124	$130
6	$3.00	84	74	13.9	39.5	$1,455	$1,298	$124	$130
7	$4.50	84	74	13.9	39.5	$1,641	$1,493	$124	$130
8	$5.25	84	74	13.9	39.5	$1,734	$1,590	$124	$130
9	$2.25	84	74	13.9	39.5	$1,363	$1,201	$124	$130

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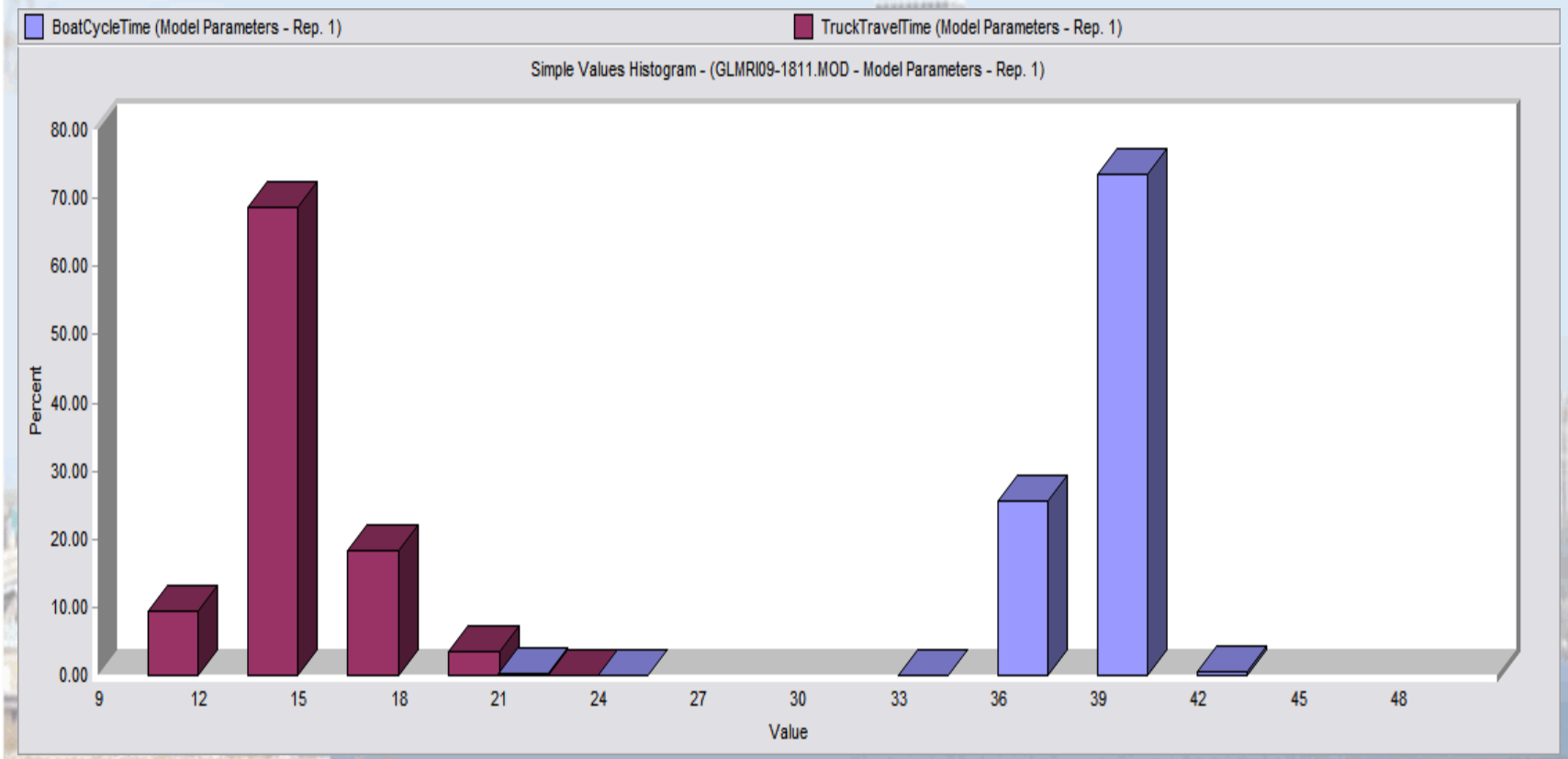
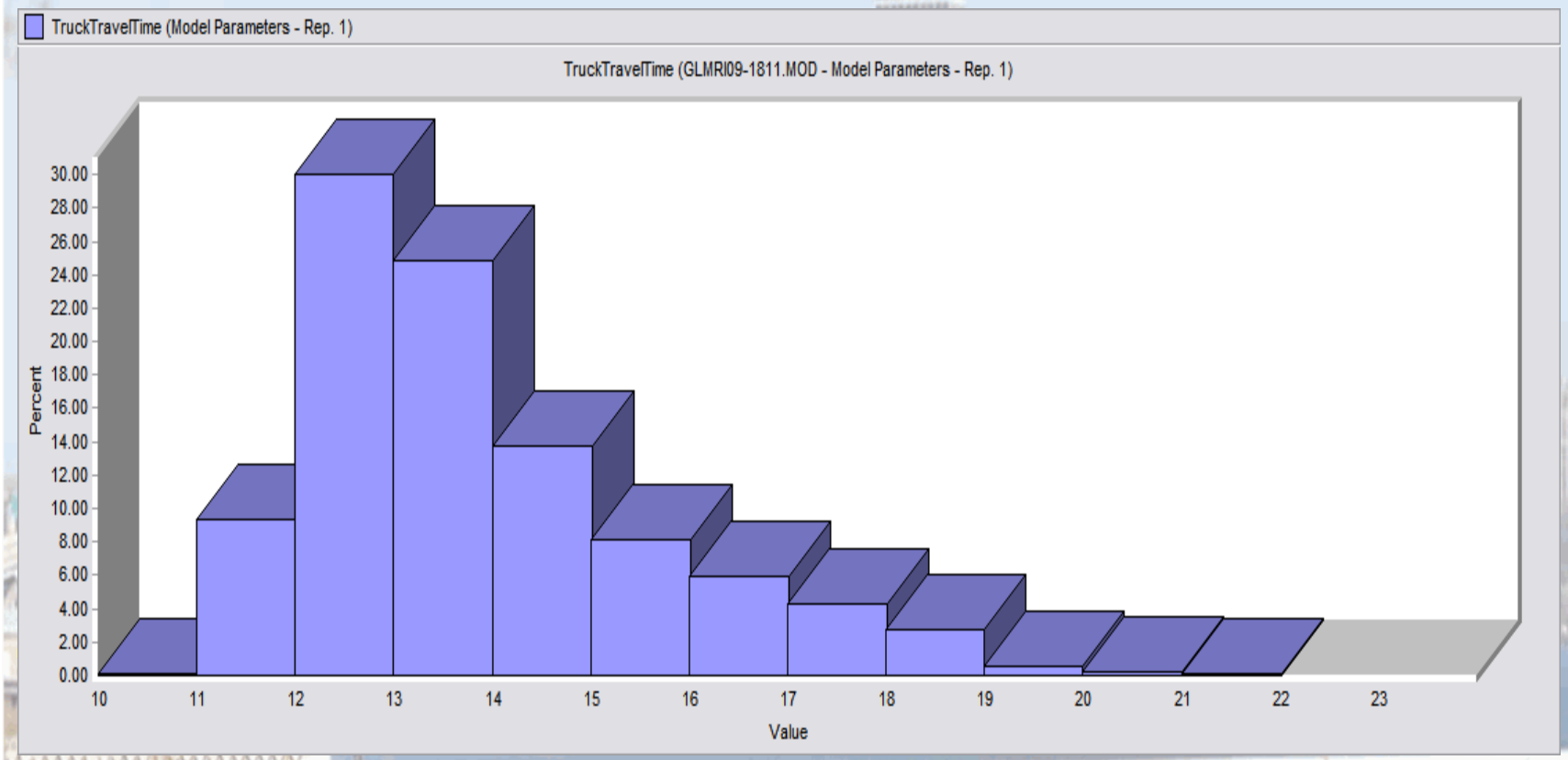
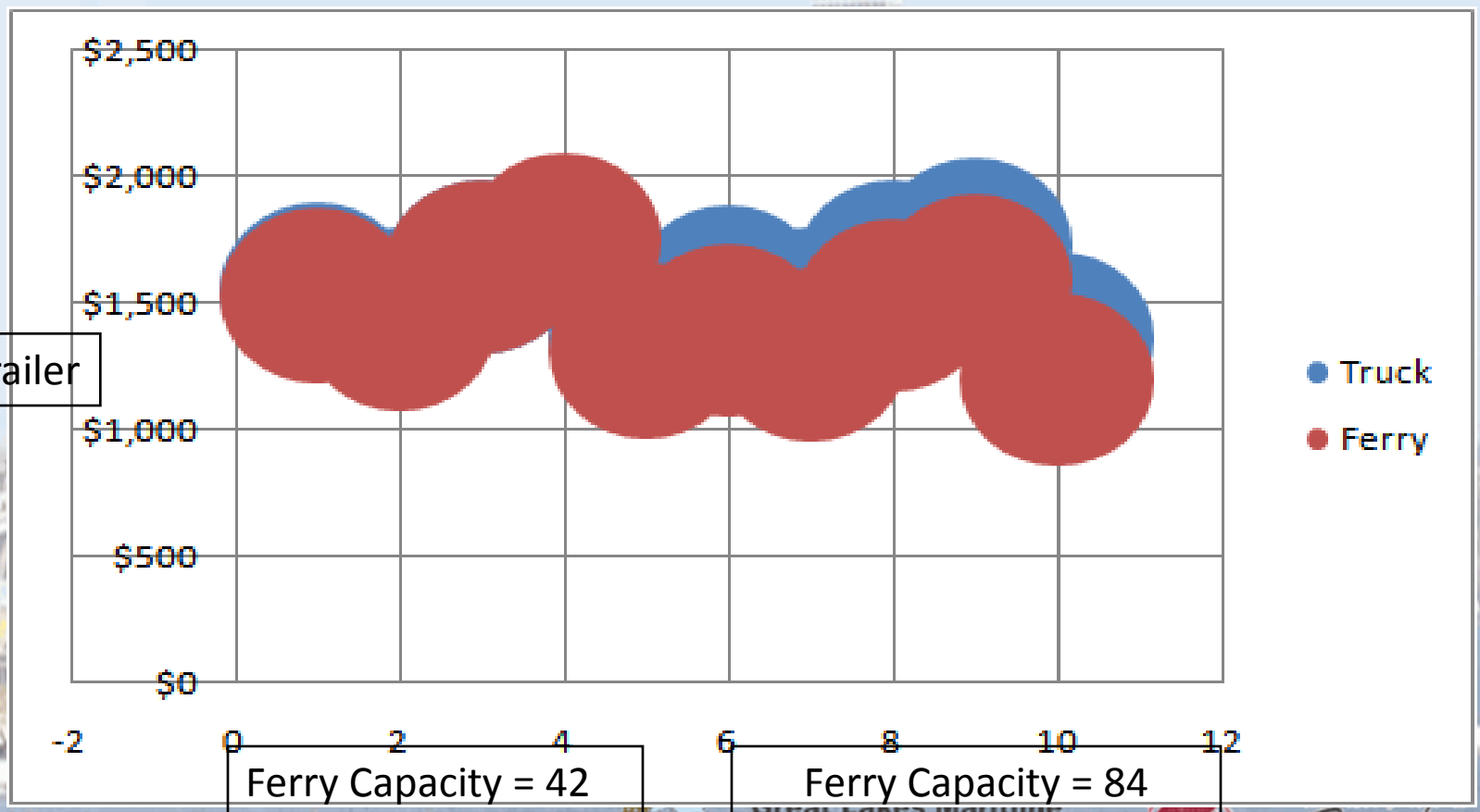
Transit Time Variability



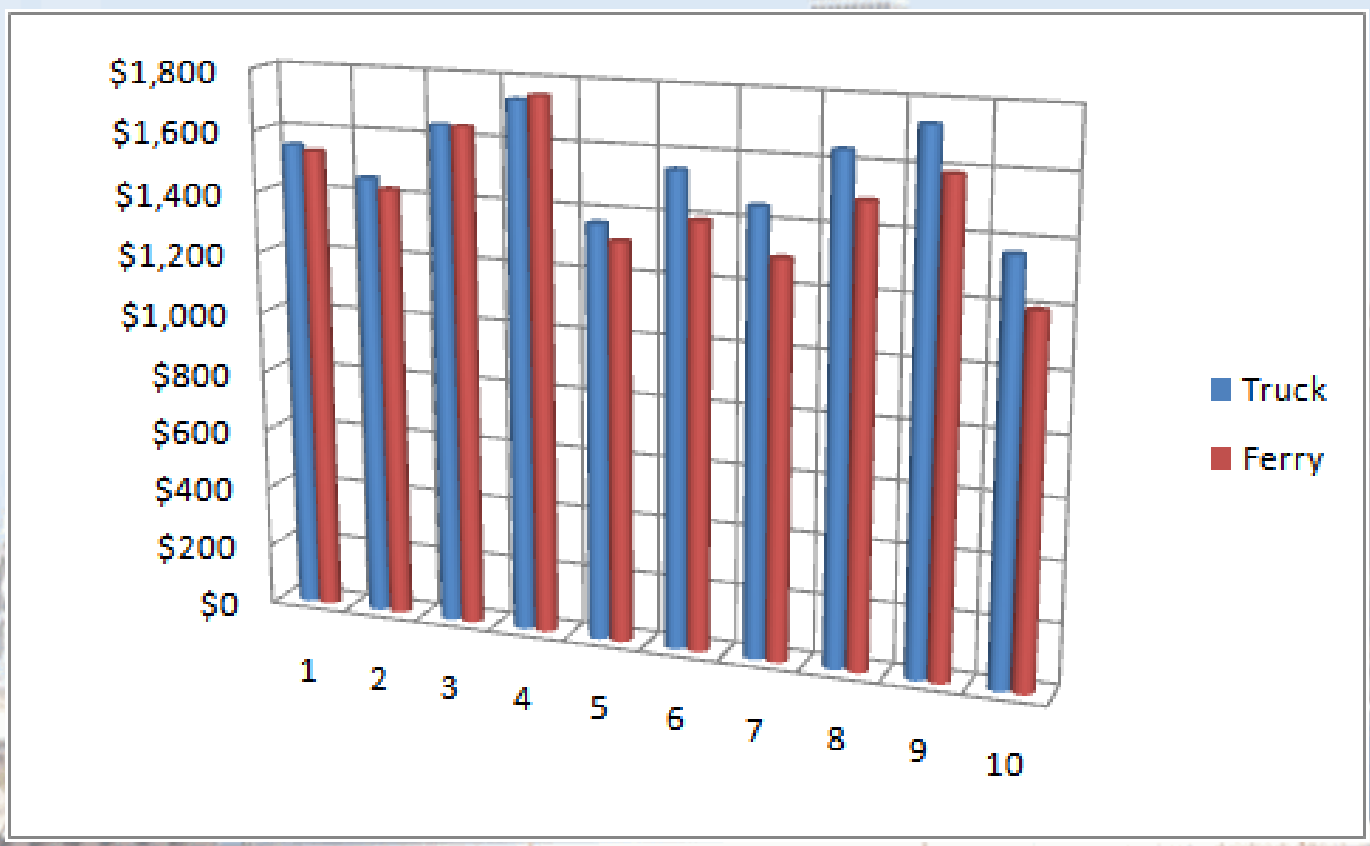
Transit Time Variability



Tipping Point



Tipping Point



Conclusions

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- There is sufficient demand for a ferry linking Wisconsin to Michigan
- A ferry operation cannot compete with trucking in terms of transit time
- A truck ferry with a capacity of 42 trailers can deliver a trailer from Minneapolis to Detroit for approximately the same cost as a truck
- A truck ferry with a capacity of 84 trailers provides an approximate ***$148/trailer advantage*** over a truck
  - This provides a simple payback of 87, 838 trailers
  - This provides a simple payback of 1,156 trips
  - This provides a ***simple payback of 1.9 years***

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Recommendations

- Perform a more thorough analysis of the commodities that would be suitable for a ferry operation
- Investigate back haul empty trailer scenarios
- Investigate a ‘triangular’ ferry incorporating the Port of Indiana