

LNG Conversion Summary

Liquefied Natural Gas is the best option that the Badger has for fuel replacement. Fueling the Badger's boilers with LNG would eliminate the generation of all coal ash and eliminate all overboard ash discharge. LNG has been identified as the fuel of the future for modern shipping. Unfortunately it currently has limited commercial availability. Energy companies in the Great Lakes region currently do not have the infrastructure to sell and transport LNG commercially for the shipping industry. Additionally, energy companies will require regulatory approval from the state commerce commissions where they are located before they are allowed to sell LNG commercially.

LNG Fuel, Transportation and Infrastructure

Most energy companies contacted were not yet able to quote exact pricing for LNG because they are not yet capable of commercial distribution. I received an estimate from Ted Calvin at Integrys Transportation Fuels, LLC in Illinois ((832) 848-0355) that LNG should be available for approximately \$1.00 per gallon.

Transporting LNG fuel from Integrys Energy Services Liquefaction facility in Fischer, Illinois to the Badger's dock in Manitowoc, Wisconsin was estimated to be \$ 0.15 per gallon of LNG by Ted Calvin.

Capital

The initial conversion cost estimate is **\$7,559,469.96**. This includes the cost of demolition of coal bunkers on the ship and the installation of new LNG infrastructure. This initial capital will cost **\$962,158.92 annually** for principle and interest payments at 5% interest and a 10 year amortization.

4/10/2012

Estimated Budget for BADGER LNG Conversion / Including Shore Side Support

• LNG storage tanks and bunkering for vessel:	\$1,500,000.00
• Piping for LNG (Assuming double-walled nitrogen pressured piping)	\$250,000.00
• Installation of LNG tanks and pipe:	\$525,000.00
• Additional cost for ABS Certification on tanks: (Between 15% and 20% of tank price. Budgeted at 17%)	\$255,000.00
• Burners, controls and ventilation / combustion air:	\$2,600,000.00
• Ship yard work and services:	\$500,000.00
• Bunkering control / Fire Detection and Suppression:	\$500,000.00
• ABS / Inspections	\$85,000.00
• Vessel Engineering:	<u>\$621,000.00</u>
Total	\$6,836,000.00

• Demolition of existing coal bunkers and machinery.	
LMC crew cost for six laborers for a month:	\$38,586.38
<small>\$28.86 an hour (current state prevailing wage for the county of Mason, State of MI, plus benefits.)</small>	
Welder for finish cutting and welding rigging:	
LMC cost for 240 hours for a boiler maker:	\$16,732.83
<small>\$54.76 an hour (current state prevailing wage for the county of Mason, State of MI, plus benefits.)</small>	
25 bottles of oxygen at \$27.25 each:	\$681.25
12 bottles of acetylene at \$62.08 each:	\$744.96
Grinding wheels, masks and other miscellaneous equipment:	\$2,500.00
Enviromental / Respirators, Ventilation / Misc:	\$5,000.00
Cranes and related lifting equipment:	\$10,000.00
Cleaning and Painting	<u>\$10,000.00</u>
	Cost
	\$84,245.42
Scrap at \$240.00 a net ton * 200 net tons =	Credit
	-48,000.00
 Demolition total cost:	 \$36,245.42

Estimated Cost of Project	\$6,872,245.42
10% Unanticipated Costs	<u>\$ 687,224.54</u>
Estimated Total Cost of Project	\$7,559,469.96

* Some of the costs listed above are based on LMC's long experience in the marine industry

Affordability of LNG Conversion Capital Costs For Lake Michigan Carferry

Economic Recovery:

The estimated capital cost of converting the Badger's fuel from coal to LNG is not currently feasible due primarily to the depressed economy in recent years. The recession has caused a reduction in passenger counts that are approximately twenty percent below the twenty-year average compiled during LMC's existence. With an improving economy it is likely that passenger counts will once again reach the 20-year average, and the resulting increased revenue would allow the company to afford the estimated \$7,500,000 cost of the LNG conversion.

LNG Technology:

LNG is not currently being used in the maritime industry in the United States to fuel large ships like the Badger. Current capital cost estimates for the conversion are based on best available technology and information. As LNG expands as a fuel source in the industry, it is logical to assume that the related improvement in technology will lower the cost of converting ships like the Badger in the future.

LNG Conversion Grants:

Currently there are no grants available to assist with the conversion of the Badger to LNG, although we recently received a \$70,000 grant from the state of Wisconsin to begin pursuing this option. Given the significant advantages of natural gas as a fuel for the maritime industry, including reduced emissions and reduced fuel costs, it is likely that in the future additional grant money will be made available through a variety of sources to encourage the conversion to this superior fuel source.

Attempted Contacts for LNG

1. Tom Puracchio @ People's energy. (217) 897-7120 . Called and left message on 3/20/12 and 3/22/12 and no return response.
2. Ted Calvin @ Integrys Transportation LLC (832) 884-0335. Called on 3/22/12 and corresponded several times after. Although Integrys is not currently able to sell LNG commercially, they are exploring that option. Ted was able to give some rough estimates on potential pricing of LNG and delivery.
3. Sandra @ NIPSCO (888) 689-8665. Called and left message on 3/22/12. Return call on 4/2/12 from Mike Paske (219) 647-4947.
4. Kay @ BP Chicago Office (312) 594-7801. Called and left message on 3/22/12 and no return response.
5. Joni Zich @ Xcel Energy. Called and spoke on 3/22/12. Xcel is currently exploring the commercial LNG market but has yet to decide if they will get in. Contact info exchanged and will keep in touch.
6. Peter Hackett @ Vista Natural Gas (541) 231-5685. pete.hackett@vista-naturalgas.com. Email correspondence between 3/20/12 and present. Vista deals in CNG and is interested in getting into the LNG market.
7. Rich Cowan @ Transcanada. Emailed several times and no response. Prior correspondence with Chuck L.