

LNG Study Phase I Meetings, Presentations and Reports

- Dr. Stewart, Dr. Parsons and Ms. Wolosz met with MARAD representatives (Mr. Carter, Dr. Junemann and Mr. Yuska) and shipping company representatives to discuss interest and focus for the study. Cleveland, OH. 23 Aug 2011
- Dr. Stewart and Ms. Wolosz met with Captain (retired) Lorne Thomas and Cmdr Scott Anderson from the USCG/9th District, and provided them with an overview of the LNG study. Cleveland, OH. 24 Aug 2011
- Ms. Wolosz coordinated a tour of the S.S. Badger with Mr. Manglitz. 6 Sep 2011
- Ms. Wolosz met with MN congressional staff member for Congressman Chip Cravaack, and provided an overview of the LNG study. Duluth, MN. 30 Aug 2011
- Dr. Stewart and Ms. Wolosz met with WI congressional staff member for Congressman Sean Duffy, and provided an overview of the LNG study. Superior, WI. 7 Sep 2011
- Dr. Stewart discussed the study at the Annual GLMRI Advisory Board meeting with members from government agencies and industry. Duluth, MN. 22 Sep 2011
- Dr. Stewart discussed the study at the Annual GLMRI Affiliates meeting with members from GLMRI affiliated universities and local agencies. Duluth, MN. 23 Sep 2011
- Dr. Stewart and Ms. Wolosz met with Mr. Carter/MARAD to discuss the plans and progress of the study. 23 Sep 2011
- Dr. Stewart met with Kevin Soucie, CN Railroad's Director for US Government Affairs. Among the topics discussed was the potential for switch engines used in CN rail yards located in port cities to be converted to operate on LNG. Mr. Soucie expressed interest and wants to be kept informed about the progress of the study. CN owns major terminals and rail lines in Duluth, MN, Escanaba, MI, and Two Harbors, MN that serve the Great Lakes Fleets. Superior, WI. 26 Sep 2011
- Ms. Wolosz attended the Society of Naval Architects and Marine Engineers (SNAME), Great Lakes and Rivers Section meeting and provided a brief overview of the study. Chicago, IL. 29 Sep 2011
- Ms. Wolosz and Mr. James Sharrow/GLMRI Advisory Board representative from (SNAME) met with Mr. Floyd Miras, the Director of the MARAD Great Lakes Gateway Office and provided an update on the plans for the study. Chicago, IL. 30 Sep 2011
- Ms. Wolosz met with the Chief Executive Officer and the Chief Engineer for the S.S. Badger and received an extensive tour of the ferry including the deck and engine room. Manitowoc, WI and Ludington, MI. 2-3 Oct 2011
- Ms. Wolosz included an overview of the study in a presentation at the Urban Transportation Center Conference held at the University of Illinois-Chicago. Chicago, IL. 12 Oct 2011
- Dr. Stewart and Ms. Wolosz met with Mr. Yuska/teleconference to discuss the plans and progress on the study. 19 Oct 2011
- Ms. Wolosz attended the Ship Operations Cooperative Program meeting and provided an overview of the study to the membership. Linthicum, MD. 2-3 Nov 2011
- Ms. Wolosz and Mr. Yuska/MARAD met to discuss the plans and progress of the study. Linthicum, MD. 2 Nov 2011

- Ms. Wolosz met with Mr. Harkins/ Engineer for the Great Lakes Fleet/Key Lakes Shipping, and provided an update on the engineering study aspects. Duluth, MN. 5 Nov 2011
- Dr. Parsons attended the Annual SNAME meeting, and met with several LNG industry contacts. Houston, TX. 17-18 Nov 2011
- Dr. Stewart and Ms. Wolosz had a telecon meeting with Mr. Yuska/MARAD, to provide an update on the project and go over the plans for the near future. 5 December 2011
- Dr. Stewart presented an update on the Study at the Marine Club meetings in Toronto, ON. 19-20 January 2012
- Dr. Stewart and Ms. Wolosz participated in the annual Transportation Research Board conference. Dr. Stewart presented updates on the study at the Marine Environmental Committee and also the Ports and Channel Committee. 22-25 January 2012
- Dr. Stewart and Ms. Wolosz met with the Executive Director of the American Great Lakes Ports Association, and discussed the project with a focus on how and when to best work with the Great Lakes ports. 22 January 2012
- Dr. Stewart and Ms. Wolosz met with MARAD personnel (Mr. Carter and Mr. Yuska/telecom) to discuss the progress of the study, and provide initial books from the literature review for their use and needs. 23 January
- Dr. Stewart and Ms. Wolosz met with congressional members and staffers to update them on GLMRI and provide an overview of the LNG study in the Great Lakes. 24 January
- Dr. Stewart and Ms. Wolosz had a telecom/meeting with Mr. Manglitz, Mr. McCarthy and Ms. Matson with the Lake Michigan Carferry Service to discuss the demonstration project and get an update on their current plans for the S.S. Badger. 10 February
- **Study Team Meeting, February 22, 2012 Cleveland, Ohio:**
Dr. Stewart and Carol Wolosz held a meeting with the study team members including:
Mr. Michael Carter, Director of Environmental Programs for MARAD
Mr. Steven Schafer, Policy Analyst for MARAD
Mr. Robert Manglitz, President of Lake Michigan Carferry Service
Mr. Chuck Cart, Chief Engineer, S.S. Badger
Captain Tom Wiater, President of Central Marine Logistics
Dr. Michael Parsons, GLMRI/University of Michigan

Dr. Stewart presented an update on the progress of the overall study and the efforts that GLMRI is moving forward with on the demonstration project modeling the *S.S. Badger*. Dr. Parsons provided the group with copies of his preliminary paper, and went over his findings to date. The group provided their comments and feedback on the current progress, along with their thoughts on where the study should focus for the future.

- **Nine students represented UW-Superior at “Posters in the Capitol Rotunda”, Madison, WI. Mar 7**
Transportation and Logistics Management student Kenneth Chong was chosen to give keynote address at UW System's annual Posters in the Rotunda celebration of undergraduate research. University of Wisconsin-Superior students involved in computer science, psychology, writing, art, and transportation and logistics management will showcase their undergraduate research projects March 7 at the State Capitol in Madison. "Posters in the Rotunda: A Celebration of Undergraduate Research," brings students and

faculty from University of Wisconsin System campuses to the Capitol Rotunda to share their undergraduate research projects with elected officials, government representatives, and the public. UW-Superior student Kenneth Chong was selected to speak about his experience at a special presentation with UW System President Kevin Reilly. Chong, a transportation and logistics management major from Mountain Lakes, N.J., talked about his undergraduate research experience at UW-Superior, what it means to his field of study, and how it will advance his career. UW-Superior students Brady Peterson of Superior and Hiroko Tada of Superior, both majoring in transportation and logistics management, joined Chong in presenting "Repowering the Great Lakes Vessels: Natural Gas as a Primary Fuel." Their faculty advisor is Dr. Richard Stewart, Professor of Transportation and Logistics Management and Co-Director of GLMRI.

- Dr. Stewart presented on LNG as a transportation fuel at the Minneapolis Transportation Club. Minneapolis, MN. 20 Mar.
- Carol Wolosz attended the Green Bay Port Symposium and networked with area businesses and agencies on LNG. Green Bay, WI. 2 Apr.
- GLMRI teleconference with USCG representatives to discuss specific regulations and regulatory processes. Dr. Stewart, Carol Wolosz and Randy Helland from the GLMRI team had a teleconference meeting with USCG representatives Mr. Mark Prescott, Chief of Deepwater Ports Standards Division, Ken Smith, Curtis Borland and others to discuss specific regulations and regulatory processes. They were happy to work with us and agreed to collaborate with us on the regulatory review for the study. 17 Apr 2012
- Dr. Stewart presented on LNG as a transportation fuel at the Institute of Supply Management in Minneapolis, MN. 19 Apr 2012
- Dr. Stewart presented on LNG as a transportation fuel at the Propeller Club meeting, Duluth, MN. 20 Apr 2012
- Dr. Stewart presented on LNG as a transportation fuel at the Alternative Fuels conference in Green Bay, WI. 1 May. (Agenda and list of company participants at Attachment 1.)
- Hosted LNG Gas Supply Meeting in Superior, WI. 19 June 2012
- Dr. Stewart and Carol Wolosz met with Mr. Steve Fisher, Executive Director of the American Great Lakes Ports Association and provided an overview of the LNG study. Alexandria, VA. 24 June 2012
- Dr. Stewart and Carol Wolosz met with Mr. Carter and Mr. Yuska at MARAD to provide an update on the study. Washington, D.C. 25 June 2012
- Dr. Stewart and Carol Wolosz met with a team of US Coast Guard representatives to discuss the study, to include regulatory issues, training, safety and security. Washington, D.C. 25 June 2012
- Dr. Stewart and Carol Wolosz met with representatives at the St. Lawrence Seaway Development Corporation Washington, D.C. 25 June 2012
- Mr. Helland traveled with the S.S. Badger, met with the fire department captains in Ludington, Michigan and Manitowoc, Wisconsin. Met with the USCG Sector Lake Michigan personnel. 16-18 July 2012
- GLMRI team toured the Norwegian Shipping Industry and LNG applications. 11-18 August 2012
- GLMRI Annual meetings were held in Duluth, MN. 26-28 Sep 2012
- Dr. Stewart presented an update on the study at the Wisconsin Freight Rail Day, in Eau Claire, WI. 26 October 2012

Other Outreach/Marketing Activities:

GLMRI prepared a news release on the MARAD cooperative agreement and the LNG/Repowering project, and submitted it to media outlets and contacts in the Great Lakes region (Attachment 3). Secondary media inquiries include: Michigan Public Radio, Associated Press, Great Lakes Inter-Tribal Council in Lac du Flambeau, WI. Ludington Daily News, Ludington, MI, Fleets and Fuels, San Francisco, CA, Duluth News Tribune. 2 December 2011

GLMRI provided Lake Michigan Carferry Service (*S.S. Badger*) with a letter of support for their grant application to the Wisconsin State Energy Office in October 2011. In December, Ms. Wolosz was provided a copy of the award letter that LMCS received from the Wisconsin Energy Office. 13 December 2011

This project received regional media coverage.

Ms. Wolosz responded to several media inquiries regarding the study, including Michigan Public Radio.

The paper Parsons, M. G., O'Hern, P. J. and Denomy, S. J., "The Potential Conversion of the U.S. Great Lakes Steam Bulk Carriers to LNG Propulsion – Initial Report" presented at the Society of Naval Architects and Marine Engineers (SNAME) Great Lakes and Great Rivers Section meeting on LNG Fuel in Cleveland, OH, on February 25, 2012, was published in the August 2012 issue of the *Journal of Ship Production and Design*, Vol. 28, No. 3, pp. 97-111.

The Great Lakes/Seaway Review included articles from Dr. Parsons on the steamship study, and also on the trip to Norway. Mr. Helland prepared an article on the regulatory issues impacting the use of LNG.

Quarterly Progress Reports on this study have been provided to MARAD on the following dates:

- As of February 29, 2012, submitted March 14, 2012
- As of May 31, 2012, submitted June 15, 2012
- As of August 31, 2012, submitted September 7, 2012

Dr. Stewart and Ms. Wolosz met with MARAD representatives on:

- August 23, 2012, Cleveland, Ohio
- September 22, 2012, Duluth, MN
- October 19, 2011 (Telecon)
- Nov 2, 2012, Linthicum, Maryland
- January 23, 2012, Washington, D.C.
- February 22, 2012, Cleveland, Ohio
- June 25, 2012, Washington, D.C.
- September 26-28, 2012, Duluth, Minnesota
- October 23-24, 2012, Providence, Rhode Island

Meeting Summaries

Great Lakes Waterways Conference, February 2012, Cleveland, Ohio

GLMRI led a panel of speakers at the Great Lakes Waterway Conference. Dr. Richard Stewart, Co-Director of GLMRI moderated a panel titled “The Future of Maritime Fuels – Greening the Fleet”. Dr. Stewart provided an overview for the discussion, and tied in the last historic fuel change from coal to fuel oil. Dr. Michael Parsons, faculty emeritus from the University of Michigan’s Naval Architecture and Marine Engineering Department presented a brief update on his research on converting the Great Lakes steamships to Liquefied Natural Gas. GLMRI funded the travel to bring Mr. Frank Duffield to Cleveland to provide a synopsis of LNG utilization in Europe, and discuss how some of the governments were incentivizing the fuel conversion. Mr. Duffield currently is employed by Argent Marine, as Senior Vice President of Argent Marine Companies, a U.S. based corporation with extensive experience in LNG shipping and is also a visiting Fellow at the University of Auckland, New Zealand, Business School.

Approximately 300 people were registered for the conference.

Society of Naval Architects and Marine Engineers (SNAME) – Great Lakes and Rivers Winter Section Meeting

GLMRI worked with the SNAME Section to coordinate a slate of speakers to provide informational sessions with industry and provide a venue for discussion and exchange with agencies, maritime industry engineers and gas suppliers at a 2-day technical session. It was purported that this was the largest attendance at a meeting ever held by a SNAME Section with

over 100 attendees. Mr. Gary Van Tassel from Argent Marine provided a 2 hour class/general information session on Thursday afternoon, 23 February to allow for questions in an educational setting. Also, Mr. Bob Kamb, from Mystic River Partners presented an overview of gas availability. On the second day, Dr. Parsons provided his preliminary findings on the GLMRI Study for converting the Great Lakes steamships to LNG. A panel of marine engine manufacturers discussed available technology, and on-going work in their companies. Mr. Odd Magne Horgen, presented information from Rolls Royce/Bergen Engines and showed a brief video on the ferries that are operating in Norway. Mr. Chad Verret from Harvey Marine with Mr. Peter Jacobs from Wartsila Engines, discussed the building of the first U.S. Flagged dual fuel/LNG ship and the design parameters of the engine. Mr. Verret was pointed out that they are addressing each of the issues as they present themselves, but are moving forward. Mr. Jonas Nyberg from Caterpillar, Inc. discussed what they are doing with dual-fuel marine engines. Mr. Ken Westcar from Toromont Power Generation Systems discussed the issues with capital costs and fuel infrastructure. Speakers from the classification societies' business development departments also were present to address LNG. Mr. Stephen Gumpel from ABS and Mr. Tony Teo from DNV each spoke on their involvement in LNG fuel integration.

After the networking lunch, an open discussion panel was led by Mr. Gary Van Tassel, Dr. Stewart and Mr. Steve Kemp. About 25 – 30 of the attendees stayed for the session. Topics included: Regulations, winter lay-up for Great Lakes' ships, crewing requirements, fuel quality, make-up of the fuel, bunkering procedures, hoses/valves, private-public partnerships, funding for a pilot project, government assistance with land-based markets, and risk mitigation.

A contingent of students from the University of Michigan's Naval Architecture and Marine Engineering program and the University of Wisconsin-Superior's Transportation and Logistics program attended.

Meeting to Connect Natural Gas Providers with Potential Users

On Tuesday, June 19, 2012, GLMRI hosted a meeting at the University of Wisconsin-Superior (UW-S) to bring together potential LNG fuel users from the mining, agricultural, trucking, rail and maritime sectors to determine if there is sufficient base load demand in a 200 mile region to warrant development of an LNG fuel transport, storage and distribution network centered in the Twin Ports of Duluth/Superior. The meeting will put current LNG users and solution providers together with businesses facing fuel cost and emissions challenges.

The Duluth Seaway Port Authority co-sponsored the event and assisted with contacting key industry focal points for engaging the discussion.

UW-S Chancellor Renee Wachter welcomed the participants, and Dr. Stewart provided an overview for the discussions, bringing in the consideration for rail, trucking and mining.

Mr. Bob Kamb, the Managing Partner with Mystic River Partners out of Boston, Massachusetts along with being a licensed mariner, moderated a panel of gas company, pipeline and equipment representatives. Mr. Kamb helped coordinate the slate of speakers for the event.

Mr. Kevin Markey, the Director of Natural Gas Fueling Solutions with GP Strategies out of Dallas was key in reaching out to the local and regional industry participants. Mr. Markey provided the thoughts on what goes in to the decision making considerations on designing and utilization of the fueling process from his involvement with the design of the LNG KWIK Trip station at La Crosse, Wisconsin.

Other speakers included: Mr. Todd Sondag, with Allstate Peterbilt Group presented on the new Peterbilt trucks that use LNG; Mr. Jeff Resch, with Dart Transit Company discussed how Dart is using natural gas; Mr. Joe Hoyt, the Director for Fuels at Pivotal, LNG/AGL Resources out of Atlanta, Georgia presented on the supply access for gas; Mr. Alex Quintero from the Altronic, LLC, presented on their Bi-Fuel Systems for dual fuel options; Mr. Mike McLean, the manager for Business Development at TransCanada Pipeline and Great Lakes Gas Transmission provided an overview of their pipeline access.

The meeting was attended by federal, state, and local representatives including elected officials, mining, shipping, trucking, construction, resort/water park owners and energy providers from industry, regional economic development agencies and academia.

All of the presentations from the June meeting are posted at www.glmri.org/research/

GLMRI Annual Meetings Held In September

The Annual GLMRI Advisory Board meeting and the Affiliates meeting were held in Duluth, MN on 27-28 September 2012. The research presentations were divided to cover the updates on the Liquefied Natural Gas projects on Thursday afternoon. Dr. Michael Parsons/University of Michigan provided an update on the steamship study. He also led the panel discussion on the outcomes from the Norway LNG trip. Mr. Joseph Fischer and Ms. Ziyang Zhan from Bay Engineering, Inc. presented their engineering analysis on converting the S.S. Badger from coal to natural gas. Capt. Randolph Helland, USCG, retired, presented an overview of his research in addressing the regulatory issues from federal, state and local authorities that will impact the utilization of LNG as a marine fuel. The team of Drs. James Winebrake/Rochester Institute of Technology and James Corbett/University of Delaware with Ms. Heather Thomson modeled a comparative analysis of the S.S. Badger emissions profile utilizing various fuels options.

On Friday morning, presentations included the work that Dr. Donn Branstrator/UMD and Matt TenEyeck/UW-S are doing in conjunction with the Great Ships Initiative ballast water treatment testing in researching the propagation of invasive species. Also, Dr. Branstrator presented his initial findings on sampling of ballast tank sediment. Dr. Tom Brady/Purdue North Central presented a final report on his study on barging truck trailers across Lake Michigan. Dr. Zamira Simkins/UW-S presented an economic analysis of the value of cargoes being shipped on the Lakes. Dr. Nathan Johnson/UMD provided his results in combining dredged material with biosolids from the Western Lake Superior Sanitation District. Dr. Peter Lindquist/University of Toledo gave a brief summary on the current updates on the Great Lakes Maritime Information Clearing House. Presentations are available at: <http://www.glmri.org/news/presentations12>

Affiliate university representatives provided updates on their programs: Dr. Teresa Adams/UW-Madison, Admiral Jerry Achenbach/Great Lakes Maritime Academy, and Dr. Brad Hull/John Carroll University.

The meetings were attended by U.S. Department of Transportation/Maritime Administration and the St. Lawrence Seaway Development Corporation representatives, members from the Lake Carriers Association and Great Lakes Shipping industry, port representatives, USCG, US Army Corps of Engineers and the Society of Naval Architects and Marine Engineers.