

# TR NEWS

NUMBER 298

JUNE-JULY-AUGUST 2015

## Moving Energy

**Gulf Ports Harbor the Changes  
Multimodal Freight Opportunities  
Delivering Natural Gas to New England  
Rural Roads and Heavy Hauling  
Crude Oil by Rail: Economics and Safety**



The **National Academy of Sciences** was established in 1863 by an Act of Congress, signed by President Lincoln, as a private, nongovernmental institution to advise the nation on issues related to science and technology. Members are elected by their peers for outstanding contributions to research. Dr. Ralph J. Cicerone is president.

The **National Academy of Engineering** was established in 1964 under the charter of the National Academy of Sciences to bring the practices of engineering to advising the nation. Members are elected by their peers for extraordinary contributions to engineering. Dr. C. D. Mote, Jr., is president.

The **National Academy of Medicine** (formerly the Institute of Medicine) was established in 1970 under the charter of the National Academy of Sciences to advise the nation on medical and health issues. Members are elected by their peers for distinguished contributions to medicine and health. Dr. Victor J. Dzau is president.

The three Academies work together as the National Academies of Sciences, Engineering, and Medicine to provide independent, objective analysis and advice to the nation and conduct other activities to solve complex problems and inform public policy decisions. The Academies also encourage education and research, recognize outstanding contributions to knowledge, and increase public understanding in matters of science, engineering, and medicine.

Learn more about the National Academies of Sciences, Engineering, and Medicine at [www.national-academies.org](http://www.national-academies.org).

The **Transportation Research Board** is one of seven programs of the National Academies of Sciences, Engineering, and Medicine. The mission of the Transportation Research Board is to provide leadership in transportation innovation and progress through research and information exchange, conducted within a setting that is objective, interdisciplinary, and multimodal. The Board's varied activities annually engage about 7,000 engineers, scientists, and other transportation researchers and practitioners from the public and private sectors and academia, all of whom contribute their expertise in the public interest. The program is supported by state transportation departments, federal agencies including the component administrations of the U.S. Department of Transportation, and other organizations and individuals interested in the development of transportation.  
[www.TRB.org](http://www.TRB.org)



## TRANSPORTATION RESEARCH BOARD 2015 EXECUTIVE COMMITTEE\*

**Chair:** Daniel Sperling, Professor of Civil Engineering and Environmental Science and Policy; Director, Institute of Transportation Studies, University of California, Davis  
**Vice Chair:** James M. Crites, Executive Vice President of Operations, Dallas–Fort Worth International Airport, Texas  
**Executive Director:** Neil J. Pedersen, Transportation Research Board

Victoria A. Arroyo, Executive Director, Georgetown Climate Center; Assistant Dean, Centers and Institutes; and Professor and Director, Environmental Law Program, Georgetown University Law Center, Washington, D.C.  
Scott E. Bennett, Director, Arkansas State Highway and Transportation Department, Little Rock  
Deborah H. Butler, Executive Vice President, Planning, and CIO, Norfolk Southern Corporation, Norfolk, Virginia (Past Chair, 2013)

Jennifer Cohan, Secretary, Delaware Department of Transportation, Dover  
Malcolm Dougherty, Director, California Department of Transportation, Sacramento  
A. Stewart Fotheringham, Professor, School of Geographical Sciences and Urban Planning, University of Arizona, Tempe

John S. Halikowski, Director, Arizona Department of Transportation, Phoenix  
Michael W. Hancock, Secretary, Kentucky Transportation Cabinet, Frankfort  
Susan Hanson, Distinguished University Professor Emerita, School of Geography, Clark University, Worcester, Massachusetts

Steve Heminger, Executive Director, Metropolitan Transportation Commission, Oakland, California  
Chris T. Hendrickson, Professor, Carnegie Mellon University, Pittsburgh, Pennsylvania

Jeffrey D. Holt, Managing Director, Bank of Montreal Capital Markets, and Chairman, Utah Transportation Commission, Huntsville, Utah

Roger Huff, Manager, Ford Global Customs, Material Export Operations, and Logistics Standardization, Ford Motor Company, Farmington Hills, Michigan

Geraldine Knatz, Professor, Sol Price School of Public Policy, Viterbi School of Engineering, University of Southern California, Los Angeles

Ysela Llori, Director, Miami–Dade Transit, Miami, Florida

Abbas Mohaddes, President and CEO, Iteris, Inc., Santa Ana, California

Donald A. Osterberg, Senior Vice President, Safety and Security, Schneider National, Inc., Green Bay, Wisconsin

James Redeker, Commissioner, Connecticut Department of Transportation, Newington

Mark Rosenberg, President and CEO, The Task Force for Global Health, Inc., Decatur, Georgia

Sandra Rosenbloom, Professor, University of Texas, Austin (Past Chair, 2012)

Henry G. (Gerry) Schwartz, Jr., Chairman (retired), Jacobs/Sverdrup Civil, Inc., St. Louis, Missouri

Kumares C. Sinha, Olson Distinguished Professor of Civil Engineering, Purdue University, West Lafayette, Indiana

Kirk T. Steudle, Director, Michigan Department of Transportation, Lansing (Past Chair, 2014)

Gary C. Thomas, President and Executive Director, Dallas Area Rapid Transit, Dallas, Texas

Paul Trombino III, Director, Iowa Department of Transportation, Ames

Thomas P. Bostick (Lieutenant General, U.S. Army), Chief of Engineers and Commanding General, U.S. Army Corps of Engineers, Washington, D.C. (ex officio)

James C. Card (Vice Admiral, U.S. Coast Guard, retired), Maritime Consultant, The Woodlands, Texas, and Chair, TRB Marine Board (ex officio)

Alison Jane Conway, Assistant Professor, Department of Civil Engineering, City College of New York, New York, and Chair, TRB Young Members Council (ex officio)

T. F. Scott Darling III, Acting Administrator and Chief Counsel, Federal Motor Carrier Safety Administration, U.S. Department of Transportation (ex officio)

Sarah Feinberg, Acting Administrator, Federal Railroad Administration, U.S. Department of Transportation (ex officio)

David J. Friedman, Acting Administrator, National Highway Traffic Safety Administration, U.S. Department of Transportation (ex officio)

LeRoy Gishi, Chief, Division of Transportation, Bureau of Indian Affairs, U.S. Department of the Interior, Washington, D.C. (ex officio)

John T. Gray II, Senior Vice President, Policy and Economics, Association of American Railroads, Washington, D.C. (ex officio)

Michael P. Huerta, Administrator, Federal Aviation Administration, U.S. Department of Transportation (ex officio)

Paul N. Jaenichen, Sr., Administrator, Maritime Administration, U.S. Department of Transportation (ex officio)

Therese W. McMillan, Acting Administrator, Federal Transit Administration, U.S. Department of Transportation (ex officio)

Michael P. Melaniphy, President and CEO, American Public Transportation Association, Washington, D.C. (ex officio)

Gregory G. Nadeau, Acting Administrator, Federal Highway Administration, U.S. Department of Transportation (ex officio)

Peter M. Rogoff, Under Secretary for Transportation Policy, Office of the Secretary, U.S. Department of Transportation (ex officio)

Mark R. Rosekind, Administrator, National Highway Traffic Safety Administration, U.S. Department of Transportation (ex officio)

Craig A. Rutland, U.S. Air Force Pavement Engineer, Air Force Civil Engineer Center, Tyndall Air Force Base, Florida (ex officio)

Vanessa Sutherland, Acting Deputy Administrator, Pipeline and Hazardous Materials Safety Administration, U.S. Department of Transportation (ex officio)

Barry R. Wallerstein, Executive Officer, South Coast Air Quality Management District, Diamond Bar, California (ex officio)

Gregory D. Winfree, Assistant Secretary for Research and Technology, Office of the Secretary, U.S. Department of Transportation (ex officio)

Frederick G. (Bud) Wright, Executive Director, American Association of State Highway and Transportation Officials, Washington, D.C. (ex officio)

Paul F. Zukunft (Admiral, U.S. Coast Guard), Commandant, U.S. Coast Guard, U.S. Department of Homeland Security (ex officio)

\* Membership as of August 2015.

# TR NEWS

NUMBER 298

JUNE–JULY–AUGUST 2015

## MOVING ENERGY

### 3 INTRODUCTION

#### **Changes in Energy Markets: Effects on the U.S. Transportation System**

*Jonathan Rubin*

The U.S. transportation energy system is undergoing rapid changes, from historic increases in fuel efficiency to renewed domestic production of oil and natural gas to new routes for moving energy around the nation and the world. Articles in this issue address these changes with a clear understanding that transportation services are essential to meeting the nation's economic and social goals.

### 6 U.S. Gulf Ports Harbor the Changing Energy Supply

*Michael Bomba*

The Gulf of Mexico region has served for decades as the U.S. headquarters for petroleum production and exploration—but also for commerce in natural gas, coal, and renewable energy resources. The author traces trends in energy sector commodities and policies and their effects on the ports and private terminals along the Gulf.

### 14 Moving the Changing U.S. Energy Mix by Multimodal Freight: Opportunities, Prospects, and Issues

*Mark J. Carr*

The structural shift in U.S. energy production and consumption is changing the locations of energy trade lanes and the commodities and volumes transported. A 2015 TRB Annual Meeting session examined the effects on the multimodal freight system; the author presents insights from session speakers on the historic opportunities, regulatory influences, safety concerns, infrastructure needs, and more.

### 18 Natural Gas Transport in New England: Supply, Storage, Infrastructure, and Security

*Kevin R. Easley*

Boosting infrastructure capacity to deliver affordable natural gas supplies reliably to the New England region year-round is—and will continue to be—an enormous challenge, the author reports, describing the geographic constraints, pipeline and offshore facilities, storage, distribution, and related issues for producers, shippers, policy makers, consumers, and other stakeholders.

### 23 Pennsylvania Roads and Marcellus Fracking Operations: A Peaceful Coexistence in Lycoming County

*Mark R. Murawski*

Lycoming County, located at the epicenter of the Marcellus shale play, has partnered with the state of Pennsylvania to take bold steps with the gas industry to ensure that roads and bridges stay safe and sound under heavy hauling, and that all parties receive the economic benefits of natural gas development. The author documents the measures and the lessons learned.

### 28 Transporting Crude Oil by Rail in North America: Economics, Logistics, Safety, Lessons Learned, and Outlook

*Malcolm Cairns*

A comprehensive review of the surge in the transport of nonconventional shale oil and oil sands produced and delivered within North America—including a comparison of pipelines and rail, economic factors, safety matters, lessons from the Lac-Mégantic derailment and explosion, and the outlook for production, innovations, and market influences.



6



14



23



COVER: A new crude-by-rail origination terminal in Hardisty, Alberta, Canada. The changing landscape of energy use and production in the United States has implications for facilities, freight flows, technologies, and safety. (Photo: USD Partners, LP)

# TR NEWS

features articles on innovative and timely research and development activities in all modes of transportation. Brief news items of interest to the transportation community are also included, along with profiles of transportation professionals, meeting announcements, summaries of new publications, and news of Transportation Research Board activities.

## **TR News is produced by the Transportation Research Board Publications Office**

Javy Awan, Editor and Publications Director  
Lea Camarda, Associate Editor  
Jennifer J. Weeks, Photo Researcher  
Juanita Green, Production Manager  
Michelle Wandres, Graphic Designer

## **TR News Editorial Board**

Frederick D. Hejl, Chairman  
Christine L. Gerencher  
Edward T. Harrigan  
Christopher J. Hedges  
Russell W. Houston  
Katherine Kortum  
Thomas R. Menzies, Jr.  
G.P. Jayaprakash, Research Pays Off Liaison

## **Transportation Research Board**

Neil Pedersen, Executive Director  
Mark R. Norman, Director of Program  
Development and Strategic Activities  
Russell W. Houston, Assistant Executive  
Director  
Ann M. Brach, Director,  
Technical Activities  
Stephen R. Godwin, Director,  
Studies and Special Programs  
Gary J. Walker, Director,  
Administration and Finance  
Christopher W. Jenks, Director,  
Cooperative Research Programs

**TR News** (ISSN 0738-6826) is issued bimonthly by the Transportation Research Board, 500 Fifth Street, NW, Washington, DC 20001. Internet address: [www.TRB.org](http://www.TRB.org).

**Editorial Correspondence:** By mail to the Publications Office, Transportation Research Board, 500 Fifth Street, NW, Washington, DC 20001, by telephone 202-334-2972, by fax 202-334-3495, or by e-mail [jawan@nas.edu](mailto:jawan@nas.edu).

**Subscriptions:** North America: 1 year \$60; single issue \$12. Overseas: 1 year \$85; single issue \$12 plus shipping. Inquiries or communications concerning new subscriptions, subscription problems, or single-copy sales should be addressed to the Business Office at the address below, or telephone 202-334-3216, fax 202-334-2519. Periodicals postage paid at Washington, D.C.

**Postmaster:** Send changes of address to *TR News*, Transportation Research Board, 500 Fifth Street, NW, Washington, DC 20001.

**Notice:** The opinions expressed in articles appearing in *TR News* are those of the authors and do not necessarily reflect the views of the Transportation Research Board. The Transportation Research Board and *TR News* do not endorse products or manufacturers. Trade and manufacturers' names appear in an article only because they are considered essential.

Printed in the United States of America.

Copyright © 2015 National Academy of Sciences. All rights reserved. For permissions, contact TRB.

36 TRB 2015 Annual Meeting Workshop  
**Crude Oil by Rail: Logistics and Community Impacts**  
*Scott Babcock*

## **38 Energy Transportation Safety on the Rails: Historical Perspectives on Applied and Cooperative Research**

*Philip J. Daum*

Advances in hazardous materials transportation safety in the past four decades have yielded valuable data and methodologies for risk management decisions that continuously improve safety. The author takes a look at the historic contributions of key cooperative research projects to the safe transport of flammable liquids in unit trains.

## **ALSO IN THIS ISSUE:**

### **41 Research Pays Off Enhanced Tank Car Design Improves the Safety of Transporting Crude Oil and Alcohol by Rail**

*Christopher P. L. Barkan, Xiang Liu, and M. Rapik Saat*

### **44 Profiles**

Transportation economist and freight policy adviser Paul Bingham; and research center director and freight and intermodal consultant David B. Clarke

### **46 News Briefs**

46, Rest Stops for Safer Highways, by Sophia Bennett

47, Winter maintenance budgets; technologies to prevent drunk driving; big data and privacy

### **49 Calendar**

### **50 TRB Highlights**

50, Communicating Freight Needs Effectively: Annual Competition Identifies Best Practices, by Terri H. Parker

52, Cooperative Research Programs News

### **53 Bookshelf**

## **COMING NEXT ISSUE**

The next issue of *TR News* explores the interrelationships of public health and transportation, as metropolitan planning organizations are beginning to incorporate health-related issues into plans and programs, state departments of transportation are adopting health policies, and the research community is responding. Articles cover health impact assessments and analyses, incorporating health into transportation planning and decision making, modeling the risk of infectious disease spread through the

transportation system, transportation lessons learned from the Ebola epidemic, measuring the health impacts of walking and bicycling, innovative practices and research to assess active transportation and health, health-related findings from TRB-managed research projects—and more.

Bicycles are becoming a popular mode of transportation in cities, offering individual and community health benefits, but also raising issues of traffic planning and operations and safety. Above, bicyclists at the end of the day travel along a dedicated lane on Constitution Avenue, NW, in Washington, D.C.

PHOTO: ZACHARY ELGART

