Organizers

**CONFERENCE ORGANIZERS**

**John DeCicco**, Research Professor, University of Michigan Energy Institute

**Ryan Kellogg**, Professor, Harris School of Public Policy, University of Chicago, Research Associate, National Bureau for Economic Research

**Thomas Lyon**, Dow Chair of Sustainable Science, Technology and Commerce, Ross School of Business and School of Natural Resources and Environment, University of Michigan, Associate Director for Social Science and Policy, University of Michigan Energy Institute

**Susan Fancy**, Manager of Programs and Development, University of Michigan Energy Institute

**STEERING COMMITTEE**

**Alberto Ayala**, Deputy Executive Officer, California Air Resources Board

**William Chernicoff**, Manager, Energy and Environmental Research, Toyota

**David Greene**, Senior Fellow, University of Tennessee Baker Center for Public Policy

**Gloria Helfand**, Assessment and Standards Division, Office of Transportation and Air Quality, U.S. Environmental Protection Agency


**John Reese**, Downstream Policy and Advocacy Manager, Shell Oil Products U.S.

**John Viera**, Global Director of Sustainability, Ford Motor Company

**RAPPORTEUR**

**Joe Tate**, MBA/MS Candidate, 2017, Erb Institute for Global Sustainable Enterprise, University of Michigan
Thank You to Our Sponsors

California Environmental Protection Agency

Air Resources Board

GE

Delphi

Mobility Transformation Center
University of Michigan
About TE³

TE³ brings economic scholars together with government and industry practitioners to explore transportation and fuel research for energy and environmental policies that will foster progress toward long-term climate protection and business goals.

Conference Summary

University of Michigan Energy Institute Director Mark Barteau welcomed the audience to the third annual Transportation, Economics Energy, and the Environment (TE³) conference. In his opening remarks, Barteau encouraged attendees to think of ways to bring home to the public the magnitude of the greenhouse gas (GHG) emissions challenge and its consequences. He highlighted the event as an opportunity to collectively consider the prospects for technological progress and how economic, regulatory and other policy levers might be harnessed to reduce GHG emissions from transportation.

Over 120 people attended the conference, including participants from the automotive, energy and related industries, public agencies and nonprofit organizations as well as academia. The conference consisted of three sessions of original research presentations, each followed by a discussion. The day concluded with a policy panel and discussion.

To view all available conference videos, papers and presentations, see the 2016 TE³ Conference Archive.
Session #1:
Understanding the Demand for Vehicles and Fuel

TE3’s opening session was moderated by Ryan Kellogg of the Harris School for Public Policy at the University of Chicago. The session focused on vehicle fuel economy and gasoline demand.

For his paper “Step On It: High Frequency Evidence on the Demand for Gasoline,” Matthew Lewis of Clemson University secured credit card data on daily gasoline expenditures and prices from 243 U.S. metropolitan areas during February 2006 - December 2009. These data, much more granular than examined in prior studies, enable more accurate measurement of the relationship between gasoline demand and price. Understanding gasoline demand is critical for assessing the effects of price volatility and evaluating policies designed to address transportation energy use. Lewis and his coauthors estimate that demand is ten times more elastic than found in previous studies using more highly aggregated data. The implication: gasoline taxes may be more effective in curbing demand than conventional wisdom suggests.

Next, David Rapson of UC Davis presented his paper “The Household Vehicle Portfolio: Implications for Emissions Abatement Policies,” which explores the limitations of fuel economy standards. Specifically, Rapson and his coauthors look at the “portfolio effect,” in which households with multiple vehicles choose a new automobile based on the attributes of the automobiles they currently have. Using data from the California Department of Motor Vehicles, this research focuses on two-car households that are replacing one of their vehicles. The findings show an appetite for diversity (automobiles with different fuel economies) within two-car households in California. As a result, GHG emissions reduction from mandated increases in fuel efficiency may be partially offset by household shifts toward larger or more powerful vehicles.

Discussants Steven Puller of Texas A&M and Jim Kliesch of Honda provided reactions to the two studies, sparking a lively discussion about the findings and generating suggestions for additional research. For instance, is the portfolio effect primarily manifested in diversity of fuel economy, or are there other vehicle attributes for which households may prefer to diversify?
Session #2: Designing Policies for Reducing Vehicle GHG Emissions

The second session, moderated by John DeCicco of the University of Michigan Energy Institute, shed light on the various policy levers that can reduce GHG emissions from personal automobile transportation.

Ryan Kellogg's paper, “Gasoline Price Uncertainty and the Design of Fuel Economy Standards,” examined how regulatory policy should address energy price uncertainty. He reminded attendees that in October 2012, when the latest standards were set, the price of a gallon of gasoline was $3.45; it has fallen significantly since then. Kellogg used an optimizing cost/benefit model to evaluate the economic benefits of a fixed standard versus a flexible standard to raise the fuel efficiency of vehicles. His finding: flexible standards are generally more desirable, but if, for political reasons, standards must be fixed over periods of several years, then the analysis suggests they should err on the weak side. Otherwise, later increases in price could render stringent standards irrelevant. Kellogg concluded that gasoline price volatility undermines the economic efficiency of fixed fuel economy standards.

Soren Anderson, of Michigan State University and the National Bureau for Economic Research, presented his paper, “Overlapping Strategies for Reducing Carbon Emissions from Light Duty Vehicles,” which examined the effect of current emissions policies and evaluated various policy option portfolios. He emphasized that policy tools are available to reduce carbon emissions along multiple margins, including incentivizing driving less or buying smaller cars. Carbon taxes, fuel taxes, CAFE standards, and renewable fuel standards are among the key policies currently implemented. Anderson and his co-authors created a two-stage model to simulate the fuel demand and fuel economy choices that result from alternative policy mixes. The results show the optimal policy for this simulation would be the carbon tax, with a generic fuel tax performing almost as well as a carbon tax. Anderson’s work posits that current policy packages are focused too much on new technology when other, lower-cost policy opportunities can affect driving behavior in existing vehicles.

Discussants Ian Parry of the International Monetary Fund and Emily Wimberger of the California Air Resources Board offered their remarks from both U.S. and international perspectives. Both discussants described how their respective organizations were approaching the multifaceted nature of transportation’s energy challenges. The discussion also raised the need for practical analytic tools able to evaluate policies for automobiles and other forms of transportation.
Session #3: Issues in Compliance with Transportation Policy

The third session, moderated by Mark Barteau, explored regulatory compliance.

Zhenhong Lin of the Center for Transportation Analysis presented the paper, “Exploring Factors Affecting Compliance of CAFE and GHG Standards: A Consumer Choice Based Analysis,” which applied an economic model of consumer decision making in the light duty vehicle market. Individuals choose efficient vehicles, said Lin, because a tradeoff exists between efficiency and incremental costs, with gasoline prices and driving habits also important. Lin observed that the literature on consumer choice modeling has a wide range of behavioral estimates, which has led to reservations in using this as a framework in some policy circles. Findings from the authors’ model suggest that it will be possible for the auto industry to comply with the regulations between now and 2025 and that plug-in electric vehicle (PEV) technology and supporting tax credits would aid industry compliance.

Jeff Thurk of Notre Dame presented his paper, “Innovation, Emissions Policy, and Competitive Advantage in the Diffusion of European Diesel Automobiles,” examining the following question: can a non-tariff emissions policy be an effective tool to protect domestic industry? Looking at diesel adoption in Europe, Thurk and his co-authors argue that the European Union (EU) protected continental firms with vested capabilities in diesel engine technology through EU emissions standards, which are weaker on nitrogen oxide emissions than U.S. standards. Econometric analysis of the European car market showed that such a non-tariff policy can have the same influence as an explicit tariff on automobile imports. Thurk stressed that although their study shows the emissions standards had a trade protection effect, it does not establish that that was the EU’s intent.

Discussants Ryan Keefe of the US DOT Volpe Center and Ashley Langer of the University of Arizona explored several points regarding both publications. For both papers, the discussants highlighted the global fragmentation of policies across sovereign nations, and the challenges of coordinating these policies. Additionally, the discussants noted that both papers implicitly reinforce the point that policy and regulation cannot be made in a vacuum, and that many stakeholders need to be involved in the development of effective initiatives.
Panel: The Decade Beyond — Prospects for Transportation Sector GHG Mitigation Post-2025

The conference concluded with a policy discussion focusing on the potential suite of vehicle emissions reduction policies, technologies and initiatives that could be deployed after 2025 to meet progressively tighter climate protection targets. The panel was moderated by the University of Michigan’s Thomas Lyon and featured:

**Kevin Butt** — Chief Environmental Officer, Environmental/Safety Engineering, Toyota Motor Engineering & Manufacturing North America

**Ellen Hughes-Cromwick** — Chief Economist, U.S. Department of Commerce

**Therese Langer** — Transportation Program Director, American Council for an Energy-Efficient Economy

**Tamara Nameroff** — General Manager, Downstream Policy & Advocacy, Shell

**Lisa Snapp** — Director, Climate Analysis and Strategies Center, U.S. Environmental Protection Agency Transportation and Climate Division

To open the panel, Lyon presented a slide from a recent study on “Silver Bullet Scenarios” that explored the potential for a single technology solution (e.g. electrification, hydrogen, biofuel, or increased fuel economy) to achieve an 80% reduction in U.S. transportation sector GHG emissions by 2050. This emissions reduction goal is thought by scientists to be necessary to avoid dangerous increases in global temperature. The analysis concluded that no one solution can meet that goal, and highlighted the need for a combination of solutions.

First, the panel focused on government intervention in the marketplace — how much government intervention should be involved in new technologies, and picking winners and losers in the market. A common trend in the response was that partnerships between the public and private sector around the globe are necessary in order to achieve meaningful GHG reductions. An unavoidable reality is that the rise of approximately 50 countries with rapidly growing economies will present a clear demand for additional vehicles around the globe.

The panel discussion then began a detailed discussion of long-term policy frameworks that could incentivize the building of new infrastructure conducive to GHG reduction. Again, the panel agreed a commitment to public-private partnerships would be critical to building effective long-term programs. They added that industry needs certainty that it can safely invest in researching, developing, introducing and scaling up clean vehicle technologies and supporting infrastructure. Panelists noted that a broad array of complementary policies would need to be implemented to encourage such investment, and no one policy will be the solution.

The nascent introduction of autonomous vehicles and other new mobility technologies were discussed throughout the panel. All of the panelists agreed that shared mobility offers significant opportunity to assist in GHG reduction, with the caveat that since this is an emerging technology, it needs to be tailored properly to have the greatest GHG reduction impact.

To view all available conference videos, papers and presentations, see the 2016 TE³ Conference Archive.