

2015 in the rear view mirror, accelerating into 2016

The year 2015 was a tremendous one for the automotive industry and for those of us at CAR. While the industry was on a roll, CAR researchers were extremely busy with in-depth research and presentations on the critical issues facing the industry, including the industry's economic significance, new labor contracts, manufacturing capacity, fuel economy and related technologies, automotive communities, and a whole host of other topics upon which CAR conducts analysis. In addition, we passed a milestone with the CAR Management Briefing Seminars, recognizing the event for 50 years of thought leadership and engagement with key stakeholders. Check out our 2015 recap inside.

While in 2015 the industry enjoyed the strongest summer sales in a decade and its longest sustained period of growth, CAR's outlook for 2016 predicts the U.S. market may be nearing the end of its extended growth cycle. Our focus on key research trends for 2016 will include: 2025 and the impact of fuel economy and greenhouse gas regulations; the Mid-Term Review; automaker perspectives on technology pathways for powertrain and lightweighting; talent and workforce challenges; the impact of Mexico, with a U.S./Mexico competitive analysis; and the future of connected and automated vehicles as well as cyber-security. Read more inside and join us, as we look forward to an eventful new year.

The potential for connected and automated vehicle systems to deliver vital travel demand model data

CAR and Parsons Brinkerhoff recently published a report titled: *Use of Data from Connected and Automated Vehicles for Travel Demand Modeling*. This research was sponsored by a State Planning and Research Grant administered by the Michigan Department of Transportation (MDOT).

Travel demand modeling is a crucial component of transportation planning and system management. The strength of modern travel demand forecasting is the ability to ask critical "what if" questions about proposed plans and policies. Within the model, mathematical equations are used to repre-

sent each individual's decision-making process of: "why," "when," "where," and "how" to make a trip, as well as "what" route to follow to complete the trip. The model results for these individual choices are combined so that the aggregate impacts of roadway vehicle volumes and transit route ridership on the average travel times can be determined. This process for creating an accurate model of network traffic patterns can be difficult and time-consuming. To calibrate and validate travel demand models, extensive datasets are required, and these describe the travel characteristics of people in the modeling area,

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Activities and Topics in 2015

- Serving on the National Research Council Committee on Fuel Economy of Light Duty Vehicles
- Economic Briefings – Automotive Outlook
- Auto Jobs – Automotive Labor Outlook/Labor Market Industry Briefing
- Cyber Security – CAR Industry Briefing
- Coalition for Automotive Lightweighting of Materials
- Growth of Bio-Based Materials
- Advanced Powertrain Thought Leadership Roundtable
- Fuel Economy & GHG Emissions Regulations
- Chinese Direct Investment
- UAW and Detroit 3 Labor Contract Negotiations and Analysis
- Self-Driving Vehicles: Fleet Size & Prices
- Increasing Costs of Fuel Economy Gains to the U.S. Fleet
- Celebrated the 50th Anniversary of CAR MBS
- Announced Two New Board Members

Papers in 2015

- JAN** Contributions of the Automotive Industry to the Economies of All Fifty States and the United States
- JAN** Assessment of Tax Revenue Generated by the Automotive Sector for the Year 2013
- APR** Contribution of General Motors' Manufacturing Plants to the Economies of the 10 States & the U.S.
- APR** Management Procedures for Data Collected via ITS
- APR** Connected vs. Automated Vehicles as Generators of Useful Data
- APR** Crowd Sourcing Transportation Systems Data
- AUG** A Primer to Fuel Economy and Emissions Standards
- AUG** Crucial Greenhouse Gas and Corporate Average Fuel Economy (CAFE) Regulation Differences in the U.S.
- SEP** Contribution of New-Car Dealerships to the Economies of All 50 States and the United States
- OCT** Assessing the Cost & Benefit of Effective Lightweighting Technologies
- NOV** Meeting U.S. Passenger Vehicle Emissions Standards: Greenhouse Gas Credits Balance

Connected and Automated — Demand Model Data continued from page 1

including origins and destinations, trip duration and frequency, mode choice, and other parameters. These data are typically collected through household surveys conducted as part of model updates, as well as drawn from the American Community Survey (ACS) when model updates are close to the census years. Household travel surveys are costly and complex to obtain and often rely on a small sample of travelers in a region, making model calibration more challenging. Furthermore, because a household travel survey requires participants to log their activities after the fact, and the resulting data must be geocoded, such surveys have an inherent potential for errors during data coding. These transportation planning functions also are supplemented with data from Permanent Traffic Recorders (PTRs) and other traffic count sources that include information on vehicle classifications to gauge fleet composition in the network and different travel characteristics between fleets.

Connected and automated vehicle systems have the potential to deliver travel data vital to model calibration, in near real-time, for the entire equipped system, and without requiring any action from the traveler. However, should the related privacy concerns be overcome, the practicality of capturing, managing and processing the data required for travel demand modeling is still not

well understood. The CAR and PB research team interviewed stakeholders from MDOT and the Southeast Michigan Council of Governments (SEMCOG) to evaluate current modeling practices and data gaps and to investigate the potential use of this data source for both statewide and regional-level modeling. While certain privacy and data management issues need to be overcome, our research found that the data collected from CAVs holds great promise for supporting travel forecasting modeling and transportation system management and planning. CAV-based data have potential to fill data gaps, especially for commercial vehicle travel and long-distance trips, and improve models of route choice. The report recommends ongoing monitoring of the evolution and deployment of connected and automated vehicle technologies with an eye toward how they can provide data needed for travel demand modeling.

The complete report may be downloaded from the publication page of CAR's website, www.cargroup.org. For more information on the study, contact **Richard Wallace**, Director of CAR's Transportation Systems Analysis Group, at 734-929-0475 or rwallace@cargroup.org.

GHG Credits: Emissions Regulations, Compliance and Technology Costs

by Jay Baron, Ph.D.

Emissions regulations through 2025 will have a two-pronged impact on the vehicles driven in the U.S. Vehicles will be cleaner and drive farther on a gallon of gas, but they will also cost more. The emissions and fuel economy performance improvement are well known because they are set by regulators, but the cost impact is highly debated and varies greatly across auto manufacturers and even by model. Companies whose products emphasize light duty trucks and SUVs will likely be affected more than full product line companies. Some utility vehicle manufacturers may lag in fuel economy technology development and deployment because their customer base has traditionally focused on attributes other than emissions or fuel economy. These companies will incur greater costs and will be more significantly impacted by the regulations. CAR has analyzed the depletion rate of GHG credits as one indicator of the impact on the industry (see: “Meeting U.S. Passenger Vehicle Emissions Standards: Greenhouse Gas Credits Balance” – Dec. 2015). The analysis looks at emissions regulations and the use of credits as a metric of compliance.

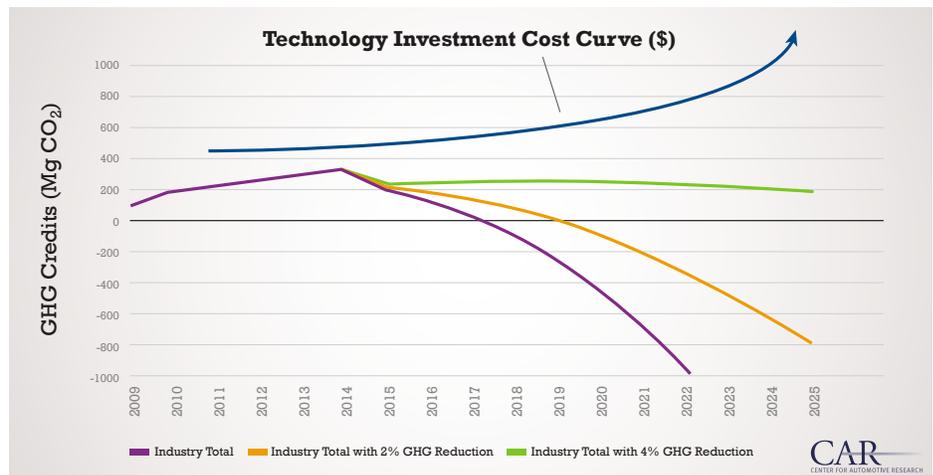
The balance of accumulated credits through 2013 by auto manufacturer is available from the U.S. EPA Manufacturer Performance Report. Credits have been accumulated from 2009 to 2013 by over-complying with tailpipe emissions, or from other means such as attaining air conditioning credits, off-cycle credits or flex-fuel credits. The credit market is liquid, allowing the buying and selling of credits between companies. The credit balance and potential depletion

rate of credits are designed to impact the deployment rate of technology, and will significantly affect auto manufacturers quite differently.

Between 2004 and 2013, the rate of emissions reduction by the industry has been about 2 percent per year. New regulations through 2025 will require more than doubling of this historical rate of progress to between 4 and 5 percent. Auto manufacturers will respond in two ways: 1) deplete their bank of credits earned or traded, and 2) deploy new technologies that continue to reduce emissions but at increasingly greater costs. In the early years of these regulations, manufacturers have taken advantage of the “low-hanging fruit” technologies with modest cost increases; much of this has already been deployed. In future years, more expensive technologies will be needed that demand an increase in research and development. Costs will also increase from an accelerated product development process at the same time automakers are faced with shorter lifecycles over which to amortize

these greater development costs. As technologies become available, they can no longer be shelved to deploy on future model changeovers and batched with other advancements. Companies cannot afford to delay deployment and deplete their credit bank because regulations increase in stringency every year. Of course accelerating technology deployment must be ensured against any compromises in quality or safety.

The chart below shows the industry’s GHG credit burn rate under three scenarios and the generic cost curve for technology deployment. There are three credit burn rate scenarios: 1) no technology deployment past 2014 (industry credit balance would fall to zero in 2018); 2) technology deployment based on historical (2 percent) rate of improvement (credit burn rate falls to zero in 2020); and 3) technology deployment rate based on meeting regulations (4 percent). Of course scenarios 1–3 each produce an increasingly steep cost curve for the industry.



People Driving CAR



Adela Spulber joined CAR in the summer of 2015 as a Transportation Systems Analyst within the Transportation Systems Analysis research group. In this role, she focuses on connected and automated vehicle research and also contributes to efforts in supply chain and logistics, economic development, and other topics. Since joining CAR, she

has conducted research on the effects of vehicle automation on driver skills, with a focus on the potential for automation to cause driver skills to degrade; analyzed survey data and also presented on the topic of cross-border trade.



Shashank Modi is a research engineer at CAR, where he works in the Manufacturing, Engineering, and Technology Group. He joined CAR in 2015 after completing a Master’s degree in Mechanical Engineering from The University of Cincinnati. Shashank’s research at CAR is focused towards development of fuel economy technology path-

ways for regulatory analysis. As part of his work, he conducts technology reviews for vehicle mass reduction and is currently working on the qualification of new materials.

David Andrea Joins CAR as Executive Vice President of Research



CAR is very pleased to announce Dave Andrea is joining CAR as Executive Vice President of Research. As a key member of the executive management team, Andrea will report to CEO Dr. Jay Baron. He will have overall responsibility for CAR's research agenda including

day-to-day management of CAR's multi-disciplinary research team. Andrea's commitment to the automotive industry, along with his strong forecasting and roots in research, will help to ensure CAR's continued growth. As a business analyst and economist with keen insights about manufacturer and supplier relations and the ongoing restructuring of the automotive industry, he will help to lead expansion of CAR's strategic research focus among automakers, suppliers, industry associations, policymakers and educational institutions.

Andrea was one of CAR's founders, and as CFO and director of forecasting was instrumental in its formation as an independent non-profit organization in 2003. He was also involved with CAR's predecessor organization, the Office for the Study of Automotive Transportation (OSAT) at the University of Michigan.

Most recently, Andrea was senior vice president and chief economist for the Original Equipment Suppliers Association (OESA) where he was responsible for directing industry benchmarking surveys, expanding OEM and media relations, and administrating several OESA councils. Prior automotive industry experience includes positions as director of forecasting at AutoPacific; automotive equity analyst at Roney & Company; and chief economist at CSM Worldwide. Andrea holds a Bachelor of Science degree in business economics from Miami University and an MBA from the University of Michigan. He also serves on the finance committees of SAE International and the SAE Detroit Section, is a member of the Detroit Economic Club, the National Association for Business Economics, Automotive Press Association and is the past president of the Detroit Association for Business Economics.

Upcoming Events

Michigan Connected and Automated Vehicle Working Group meeting

Wednesday, January 27, 2016

Detroit Regional Chamber

1 Woodward Avenue, 19th floor, Detroit, Michigan.

Information or RSVP via email [Josh Cregger](mailto:jcregger@cargroup.org) at

jcregger@cargroup.org

Industry Briefing: Pathways to Engage K-12 Students with the Automotive Industry

Thursday, February 25, 2016

Henry Ford College M-TEC

3601 Schaefer Rd, Dearborn, Michigan

Organizations such as First Robotics, and Ford's Next Generation Learning, work with educational institutions to develop students' science, technology, engineering, and math abilities. The goal is to engage with youth as early as possible to excite them about careers in educational areas where the United States is falling behind other countries. The next CAR Industry Briefing will highlight important lessons which can be learned from the interactions between these programs and their automotive industry counterparts with an emphasis on what's working and how it is working. Seating is limited – register now at www.cargroup.org.

Powertrain Thought Leadership Roundtable

Tuesday, March 1, 2016

Ann Arbor, Michigan

For information about CAR's working group, please contact

Brett Smith at 734-929-0491 or bsmith@cargroup.org

Spring Industry Briefing & Affiliate Dinner

Wednesday, May 4, 2016

Novi, Michigan

For information about the CAR Affiliates Program,

please contact **Brian Esterberg** 734.929.0466 or

besterberg@cargroup.org

CAR Management Briefing Seminars

August 1-4, 2016

Grand Traverse Resort, Traverse City, Michigan

Registration will open in March