

DRAFT v21 – 25 October 2016

***Life in the Fast Lane:
Evolving Paradigms for Mobility and
Transportation Systems of the Future***

***A Workshop to Determine Research & Development Needs
and Supporting Policies***

**Hosted by the U.S. Department of Energy
Washington, DC**

October 26–27, 2016

James V. Forrestal Building

**1000 Independence Avenue, SW
Washington DC, 20585**

Room 4A-104

Mobility and Transportation Systems of the Future

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To reach the Paris Agreement goal of limiting global warming to well below 2°C, significant emission reductions from the transportation sector—which accounts for about 28% of global energy consumption—are required. While yielding such reductions could be challenging, the convergence of a number of societal megatrends—together with improving vehicle and fuel technology and the pervasive expansion of information infrastructure—represents an opportunity to transform the transportation sector and reduce greenhouse gas (GHG) emissions.

Many technology advancements will contribute to this transformation, such as improved and higher efficiency automotive powertrains, sustainable and low-carbon alternative fuels, and lightweight materials. However, these advancements alone are unlikely to achieve the GHG reductions required by 2050.

Societal megatrends are important drivers of transport energy use and emissions. These trends include shifting societal preferences, geospatial changes in work activity, widespread adoption of smart devices and social media, and greater connectivity and convergence across sectors. Other drivers include rapid advancements in information technology and infrastructure and affordable low-carbon energy technologies. Collectively, these factors offer potential for a radical transformation to a future with a variety of new mobility systems.¹

It may be possible to harness these megatrends to deliver cost-effective and major reductions in GHG emissions. Some illustrative examples follow:

Shifts in societal preferences, such as increased car- and ride-sharing, can lead to higher rates of asset utilization, which may boost the adoption of fuel-saving technologies and compact, efficient vehicles as owners place greater focus on lowering operating costs. Car-sharing can also benefit the built infrastructure; the reduced need for parking lots could provide space for alternative modes and enable greater building density. Policies and shifts in cultural preferences and priorities are promoting more efficient transport modes.

These shifts also have potential downsides. Car- and ride-sharing services may be parasitic on public transport and may lead to more driving in aggregate, thereby increasing fuel use and congestion. These sharing services (as well as vehicle automation) may also make it more convenient to live further away from the city center—and thus promote further sprawl.

Information and communication technologies (ICT) integration uses electronic control modules and sensors that enable vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I)

¹ Source: U.S. Department of Energy workshop *Overview: Future of Mobility Workshop Series: Forward-Looking, Flexible Transportation Policy*, held July 12–13, 2016.

communications. These technologies enable adaptive vehicle control and improve driving performance to optimize energy efficiency. ICT can also guide electric vehicles (EVs) to charging stations and may provide a robust means to coordinate energy flows among energy storage devices, power electronics, and the power grid. ICT connecting equipment (e.g., sensors, global positioning devices, mobile phones) has the potential to improve system efficiency via monitoring real-time conditions to optimize route planning and freight logistics. A V2V network could dramatically reduce the severity and frequency of traffic jams.

There are, however, some potential risks to ICT. V2V and V2I systems must be secure to protect data and prevent system hacking. In addition, codes and standards are needed to ensure interoperability between devices and manufacturers and across national boundaries.

Electrification of road transportation is gaining momentum. In recent years, annual sales of a wide range of EVs have begun to grow dramatically. Electrification can bring about emissions reductions by displacing oil with renewable energy. Still, there are several unknowns regarding EVs, such as how quickly electrification can occur and how EVs will affect power grids.

Automated and autonomous road transport (e.g., Connected and Autonomous Vehicles [CAV]) have the potential to enable computer-optimized driving that could improve energy efficiency. Such networks might use V2V and V2I communications to improve the capacity of roadways and system efficiency. On an automated highway system, for example, the distance between vehicles can be safely shortened to decrease aerodynamic drag and reduce traffic congestion by increasing lane throughput. However, the convenience and reduced congestion created by vehicle autonomy might increase overall demand for travel.

Trends toward low-carbon mobility can also give rise to other local benefits, such as improved air quality, increased safety, and reduced transport-related noise. These benefits may translate into increased economic productivity and broader social benefits.

Such sweeping changes have implications for transport policy and national investments in associated research, development, and demonstration (RD&D). Developing a clearer understanding of these changes will help policymakers, businesses, and individuals make smarter long-term investments in programs, technologies, and infrastructure.

Meeting Scope

The IEA's Experts Group on R&D Priority Setting (EGRD) will hold a workshop 26–27 October 2016 in Washington, DC, hosted by the U.S. Department of Energy. It will focus on the evolving paradigms for future mobility and transportation systems. The workshop will gather input from a wide range of actors, sectors, and regions. Key speakers will be invited from leading agencies, research entities, and academia. The workshop's goal is to identify novel approaches and RD&D needs, gaps, and opportunities that could accelerate innovation and facilitate market uptake and transformation. Participants will also discuss potential barriers and strategies to address them.

A public report will summarize the results and identify the key challenges, highlight promising technologies, sample activities underway in various countries and sectors, identify RD&D

priorities and gaps in current programs, provide a sampling of best practices, and recommend innovation areas that require policy attention.

Questions

Questions to be addressed by the participating technology experts include the following:

On technology:

- *What key trends in the transportation sector are driving technology breakthroughs?*
- *What technologies must be further developed to address freight movement and aviation?*
- *What are the potential impacts of electrification of transportation for passenger vehicles and, potentially, the road freight and the maritime sector?*
- *How can ICT in vehicle technology help enable efficiency improvements?*

On modal shift:

- *What positive lessons can we take from developments such as Uber and increased ICT technology, and what risks do we see?*
- *How will new ride-sharing business models or the adoption of CAVs affect the overall size and utilization rate of the car fleet, and what will be impacts on the supply chain?*
- *What transportation network issues do urban planners and policy makers need to address to ensure competitiveness of low-carbon technologies and practices?*
- *Which policies or frameworks have proven to be effective in reducing transport demand?*
- *Are there country- or region-specific advantages to adopting particular transport systems or technologies?*

On modelling/planning:

- *What are key challenges to decarbonizing the transport sector to well below the 2DS?*
- *What can be learned from behavior programs aimed at mobility?*
- *What is the role of congestion charging, ultra-low emission zones, and other fiscal and regulatory travel demand management policies in planning and modelling?*
- *How can shared mobility contribute to significant GHG reductions?*

On policy measures:

- *Which potential future transport paradigm has the greatest potential and the least number of barriers to implementation (e.g., financial, policy, or RD&D)?*
- *What actions are needed to achieve further efficiency gains? Who is primarily responsible (e.g., manufacturers, entrepreneurs, or policy makers)?*
- *Which financing mechanisms have proven to be successful for new transport programs?*

Target Audience

In addition to EGRD national experts, we are seeking input from RD&D decision-makers, strategic planners, and program managers from industry, academia, think tanks, national laboratories, and government. Participation is by invitation only.

DAY 1 – Wednesday, 26 October 2016

Session 1: Introduction

The Session provides background and context for the workshop. It reminds participants of the purpose, interactive nature of presentations, dialogue and social interactions, and the expected outcomes, and post-meeting activities and communications.

- *Background and Previous Work of the EGRD*
- *Rationale of the Workshop*
- *Expected Outcomes of the Workshop*
- *Evolving Trends in the Transportation Sector, with Input from IEA*
- *Current R&D Activities in Intelligent Transportation Systems*

Introduction			
Chair: Bob Marlay			
08:30	Registration (Allow 30 minutes to allow time for DOE Security)		
9:00	Welcome		Paula Gant, Principal Deputy Assistant Secretary for International Affairs, DOE
9:10	Introduction		Rob Kool, Chair EGRD, Bob Marlay, Vice Chair EGRD, U.S. DOE
9:25	1	Key note	Reuben Sarkar, Deputy Ass't Secretary for Transportation, DOE
10:00	2	Technology and Policy Pathways to Achieve the Two-Degree Scenario (Energy Technology Perspectives 2016)	Jacob Teter, IEA
10:35	3	The Future of Transportation: the Defining Challenges for the 21 st century	Chris Gerdes, Chief Innovation Officer, U.S. Department of Transportation
11:10	Coffee break		

Session 2: Transportation & Mobility Emerging Trends and Promising Technologies

This session notes emerging trends, shifting mobility paradigms, and new technologies that can transform the future of transportation demand and services, and significantly reduce GHG emissions of future transportation systems in different regions/countries, and worldwide.

- *What are the key trends in the transportation sector driving breakthroughs in technology?*
- *What are the technologies shaping these changes and giving rise to a new vision of the future?*
- *What are the potential energy impacts of connected and automated vehicles, ride-sharing, and other smart mobility concepts?*
- *What are the most important modelling/planning topics to decarbonize the transport sector to well below the 2DS?*
- *What possible scenarios could tip the balance in favor of one technology?*

Transportation and Mobility Technologies of the Future			
Chair: Rob Kool			
11:30	4	Freight Mobility and Supertruck	Roland Gravel, Vehicle Technology Office, DOE
12:05	5	Market uptake of battery and hybrid electric vehicles. Targets, incentives and research needs as experienced in Norway	Lasse Fridstrøm, Institute of Transport Economics, Norway
12:40	6	National Innovation Programme on Hydrogen and Fuel Cells in Germany	Johannes Tambornino, Projektträger Jülich
13:15	Lunch		
14:00	7	The EU's Experience in Transportation Innovation	Estathios Peteves, European Commission
14:35	Discussion		
15:10	Coffee Break		

Session 3: Technology R&D: Barriers and Solutions

This session discusses factors inhibiting new technology and significant changes in mobility, and possible solutions for overcoming the barriers.

- *Examining potential future transport paradigms, what key barriers are the greatest inhibitors to widespread implementation (e.g. financial, policy, RD&D, or other)?*
- *What are the consumer adoption challenges to deployment of new mobility systems?*

- *What are the new pathways to reaching consumers and what are the impacts on the traditional sales model (i.e. big data, social media, sharing economy, etc.)?*
- *What actions are needed to achieve further efficiency gains and who is primarily responsible (e.g. manufacturers and policy makers)?*

Technology R&D: Barriers and Solutions			
<i>Chair: Birte Holst Jørgensen</i>			
15:40	8	Current Market Trends in Transportation and R&D opportunities for ITSs	Alex Schroeder, National Renewable Energy Lab, DOE
16:15	9	Transforming Transportation Technologies: The Toyota Experience.	William Chernicoff, Toyota of North America
16:50	10	Technology R&D Challenges in Enabling Autonomous and Connected Vehicles	Cem Saraydar, General Motors
17:25	11	Testing and deploying new solutions through collaboration	Juho Kostianen, VTT Technical Research Centre of Finland
18:00	Discussion		
18:30	Close Day 1		
19:15	No-Host Voluntary Dinner Farmers Fishers Bakers 3000 K St NW Washington, DC 20001 Phone: 202.298.8783		

DAY 2 - Thursday, 27 October 2016

Session 4: Policy and Markets Supporting Future Transportation Technologies

This session focusing on necessary policies and markets to support future transportation systems.

- *What are the best policy levers – price-based, regulatory, and RD&D – to realize new technologies and mobility systems and drive deep de-carbonization? (e.g. new regulatory framework to measure fuel economy)*
- *What transportation network issues must urban planners and policy makers address to facilitate developing and implementing low-carbon technologies and practices?*
- *Which policies or frameworks have proven most effective in reducing transport demand?*
- *Is the concept “Mobility as a Service (MaaS)” a possible game changer?*

Policy and Markets Supporting Future Transportation Technologies			
<i>Chair: Herbert Greisberger</i>			
09:00	12	Business models for ultra-low emissions vehicles' and sustainable business models	Gavin Harper, Midlands Univ., U.K.
09:35	13	Measuring Influences on Automated Vehicle Market Development: Consumer Acceptance and Adoption	Johanna Zmud, Director, Texas A&M Transportation Institute
10:10	Coffee break		
10:40	14	Drivers for a Sustainable Future Transportation System: Policy, Market and Technology Insights	Levi Tilleman-Dick, Fellow, New America/Managing Director, Valence Strategic LLC
11:15	15	Future Scenarios and Technology for Urban Transport/ Role of Traffic modeling in future transportation systems	Prof. Otto Anker Nielsen, Technical University of Denmark
11:50	Lunch		
13:20	16	Pioneering E-mobility through Knowledge Exchange and Innovative Networks	Peter van Deventer, Coast to Coast, Netherlands
13:55	Discussion		
14:25	Coffee Break		

Session 5: Synthesis and takeaways

Synthesis and takeaways	
<i>Chair: Robert Marlay</i>	
14:55	Discussion, recommendations
16:00	Workshop conclusions
16:30	Close Day 2