2020 All Tech Team Breakout Session Summaries

21st Century Truck Partnership Collaboration

This session offers U.S. DRIVE tech team members the opportunity to discuss light-duty automotive vs. medium- and heavy-duty commercial vehicle applications and opportunities/potential for technology and R&D leveraging. The conversation is meant to build on the various bilateral cross-Partnership (U.S. DRIVE-21CTP) tech team dialogues already underway (after initial roll-out in July/August) and feedback from U.S. DRIVE senior leadership and will serve as a forum for broader discussion about the pathway from initial thinking to longer-term collaboration across tech teams and across Partnerships (including engagement with representatives from 21CTP tech teams). Ideally, participants in this session will polish and confirm initial plans set at the tech team level, identify and address any gaps identified by U.S. DRIVE leadership and/or during this session, and achieve general consensus about the substance and logistics of complementary mobility system technology R&D programs and cross-Partnership collaboration.

Circular Economy and Sustainable Materials/Manufacturing

In a traditional linear economy, products are made, used for a given time, and then disposed of when they meet the end of their useful life. Alternatively, a circular economy aims to keep resources in use for as long as possible, extract the maximum value from them during this lifespan, and then recover the products and materials at the end of each service life for regeneration or repurposing. As well as creating new opportunities for growth, a more circular economy reduces waste, drives greater productivity and efficiency, addresses resource scarcity, and reduces the environmental impacts of economic consumption.

The transportation sector can contribute to a circular economy through the remanufacturing of vehicle components at the end of their life to reduce waste, by optimizing vehicle hardware for recyclability, or by addressing the circularity of fuel through the use of waste feedstocks which lowers the overall lifecycle GHG emissions. This breakout session aims to further discuss this concept with U.S. DRIVE tech teams to understand how such circular economy concepts are viewed by individual teams, where potential synergies exist across the Partnership, and how OEMs incorporate circular design principles in their design process.

Energy Efficient Advanced Compute Working Group

While advances in vehicle computing systems have been key to improving efficiency and lowering emissions for decades, these systems are increasingly subject to their own energy consumption challenges. This can be seen in the steady growth of computational power needed for convenience, comfort, connectivity, and most of all, autonomy-related systems. These energy needs are forecasted to grow exponentially for all future vehicles, regardless of automation level, driving carbon footprint growth whether work is performed on- or off-board. Although relevant to all types of vehicles, nowhere is this increasing energy demand more noticeable than the EV space, where computing power requires a direct trade-off with vehicle range. In August 2020, USCAR approved the creation of the EEAC Working Group to study this space, and early findings suggest that there may be advantages to growing the study further into a U.S. DRIVE Tech Team.

This breakout session will introduce, and seek feedback on, a wide range of early EEAC considerations:

- Mapping computational power draw to vehicle- and grid-level consumption needs, establishing new performance metrics and thresholds
- Identification of key technical gaps unique to vehicle computing design and efficiency
- Assessing emerging HPC hardware and algorithms, and their applicability within the safety requirements of vehicle compute architectures
- Balancing on- & off-board computing tasks by accounting for data volume vs processing needs, grid demand planning, and vehicle efficiency
- Leveraging grid modernization (e.g. data management, protocols, distributed energy resources) to improve vehicle computing ecosystem efficiency
- Evaluation of how to best interface the team with the semiconductor industry

HPC and DOE Computing Initiative(s)

The Department of Energy's National Labs are home to some of the world's most advanced supercomputing capabilities, consistently holding several positions in the list of the top ten fastest supercomputers in the world. With exascale computing scheduled to come online at Argonne National Lab ("Aurora") and Oak Ridge National Lab ("Frontier") in the next year, the U.S. will maintain its leadership in high performance computing (HPC). These computing resources are being used to solve problems on a "very small scale" (e.g., research on subatomic particles), a "very large scale" (e.g., answering questions about the origins of the universe), and everything in between. By combining subject matter expertise in powertrains, vehicles, and transportation with HPC expertise within DOE's national labs, an opportunity exists to tackle some previously computationally intractable research questions.

This breakout session will include presentations from several national lab computing experts describing their HPC capabilities and providing examples of current vehicle- and transportation-related research that their teams are conducting. The session will then transition to a discussion of research needs and questions suitable to be addressed through HPC and relevant to US DRIVE Tech Teams.

Planning, Design, and Control of High-Power Charging Facilities to Enable Grid Integration

Electric Vehicle (EV) technologies are rapidly advancing, especially in the area of charging. Light duty EVs will soon be capable of charging using extreme Fast Charging (xFC) at rates up to 400kW and medium- and heavy-duty EVs will be capable of charging using charging systems at rates exceeding 1 MW. While Smart Charge Management systems are rapidly evolving to manage the charging of AC Level 2 EV charging, primarily residential and workplace charging, these systems will not be sufficient to manage charging at xFC and 1+ MW levels. The integration of charging facilities with these xFC and 1+ MW chargers will require new design and control approaches. New facility designs are likely to include Distributed Energy Resources (DER), such as photovoltaics (PV) and stationary storage, and could incorporate architectures such as DC-as-a-Service. In order to properly design and integrate these various technologies, it is also imperative that the demand for these charging facilities be understood. This will require modeling and forecasting that accurately predicts EV adoption, use, and travel patterns across the vehicle classes that comprise the transportation sector.

This session will explore the research and development needs to facilitate the design, deployment, and operation of charging facilities with multiple high-power chargers. Additionally, the prediction and informational needs to ensure that these facilities can be properly size, sited, and integrated with the grid will be discussed. Activities of the Grid Integration Tech Team, Energy Storage Tech Team, and Integrated Systems Analysis Tech Team will be covered to identify opportunities for Tech Team collaboration, as well as opportunities for collaborative efforts with 21st Century Truck Partnership Tech Teams.

Target-setting

In support of its vision and mission, U.S. DRIVE has identified Partnership goals and research targets for its portfolio of advanced vehicle technologies. Goals are qualitative, reflect the Partnership's overall mission to accelerate the development of pre-competitive technologies, and guide the development of quantitative research targets. Research targets, which focus on advanced technologies for vehicle systems and components, are based on the technical achievements needed to enable commercialization, subsequent market introduction, and long-term market penetration of advanced automotive technologies. Partnership research targets represent the most significant technical metric(s) for each goal and serve as the focal point for multiple cascading and other additional Technical Team research targets. These targets, as well as related details and other technical requirements and parameters, are identified in publicly-available U.S. DRIVE technology roadmaps. The Partnership uses analytical tools to examine the links between various metrics and research targets in a vehicle-level context and to understand the relationship among targets across the technology portfolio. The session will provide an overview of the U.S. DRIVE target setting process, help answer questions on specific inputs needed from the various Tech Teams, and gather feedback on the process from partnership members.