Appendix C

Innovation Topics

AMR BAA 693JJ325BAA0001

The Accelerating Market Readiness (AMR) program shall be administered with sufficient flexibility to enable awards to support key U.S. DOT and FHWA strategic goals. Additionally, this solicitation is intended to address specific technology and knowledge gaps that will help reduce transportation related fatalities and serious injuries; accelerate project delivery, reduce project life cycle costs and optimize the operation and performance of existing transportation facilities.

In support of the program scope and desired outcomes described above, the following topics are intended to guide potential offerors, and are based on authorizing legislation, the strategic needs of the U.S. DOT and FHWA, and, where appropriate, stakeholder input.

TOPIC 1 - SAFETY

Safety has consistently been the top U.S. DOT strategic and organizational goal, and FHWA has long worked to reduce the number of fatalities and serious injuries on U.S. roadways by developing, evaluating, and employing lifesaving countermeasures; advancing data-driven decisions; and promoting an integrated, multidisciplinary (engineering, education, enforcement, and emergency medical services) approach to safety. FHWA is seeking AMR proposals for innovative technologies to save lives and reduce serious injuries in the following areas:

- How can safety data analysis be used in ways to guide transportation agencies' informed decision making, and work towards a future where transportation related serious injuries and fatalities are eliminated?
- How can the disproportionate transportation safety risks on State and locally owned roads in rural communities be mitigated?
- How should the infrastructure be changed to facilitate faster deployment of automated vehicles?

TOPIC 2 - SHORTENING PROJECT DELIVERY

By making efficient and effective infrastructure decisions, using innovative forms of financing, and encouraging partnerships between public and private sectors, U.S. DOT can maximize the returns to the Nation's economy and people. FHWA is seeking AMR proposals for innovative technologies to be used at any stage during the project development and delivery cycle to address the following:

- How can project development and delivery processes be improved or streamlined to provide timely benefits to users while safeguarding our communities and maintaining a healthy environment?
- How can Federal investments be better targeted toward transportation projects that address high priority infrastructure needs?
- How can State and local resources and private sector engagement be better leveraged?

TOPIC 3: INFRASTRUCTURE PERFORMANCE

Targeted transportation investments are needed to preserve mobility and accessibility of the traveling public and freight movements. FHWA is seeking AMR proposals for innovative technologies to address the following:

- How can our transportation system's operations and performance be improved through the entire life cycle of the infrastructure facilities?
- How can the use of innovative maintenance and preservation strategies help restore the transportation infrastructure and assets to a state of good repair?
- How can the infrastructure be planned, constructed and maintained using best operational and risk management practices?

TOPIC 4: CLIMATE AND SUSTAINABILITY

Transportation is the largest contributor to climate change and must play a central role in the solution. Extreme events (for example landslides, forest fires and hurricanes) and climate change threaten the considerable federal investment in transportation infrastructure. FHWA continues to work with States and metropolitan areas to increase the health and longevity of the Nation's Highways. FHWA is seeking AMR proposals for innovative technologies to address the following:

- How can our transportation system's operations and performance be improved through the entire life cycle of the infrastructure facilities in the face of future weather extremes? What can be done to ensure disrupted/damaged infrastructure is restored and adapted to future conditions quickly and economically.
- What are some innovative maintenance and preservation strategies that can help keep transportation infrastructure in a state of good repair even as the potential for impactful weather events increases?
- How can the infrastructure be planned, constructed and maintained over its full life cycle (or service life) to minimize transportation-related greenhouse gas emissions and costs to users and owners resulting from future extreme events and gradual change?
- How can we design and build climate resilient infrastructure that serves everyone today and in the decades to come?

TOPIC 5: EQUITY

The American transportation system has historically been an institution that has created obstacles to achievement of connectivity and mobility for BIPOC populations and people of lower socioeconomic status. It is the purpose of a transportation system to act as the connective tissue of our society and ensure access and spatial autonomy for all its users, not simply those in the dominant society. The US DOT 2023 Equity Action plan can be accessed at https://www.transportation.gov/priorities/equity/2023-equity-action-plan. FHWA is seeking AMR proposals for innovative technologies to address the following:

- How can our transportation system expand the meaning of access to include populations historically ignored and neglected?

- How can our transportation system integrate community engagement into decision making to ensure a more inclusive and equitable infrastructure system?
- How can the transportation system begin to produce economic vitality to underserved communities that have been isolated from opportunities for wealth through obstacles in infrastructure?

TOPIC 6: DIGITAL TWINS AND ADVANCED SIMULATIONS TECHNIQUES

Digital twins are an emerging technology that is transforming the planning, design and maintenance of transportation systems. A digital twin is a set of virtual information constructs that mimics the structure, context, and behavior of a natural, engineered, or social system (or system-of-systems), is dynamically updated with data from its physical twin, has a predictive capability, and informs decisions that realize value. The bidirectional interaction between the virtual and the physical is central to the digital twin. The transportation system digital twins could range in size from a metropolitan area and larger, down to individual vehicles. They could be any combination of modes. These representations are used to imitate real-life conditions in a digital form, where alternative scenarios can be tested to estimate problems, benefits and interactions before costly projects are built.

In addition, Artificial Intelligence(AI)/ machine learning (ML) is advancing simulation techniques for modeling transportation infrastructure. By leveraging AI capabilities, we can dramatically accelerate the planning, design, and construction of transportation projects. AI has already demonstrated progress on tasks like large-scale data collection, data fusion, and data generation. AI is already in use in limited geographies and contexts to help identify, aggregate, anonymize, and map fine-grained data about our transportation system. For more information on AI topics, please refer to "An AI Aspiration for Transportation."

FHWA is seeking AMR proposals for innovative technologies to address the following:

- How can our transportation system's operations and performance be improved through utilizing the digital twins at various scales and utilizing AI/ML capabilities.
- How can the transportation infrastructure be planned, designed, constructed, and maintained by utilizing advanced simulation techniques using AI/ML to understand the interaction between built systems and natural systems.
- How can we predict the future conditions/behaviors of transportation systems/assets by combining Digital Twins and AI/ML techniques.

ADDITIONAL/FUTURE TOPIC AREAS

FHWA continues to investigate other specific areas for potential breakthrough opportunities. FHWA welcomes questions or thoughts about opportunities and other areas of focus that could lead to transformational changes in transportation program and project delivery. Through future modification to this BAA, FHWA may change or modify the topic areas listed above or add topic areas to best address the strategic objectives of the U.S. DOT and the FHWA.

For additional information on the U.S. DOT Strategic Plan FY 2022-2026 please visit: https://www.transportation.gov/mission/us-dot-strategic-plan-fy-2022-2026. For additional information on the FHWA Strategic Plan FY 2022-2026 please visit: https://highways.dot.gov/about/fhwa-strategic-plan