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TRANSPORTATION RESEARCH BOARD

June 5, 2017

Vincent Valdes
Associate Administrator for Research,
Demonstration, and Innovation
Federal Transit Administration
U.S. Department of Transportation
1200 New Jersey Avenue, SE
Washington, DC 20590

Dear Mr. Valdes,

The Transportation Research Board's (TRB's) Transit Research Analysis Committee (TRAC) met on April 6–7, 2017, to learn more about planning under way by the Office of Research, Demonstration, and Innovation (abbreviated as TRI) to measure and assess the impact of its research investments. This letter summarizes what the committee learned and offers advice on how TRI can strengthen the goals of its programs with regard to clarity and the capacity to evaluate effectiveness. I thank you and Deputy Associate Administrator Jamie Pfister for introducing the topic and Mary Leary, Faith Hall, Michael Baltes, and Gwo-Wei Torng for providing informative briefings. Thanks also go to Matthew Welbes, Federal Transit Administration (FTA) Executive Director, for discussing the role of research and demonstration in furthering the mission and goals of the national transit program. The meeting agenda and a list of participants are attached.

As you know, TRAC consists of 12 members appointed by the National Academies for their wide-ranging expertise in public transportation (see attachment for membership). The interdisciplinary committee—drawn from industry, academia, and the private and public sectors—is charged with recommending actions that FTA can take to ensure that its research program is relevant, timely, and effective in meeting the diverse and changing needs of the public transportation community. TRAC's standing charge is contained in Box 1.

As required by the 2015 Fixing America's Surface Transportation (FAST) Act, TRI is developing a strategic plan to guide its investments in innovation during the FAST Act's authorization period. The plan will lay out the rationale for the agency's investments, define the priorities that will guide the investments, and establish metrics for assessing each program's progress and impact. TRI's basis for defining these priorities was the subject of TRAC's November 2016 letter report. Having defined these priorities, TRI is mapping its programs to each priority and developing metrics for identifying and explaining the connection between the goals of each program and the strategic goals of FTA, the U.S. Department of Transportation (USDOT), and public transportation law. As we understand it, the development of these program goals is the first step in the articulation of a more detailed set of metrics for monitoring and measuring the accomplishments of the program. You explained to the committee that your primary interest at this stage is in obtaining input from TRAC on whether the goals proposed for TRI's individual research programs are consistent with research being conducted; aligned with broader agency, departmental, and statutory goals; and capable of being assessed for impact.

The committee's feedback on these matters, including advice, is provided after a summary of what the committee learned about FTA's research priorities and how TRI's programs align with them and with broader strategic goals.

Box 1: TRAC Statement of Task

TRAC, an interdisciplinary committee of experts from industry, academia, and the private and public sectors, will examine and recommend actions FTA can take to ensure that its research and innovation program is relevant, timely, and effective in meeting the diverse and changing needs of the public transportation community. To do so, TRAC will review the program's

- Latest Section 5312 Research Report that highlights program activities and accomplishments;
- Strategic planning process, including approaches for setting research priorities and identifying research needs and opportunities;
- Procedures for obtaining and evaluating stakeholder input; and
- Means for evaluating research results, furthering their use, and understanding their value to the transit industry and broader public.

TRAC will identify candidate areas of emphasis for FTA-sponsored research that are consistent with the stated goals of the U.S. Department of Transportation and with the Fixing America's Surface Transportation (FAST) Act's emphasis on improving mobility and infrastructure durability, reducing congestion, promoting safety, and preserving the transportation system and environment.

Drawing on its interdisciplinary knowledge and experience, TRAC will assist FTA in identifying and examining emerging trends affecting the public transportation sector as well as transferable practices from outside the sector that can benefit public transportation. TRAC will make recommendations to FTA on research and innovation program strategies intended to strengthen the public transportation industry's adaptation to new circumstances and adoption of new practices.

TRAC will issue its findings and recommendations in biannual consensus letter reports but with the option, per request of FTA and subject to funding availability, to issue a longer consensus report that addresses elements of the task statement in more depth and over a longer time horizon.

MAPPING OF RESEARCH PROGRAMS TO PRIORITIES AND STRATEGIC GOALS

Through a process described in the November 2016 letter report, TRI has identified four research priorities: mobility, safety, asset management, and asset innovation.¹ Each of these priorities has been mapped to one or more high-level goals of USDOT, FTA, and public transportation law as follows.

Mobility: Intended to align with the statutory goal of improving the mobility of people and goods and the USDOT and FTA strategic goals of furthering economic competitiveness and quality of life in communities.

Safety: Intended to align with the statutory, USDOT, and FTA goals of promoting transportation safety.

Asset Management: Intended to align with the statutory goals of improving infrastructure durability and preserving the existing transportation system; USDOT strategic goals of improving mobility and infrastructure, promoting safety, and preserving the environment; and FTA strategic goals of increasing economic competitiveness and assuring a state of good repair.

¹TRI had earlier combined asset management and asset innovation, but it is our understanding that they are now distinct priorities.

Asset Innovation: Intended to align with the statutory goals of preserving the environment and reducing congestion, USDOT goals of improving infrastructure and preserving the environment, and FTA strategic goals of environmental sustainability and economic competitiveness.

TRI has mapped its nine research programs to each of the four research priorities as follows:

Mobility

- Transit Automation Research
- Mobility on Demand
- Accessible Transportation Technology Research Initiatives

Safety

- Safety-Associated Infrastructure
- Safety Standards Development Program

Asset Management

- Asset Management Program
- Bus Testing

Asset Innovation

- Low- and No-Emission Component Assessment Program (LoNo-CAP)
- Advanced Propulsion Research and Development

DEVELOPMENT OF PROGRAM GOALS AMENABLE TO IMPACT MEASUREMENT

Having aligned its research programs with research priorities and strategic goals in this manner, TRI has proceeded to the next step of proposing specific goals for each of the nine research programs. As presented to the committee, the proposed goals are as follows:

Mobility	Proposed Program Goal(s)
Transit Automation Research	Establish and execute an FTA research program to expedite deployment of transit automation for various areas of transit operations.
Mobility on Demand	Enable enhanced effective traveler-centric transportation options that are easy to use, equitable, and accessible. Help the transit industry take advantage of new technologies/business models.
Accessible Transportation Technology Research Initiatives	Increase accessibility for people with different functional abilities (people with disabilities) to transportation through technological advances and new operation practices.
Safety	Proposed Program Goal(s)
Safety-Associated Infrastructure	Advance the development of materials, technologies, construction techniques, and facility and vehicle design to reduce the number of safety incidents to mitigate severity of injuries and fatalities. Improve the safety culture within transit agencies, as well [as] support stakeholder coordination and outreach.
Safety Standards Development Program	Develop public transportation standards to improve the provision of public transportation service.

Asset Management	Proposed Program Goal
Asset Management Program	Bring public transportation infrastructure/assets up to a minimum state of good repair.
Bus Testing	Ensure that transit buses are able to withstand the rigors of daily revenue public transportation service.
Asset Innovation	Proposed Program Goal
LoNo-CAP	Increase the deployment of low- or no-emission components tested as part of LoNo-CAP.
Advanced Propulsion Research and Deployment	Increase U.S. manufacturing and economic competitiveness in the development and production of next-generation transportation vehicles.

It is TRAC’s understanding that TRI’s intention was to develop program goals that are not only aligned with strategic goals but also articulated with sufficient clarity to enable the development of downstream metrics for monitoring and assessing the accomplishments of the research. In briefings to explain the Mobility on Demand and the Advanced Propulsion Research and Deployment programs, TRI provided the following two examples of such metrics.

Mobility on Demand Program Performance Metrics

This program provides 11 grants totaling approximately \$8 million for transit agencies to explore and develop innovative approaches for integrating shared mobility services, including smart phone apps, bikesharing and carsharing, and demand-responsive bus and van services, with public transportation. The lessons learned from these projects are expected to aid other transit agencies interested in integrating shared mobility services with their other service offerings. TRI is therefore considering the following metrics as indicators of whether the program is having an impact:

- 50 percent of all transit agencies expand their geographic and/or temporal (i.e., time-of-day) coverage through partnerships with shared mobility providers between 2016 and 2021.
- 25 percent of all public transit agencies expand their portfolio of service modes between 2016 and 2021.

Advanced Propulsion Research Program Performance Metrics

A stated goal of this program is to increase U.S. manufacturing and economic competitiveness in the development and production of next-generation transportation vehicles. The program compares buses incorporating new technologies, including hydrogen fuel cells and battery electric buses, to those with traditional combustion-engine technologies in real-world deployment situations. Accordingly, TRI is considering the following metrics as indicators of whether the research has had an impact:

- Total bus procurements represented by zero-emission vehicles increase 1 percent annually from 2017 to 2030.
- Positive change in the number of U.S. workers who design and build advanced-propulsion transit vehicles (what constitutes a positive change of sufficient impact was not specified).

OBSERVATIONS AND ADVICE

In your letter and in comments to the committee during the meeting, you asked TRAC for feedback on whether TRI’s goals for its nine research programs are appropriate and articulated in a manner allowing the impacts to be measured and assessed. Before this detailed feedback is offered, some general issues are mentioned. First, the presentation of proposed goals caused confusion, largely because of the many, and sometimes inconsistent, references to “program goals,” “program performance goals,” and “program performance indicators.” Adding to the confusion were inconsistent references to research “projects” and

“programs.” A clear explanation of the nomenclature and discipline in its consistent use will facilitate communication in a strategic plan.

Communications can also be improved by streamlining. The strategic plan is intended to appeal to a diverse audience, including Congress, the White House Office of Management and Budget, USDOT and FTA leadership, industry, and the public. Perhaps this is why the charts listing the goals of the nine research programs contain repeated references to statutory goals, USDOT strategic goals, and FTA strategic research goals, which can be confusing and distracting. As these planning documents are developed, consideration should be given to presenting the high-level goals once at the beginning of the document and then referencing them as necessary.

The results of the two cases in which TRI went beyond the development of program goals and offered ideas on specific, quantitative metrics for impact assessment illustrate the challenge in doing so. Numerical goals that are unrealistically aggressive may set a program up for failure, whereas values that are demonstrably low can suggest a lack of confidence in the program. TRI will need a defensible methodology for choosing a mix of performance indicators and their specific threshold values. For example, while the committee recognizes the potential for the pace of change in technology and business models to accelerate, the goal that 50 percent of all transit agencies expand their geographic and/or temporal coverage through partnerships with shared mobility providers by 2021 appears to be highly aggressive; however, if this ambitious threshold is not achieved, the Mobility on Demand program might be viewed as a failure even if it is making significant progress toward its goals.

The following comments on the goals of each of the nine TRI research programs are offered in the spirit of prompting the development of clearer goals that are articulated in a way that will facilitate impact measurement and assessment. In some cases, this may mean that goals have been added to a program. In other cases, the goal or goals may need to be reoriented or described in more detail. Also, while the desire for succinctness in the goals is understandable, greater detail may be necessary for clarity and completeness.

Priority: Mobility

Program	Transit Automation Research
Proposed Goal	Establish and execute an FTA research program to expedite deployment of transit automation for various areas of transit operations.
Comments	<i>This proposed goal suggests that the program’s purpose is to expedite deployment of automation capabilities as opposed to ensuring that their deployment occurs in a timely but judicious way. TRI should consider whether a program goal that reflects TRI’s interest in testing and evaluating new automation services and methods for promising applications and outcomes is more appropriate than simply expediting deployment of all capabilities, some of which may not be desirable. A candidate program goal, for example, might be to “demonstrate the requirements for deployment of automation for various areas of transit operations as well as demonstrate automation technologies and applications that result in safe, efficient, effective, and high-quality service for the riding public.”</i>
Program	Mobility on Demand
Proposed Goals	1. Enable enhanced effective traveler-centric transportation options that are easy to use, equitable, and accessible. 2. Help the transit industry take advantage of new technologies/business models.
Comments	<i>TRI could elaborate on the first goal—for example, by clarifying that accessibility issues include provision of service to those who do not have access to banking services and/or smartphones. Likewise, the second goal could be strengthened by clarifying that it applies to all transit agencies, regardless of whether they are part of an existing TRI grant or pilot program. Finally, TRI could consider increased service efficiency as another goal of the program.</i>

Program	Accessible Transportation Technology Research Initiatives
Proposed Goal	Increase accessibility for people with different functional abilities (people with disabilities) to transportation through technological advances and new operation practices.
Comments	<i>As explained by TRI staff during the meeting, a quantitative metric is being considered for this program goal. The metric is based on the number of technologies in each research area deployed per two-year period, thus focusing on the sheer quantity of new technologies deployed. Such measures of impact may neglect more salient aspects of an accessibility-oriented program and are not obviously connected to the program's goal. TRI could track other impacts such as whether people with different functional abilities increase their use of public transit, decrease their use of complementary paratransit, and experience increased rider satisfaction.</i>

Priority: Safety

Program	Safety-Associated Infrastructure
Proposed Goals	<ol style="list-style-type: none"> 1. Advance the development of materials, technologies, construction techniques, and facility and vehicle design to reduce the number of safety incidents to mitigate severity of injuries and fatalities. 2. Improve the safety culture within transit agencies, as well as support stakeholder coordination and outreach.
Comments	<i>These two goals differ substantially. The first concerns infrastructure, while the second concerns organizational behavior and interactions among employees and the public. The latter goal, and any existing or prospective projects that support it, would be better presented in a separate safety program reflective of the subject matter.</i>

Program	Safety Standards Development Program
Proposed Goal	Develop public transportation standards to improve the provision of public transportation service.
Comments	<i>This goal lacks any reference to "safety." Presumably, the goal of a program to support safety standards development is to improve the safety of public transportation services.</i>

Priority: Asset Management

Program	Asset Management Program
Proposed Goal	Bring public transportation infrastructure/assets up to a minimum state of good repair.
Comments	<p><i>This goal seems more suited to the national transit program generally, as opposed to TRI's program. The goal listed in the 2016 version of FTA's 5312 report is notably different from this phrasing and appears better suited to TRI's program:</i></p> <p><i>"The goals of the transit asset management program are to conduct research for developing and demonstrating various asset management technologies and tools and to provide guidance and best practices to assist transit agencies, large or small, to establish transit asset management plans."</i></p>

Program	Bus Testing
Proposed Goal	Ensure that transit buses are able to withstand the rigors of daily revenue public transportation service.
Comments	<i>The Bus Testing program is housed within TRI's budget primarily because of statutory requirements, not because of its emphasis on research. TRI might add a safety consideration to this goal ensuring that bus design take into account the safety of pedestrians, riders, and the motoring public. TRI might also consider adding research into more efficient data collection efforts.</i>

Priority: Asset Innovation

Program LoNo-CAP
Proposed Goal Increase the deployment of low- or no-emission components tested as part LoNo-CAP.
Comments The LoNo-CAP is housed within TRI's budget primarily because of statutory requirements, not because of an emphasis on research. The committee has no suggestions on modifications to this program goal.

Program Advanced Propulsion Research and Deployment
Proposed Goal Increase U.S. manufacturing and economic competitiveness in the development and production of next-generation transportation vehicles.
Comments While this goal may have political resonance, its relevance to propulsion research is unclear. The goal should reflect an interest in creating the best and most innovative propulsion technology.

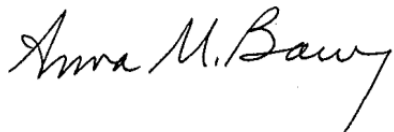
CONCLUDING COMMENTS

Measuring and evaluating the impact of research can be a complex process, but it is necessary for informing research investments. TRI is to be commended for recognizing the importance of impact evaluation and for starting an iterative process to define its program goals, the impacts to be measured, and metrics for monitoring and assessing impacts. The committee is pleased to have had the opportunity to provide timely input into TRI's efforts to develop the means of impact evaluation for the programs in a strategic research plan.

As in the past, this letter report has been kept brief in the interest of providing timely feedback for you to consider in finalizing the strategic plan in coordination with new agency leadership. TRAC is scheduled to meet again in fall 2017, by which time the committee expects that FTA will have a new administrator and a finalized strategic research plan.

On behalf of TRAC's members, I thank you and your staff for providing an engaging and productive set of presentations and discussions. TRB staff and I will coordinate with you to determine the timing and topics for the fall 2017 meeting.

Sincerely,



Anna M. Barry, Chair

Attachment

Transit Research Analysis Committee
Meeting Agenda: April 6–7, 2017
The Keck Center (Room 206) of the National Academies
500 5th Street, NW, Washington, DC 20001

Thursday, April 6

- 9:00 a.m. Committee introductions, statement of task, and report timeline: **Katherine Kortum** and **Faith Hall**, TRAC Program Manager, Office of Research Management, Innovation and Outreach, FTA Office of Research, Demonstration, and Innovation
- 9:15 a.m. FTA presentations
- Response to TRAC’s Fall 2016 Letter Report and FTA Research Priorities Within the New Administration: **Vincent Valdes**, Associate Administrator, FTA Office of Research, Demonstration, and Innovation
- Review of FTA’s Annual Research Report: **Jamie Pfister**, Deputy Associate Administrator, FTA Office of Research, Demonstration, and Innovation
What results were we looking for? What results are we seeing now?
- Review of FTA’s Performance Metrics for Research: **Mary Leary**, Director, Office of Research Management, Innovation and Outreach, FTA Office of Research, Demonstration, and Innovation
- Highlights of Performance Metrics and Outcomes in Two Major Programs:
Mobility on Demand Performance Metrics: **Gwo-Wei Torng**, Director, Office of Mobility Innovation, FTA Office of Research, Demonstration, and Innovation
- Zero-Emissions Vehicle Program: **Mike Baltes**, Director, Office of Infrastructure and Asset Innovation, FTA Office of Research, Demonstration, and Innovation
- 12:00 p.m. Lunch available in Keck 209
- 1:00 p.m. Open session adjourns

Friday, April 7

- 8:30 a.m. FTA discussion with committee members
Matt Welbes, Acting Deputy Administrator and Executive Director, FTA, **Vincent Valdes**, and **Jamie Pfister**
- 10:00 a.m. Open session adjourns

PARTICIPANT LIST

Committee

Anna M. Barry, Deputy Commissioner,
Connecticut Department of Transportation,
Chair

J. Barry Barker, Executive Director, Transit
Authority of River City

Ron Brooks, Manager of Accessible Transit
Services, Valley Metro

Charles Carr, Director, Office of Intermodal
Planning, Mississippi Department of
Transportation*

Adib Kanafani, Professor of the Graduate
School, University of California, Berkeley*

Nadine Lee, Deputy Chief Innovation Officer,
Office of Extraordinary Innovation, Los
Angeles County Metropolitan
Transportation Authority

Carol Abel Lewis, Professor and Director,
Center for Transportation Training and
Research, Texas Southern University

John Lewis, Chief Executive Officer, Charlotte
Area Transit System

Angela Miller, Director, Cubic Transportation
Systems

Brad Miller, Chief Executive Officer, Pinellas
Suncoast Transit Authority

Macy Neshati, Senior Vice President, BYD
Heavy Industries

Ed Watt, Director of Special Projects,
Amalgamated Transit Union

*Not in attendance.

Speakers and Discussants

Mike Baltes, Director, FTA Office of
Infrastructure and Asset Innovation

Faith Hall, TRAC Program Manager, Office of
Research Management, Innovation and
Outreach

Mary Leary, Director, FTA Office of Research
Management, Innovation and Outreach

Jamie Pfister, Deputy Associate Administrator,
Office of Research, Demonstration, and
Innovation

Gwo-Wei Torng, Director, FTA Office of
Mobility Innovation

Vincent Valdes, Associate Administrator, FTA
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Matthew Welbes, Acting Deputy Administrator
and Executive Director, FTA

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