Committee for Review of the Federal Railroad Administration Research, Development, and Demonstration Programs Letter Report: March 9, 2011

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TRB TRANSPORTATION RESEARCH BOARD
OF THE NATIONAL ACADEMIES

March 9, 2011

The Honorable Joseph Szabo
Administrator
Federal Railroad Administration
1200 New Jersey Avenue SE
Washington, DC 20590

Dear Mr. Szabo:

The Transportation Research Board's Committee for Review of the Federal Railroad Administration (FRA) Research, Development, and Demonstration (RD&D) Programs held its sixth meeting on November 30 and December 1, 2010, in Washington, D.C. Committee members attending the meeting are listed in Enclosure 1, and participating FRA staff are listed in Enclosure 2. The meeting was held at the Keck Center of the National Academies.

The task statement for this committee is as follows:

> The committee for this project will conduct an annual review and evaluation of the research, development, and demonstration (RD&D) program of the Federal Railroad Administration (FRA) of the U.S. Department of Transportation. FRA funds RD&D in three program areas: support of the agency's safety regulatory mandate; technology development and demonstration; and to support implementation of high-speed rail transportation. The committee will review and assess the effectiveness of FRA R&D processes for setting program priorities, selecting projects, directing projects, and maximizing and measuring the impact of its programs. The committee will provide recommendations to FRA on how to improve its processes for selecting, executing, and delivering value from its R&D program. The committee will not make recommendations about overall funding levels. As part of the upcoming 3-year cycle of the committee's work, the FRA may request that the committee organize and hold a workshop to identify needed research.

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The scope of the committee's work has been modified to acknowledge the recent emphasis on development of the nation's high-speed rail (HSR) program and on demonstration of new technologies beyond the research phase.

Committee members appreciate the dynamic environment and heightened expectations accorded rail transportation in the United States as well as the fiscal constraints that demand careful targeting of scarce research and development resources. As a group and as individuals, the committee members take their role in supporting the goals of a well-targeted and effective rail RD&D program seriously.

MEETING FORMAT

On the first day of the meeting, FRA's RD&D leaders presented highlights of the past year's research activities and the methodology used in ranking priorities for current and projected work. The committee met in executive session over the late afternoon and evening to synthesize reactions to FRA's materials and develop general themes for follow-up questions for the FRA team. The following morning the committee met again with FRA's RD&D leaders for further discussion of the previous day's presentations and related issues. The final meeting on December 1 was closed and allowed the committee to flesh out observations and content for the report contained in this letter, which was completed through correspondence among the members.

John Tunna, FRA's Director of Research and Development, has asked that the committee provide more detailed feedback on the specific project activities of the past year than has been provided in previous letter reports. The November 30–December 1 meetings were not designed to provide enough detail on the 134 active projects to allow the committee to make comments at the project level. The guidance offered in this letter is more general, in accordance with the members' expertise and the information presented at the meeting, but in what follows the committee has made suggestions concerning a process that FRA and the committee might follow in the future to enable more detailed and timely feedback.

FINDINGS

Leadership of FRA's Research Team

The committee commends FRA for development of a capable rail research leadership team and recommends that FRA maintain continuity in research management as the agenda for research is clarified and further developed.

Project Workload and Organization

The committee is concerned about the sheer number of projects under way and the ability of the modest FRA RD&D staff to manage such a workload efficiently and move projects along according to strategic priorities. Without a more thorough understanding of detailed project contents, objectives, and budgets, the committee cannot determine whether resources are dispersed too broadly. It suspects that many projects are actually complementary subefforts of a much smaller number of key research targets.

The committee believes that there is value to FRA in organizing research tasks in a way that will group related activities under 10 to 20 broader research goals. Such a classification, coupled with administrative profiles of budget, schedule, and phasing, will permit FRA to organize and prioritize more coherently. In turn, the committee will be able to deliver more detailed feedback on individual elements of the RD&D program. The committee recommends development of such an organizational scheme for FRA's outreach workshop to be held this spring.

The committee recommends that FRA group its projects on the basis of consensus research objectives. Technical objectives (extending track service life, improving safety inspection, and so forth) and policy objectives (safety, energy efficiency, intermodal interfaces, and so forth) could both be broadly grouped. This will facilitate review of the overall program emphasis and test how well FRA's research focus is aligned with real-world challenges for freight and passenger rail. Such a grouping of projects would improve the ability of the committee to provide FRA with the feedback it is seeking in future annual reviews; the grouping should also facilitate FRA's efforts to focus its vision and communicate its strategic direction to stakeholders.

Alignment with U.S. Department of Transportation Strategic Goals

The committee understands FRA's need to finalize its RD&D strategic plan to conform to current and projected developments and demands. The committee also appreciates that FRA's plan must support the U.S. Department of Transportation's (USDOT's) five strategic goals of safety, state of good repair, economic competitiveness, environmental sustainability, and livable communities. The committee encourages FRA to

consider how the benefits of current research efforts may be interpreted, transformed, or migrated in support of those goals, as opposed to developing entirely new projects to fit the USDOT scheme. Research on track integrity monitoring, for example, may be shown to improve safety, support a state of good repair, and improve the reliability and economic competitiveness of rail service. Fuel efficiency research supports economic competitiveness and environmental sustainability, with or without a shift of freight traffic from less efficient modes. Other USDOT modal administrations such as the Federal Transit Administration may be better positioned to support the livable communities goal directly, although FRA research on wayside horns and the shifting of truck traffic to rail could be organized under this heading, and research that supports development of passenger rail transportation could contribute to livable communities. The committee's overall concern is that scarce FRA resources not be spread even more thinly than they are today and that safety remain the most prominent goal of the RD&D agenda.

Contextual Research

The committee continues to support contextual research (policy research that provides the context for the development of the RD&D agenda) as complementary to development of FRA policies and programs in support of the rail mode. The nation's environmental and energy security strategy cannot be framed properly without considering the policy implications of new laws and regulations as they bear on the share of passenger and freight traffic moved by each of the surface modes.

For example, the committee strongly supports the project to evaluate more fully and quantify the impact of grade crossing incidents on all affected parties as an alternative to an approach that considers only direct costs to persons and damage to property involved in such events. Severe geographic limitations of the rail service network mean that grade crossing mishaps on high-density routes have serious network and economic impacts that should be included in any model for evaluating grade crossings. Such research will assist in setting priorities for separating or closing grade crossings and will help support and justify continued funding dedicated to addressing the grade crossing issue.

The committee applauds the information sharing and dialogue between the U.S. Department of Energy and FRA. Railways stand to benefit from investment in new battery technologies, engine improvements, and emissions control research. FRA should continue its role in ensuring that advances in these research areas are shared with rail stakeholders as a

means of improving rail efficiency and more effectively leveraging the public's investment.

The committee cautions FRA that research to define the competitive marketplace between modes has proven to be difficult and that studies using simple generalized models can produce misleading results. Past research modeling efforts on the Crescent Corridor, for example, have been insufficient to capture the range of complex variables, including highly commodity- and route-specific factors, that drive the decision to use trucking or rail intermodal services. Research efforts aimed at improving the competitiveness of rail should focus generally on the underlying technologies and regulatory constraints; it may be useful, nonetheless, to explore the potential of the newest network models for capturing mode-competitive markets.

The committee encourages further work to compare more analytically the advantages of rail freight and passenger movement with those of the highway and air modes in terms of fuel efficiency, environmental impacts, and safety. A more formal treatment of these issues as applied to individual transportation corridors could help frame future USDOT funding policies. In a similar vein, a better understanding of liability issues and their impact on the costs of rail services and modal selection would inform policy makers about the impact of their decisions with regard to statutory liability caps, sharing of risk, and other legal issues.

Project Scoring and Prioritization

The committee commends FRA for bringing discipline and clarity to setting priorities for future research projects. Three recommendations to refine this process are as follows:

- FRA described to the committee the method of assigning point scores to project proposals in its project selection process. The safety benefit score is an increasing function of the average annual cost of the category of risk that the research would be aimed at reducing. The score increases more slowly than proportionally with this cost. Safety benefit scores should be made proportional to potential benefits, to depict properly the relative merit of competing projects. It might be appropriate to rescore current research candidates accordingly to determine whether there would be changes in the final selections.
- Potential commercialization and field implementation of a project should be given significant weighting in the scoring protocol. More detailed comments on deployment considerations are given below.

- To avoid public misunderstanding, the scale of total score values should be recalibrated in such a manner that the "normal passing score" for a project to receive funding is in the range of 80 percent rather than 50 percent.

The committee understands that the scoring mechanism is only one of several tools supporting proper allocation of funding to research candidates and that some lower-scoring projects may be worthy of funding. A grouping of projects by major research areas as described above will assist the committee and stakeholders in understanding conclusions with respect to such "outlier" projects. The members understand that FRA is considering the establishment of a steering committee (which might include representatives from other agencies and the private sector) to participate in the evaluation and selection of projects and believe that such a committee would be useful.

Greater attention to the commercial potential of research projects will ensure that funds are allocated to areas with the greatest payoff for freight carriers and passenger service sponsors alike. Early engagement with carriers and interested potential suppliers can provide an important screen that will help redirect research investment away from technologies that have low probability of field application and toward more promising opportunities. Recent "best practice" examples include the project to develop high-speed imaging of joint bars and development of vehicle–track interaction monitors.

The committee encourages FRA to assign a significant weighting to early-phase interest and engagement by carriers and suppliers, including cost-sharing of the research itself, in the project selection protocols. Another important test is the willingness of suppliers and service providers to assume responsibility for the refinement and product development phase to full commercialization. Lack of such support from targeted users should serve as an early warning of questionable utility from the research initiative and this test should be used as a mechanism to winnow projects (with the exception of projects that serve regulatory needs).

HSR Research

HSR systems in the United States can benefit from the decades of research and operating experience of service providers and suppliers around the world. FRA should guard against diversion of funding to projects that would replicate long-proven HSR approaches developed overseas. In many cases, completed research and operating experience may simply be verified for applicability to the North American environment.

The committee suggests that FRA concentrate passenger rail research funding on projects supporting expansion and upgrades of shared passenger and freight rail services. The latter category includes many elements that are particular to the North American operating environment and is thus in need of original research approaches and solutions. In this vein an examination of European experience, particularly in the United Kingdom, with regard to operating freight and passenger service on shared track would be useful. Services operate on significant routes with speeds of 125 mph for passenger and up to 75 mph for freight, and they may offer lessons that could apply to the United States.

FRA's RD&D efforts should focus mainly on questions related to the incremental approach to HSR. However, FRA should also undertake a study of international best practices and lessons concerning dedicated or very high-speed rail technology, infrastructure, operations, and experience. To the committee's knowledge, no cross-national compendium of this nature has been developed. Knowledge of the HSR technologies and practices that have evolved over the past four decades is dispersed across at least a dozen nations and numerous private-sector companies. As U.S. transportation agencies develop HSR, they will benefit greatly from a compendium that consolidates what has been learned and interprets it in the U.S. context. Development of such a compendium would be beneficial in several ways. It would help in identifying adaptations of imported technologies and infrastructure designs that are necessary for compliance with regulatory constraints and other aspects unique to the United States. It would aid in planning dedicated HSR operations that use shared infrastructure; such arrangements have been used in France, Germany, Italy, Korea, and elsewhere. Finally, it would begin the process of developing expertise at FRA, other U.S. transportation agencies, and U.S. industry with regard to very high-speed rail technologies.

Support for Rail Research Programs at Colleges and Universities

The committee recognizes FRA's past efforts in directing resources to the development of rail research programs at colleges and universities and encourages FRA to place even more emphasis, as technically appropriate, on such efforts. The rail mode continues to lag far behind highways as a target for academic research, a reflection of the nation's historical investment emphasis and the relative size of Federal Highway Administration and FRA research budgets. Development of rail-centered programs is a challenge that can only be addressed through enhanced access to public funding and applied research. The committee believes that the talent pool in academia with a natural interest in rail is large but is not fully exploited because of a lack of rail research funding. The committee recommends that FRA factor

the benefit of developing a more diversified rail research community and future workforce into its procurement selections, with particular attention to universities.

Suggestions for Future Research Review Public Events

The committee appreciated the opportunity to participate in the FRA Research Review public event in December 2009 but, as noted in its previous report, believes that there was too little opportunity for dialogue with presenters. It recommends that future public events, with or without the involvement of the committee, be structured in a manner that better facilitates commentary and feedback. Depending on the scale of an event, new features could include focus groups, poster sessions, or targeted evaluation instruments for specific research initiatives. Such changes will broaden the appeal of the events and make possible the involvement of higher-level staff from targeted stakeholder organizations.

Future Role of the Committee

The committee acknowledges FRA's desire that the main focus of the committee's work shift from providing strategic consultation to evaluating current research efforts. A different and more extensive review program will be required for the committee to meet FRA's expectations for specific project or program evaluations. For an enhanced evaluation role, the committee would need a report on each project, including metrics on budget, scheduling, and outcomes. Materials would need to be provided to committee members well in advance of the committee meeting and then discussed in a 1- or 2-day review session with senior FRA RD&D staff. Program-level summaries that would group complementary research efforts, as suggested above, would enable the committee to evaluate the strategic direction of FRA's efforts properly and would provide useful input on components of the process.

Summary

FRA's RD&D program has grown over the past 2 years in scope and management strength. The committee is impressed with the management team and believes that the senior staff and leadership of this program can facilitate the transition of rail research into the mainstream of U.S. transportation infrastructure development and strategy. The committee believes that projects should be organized and presented to research partners and stakeholders in a dozen or so groupings that correspond to key research objectives. More effort to engage private interests in the earliest phases of individual efforts and assessments of commercialization potential may help FRA in winnowing the long list of projects planned and under way. Finally, the committee believes that stakeholder outreach initiatives by FRA's

research arm should feature enhanced opportunities for dialogue and feedback on both past efforts and future directions to sustain support and proper targeting of scarce RD&D resources.

The members hope that their views will be useful to FRA and look forward to supporting your efforts in future years.

Sincerely yours,

Robert E. Gallamore
Chair, Committee for Review of the FRA Research, Development, and Demonstration Programs

Enclosures

Enclosure 1
Committee Attendance
Meeting of November 30–December 1, 2010

Robert E. Gallamore, Chair
The Gallamore Group, LLC

Christopher P. L. Barkan
University of Illinois at Urbana–Champaign

Vernon W. Graham
Canadian Pacific Railway

Anson C. R. Jack
Rail Safety and Standards Board

Charles R. Lynch
Gannett Fleming Transit and Rail Systems

James W. McClellan
Woodside Consulting Group

Richard W. Pew
Raytheon BBN Technologies
(November 30 only, by telephone)

Ian P. Savage
Northwestern University

Patrick B. Simmons
North Carolina Department of Transportation

James A. Stem, Jr.
United Transportation Union

Gerhard A. Thelen
Norfolk Southern Corporation

Enclosure 2
Speakers
Meeting of November 30–December 1, 2010

Mark Yachmetz, Associate Administrator for Railroad Policy and Development, FRA
John Tunna, Director, Office of Research and Development, FRA
Sam Alibrahim, Chief, Signal, Train Control, and Communications Division, Office of Research and Development, FRA
Gary A. Carr, Chief, Track Research Division, Office of Research and Development, FRA
Scott Greene, Team Leader, Intermodal Freight and Industry Analysis, Office of Policy, FRA
Kevin Kesler, Chief, Equipment and Operating Procedures Research Division, Office of Research and Development, FRA