

The logo for the Federal Transit Administration, consisting of the letters 'FTA' in a bold, red, sans-serif font.

Federal Transit Administration

*"Delivering Solutions that Improve Public Transportation"*

***FTA MULTI-YEAR  
RESEARCH PROGRAM PLAN  
(FY 2009 – FY 2013)***

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<b>REPORT DOCUMENTATION PAGE</b>			<i>Form Approved</i> <i>OMB No. 0704-0188</i>
Public reporting burden for this collection of information is estimated to average one hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.			
1. AGENCY USE ONLY (Leave blank)	2. REPORT DATE <b>September 2008</b>	3. REPORT TYPE AND DATES COVERED <b>Final Report, October 2008</b>	
4. TITLE AND SUBTITLE <b>FTA Multi-Year Research Program Plan (FY 2009- FY 2013)</b>		5. FUNDING NUMBERS <b>Contract Number - DTFT60-05-00032</b> <b>Team number - OH-26-7245-02</b>	
6. AUTHOR(S) <b>Battelle: Kevin L. Chandler, Pamela J. Sutherland,</b> <b>TranSystems: Carol L. Schweiger</b>			
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9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) <b>Office of Research, Demonstration, and Innovation</b> <b>Federal Transit Administration, 1200 New Jersey Ave, S.E., Washington, D.C. 20590</b>		10. SPONSORING/MONITORING AGENCY REPORT NUMBER <b>FTA-OH-26-7245-2007.1</b>	
11. SUPPLEMENTARY NOTES <b>Bruce Robinson</b>			
12a. DISTRIBUTION/AVAILABILITY STATEMENT <b>No Restrictions. Available From: National Technical Information Service/NTIS, Springfield, Virginia, 22161. Phone 703.605.6000, Fax 703.605.6900, Email [orders@ntis.fedworld.gov]</b>		12b. DISTRIBUTION CODE	
13. ABSTRACT (Maximum 200 words) <b>The Multi-Year Research Program Plan (Program Plan), prepared by the Federal Transit Administration's (FTA) Office of Research, Demonstration, and Innovation (TRI), is part of FTA's strategic planning process. It provides descriptive summaries of existing FTA research projects for fiscal years (FY) 2009 through 2013, and it links these projects to the goals and objectives of FTA's Strategic Research Plan. It also identifies future transit industry research needs, links these needs to FTA's research goals and objectives, and describes new research areas and projects that FTA will consider for funding during the next five years.</b>			
14. SUBJECT TERMS <b>Federal Transit Administration, Office of Research, Demonstration and Innovation (TRI), Research Program, Strategic Planning</b>		15. NUMBER OF PAGES <b>53</b>	16. PRICE CODE
17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE <b>Unclassified</b>	19. SECURITY CLASSIFICATION OF ABSTRACT <b>Unclassified</b>	20. LIMITATION OF ABSTRACT <b>None</b>

## LETTER TO THE READER



U.S. Department  
of Transportation

**Federal Transit Administration**

1200 New Jersey Avenue, S.E.  
Washington, D.C. 20590

Dear Colleague:

This *Multi-Year Research Program Plan (FY 2009 – FY 2013)* (Program Plan) is an integral element of the Federal Transit Administration's (FTA) strategic research planning process. The Program Plan links the goals and objectives of the FTA Strategic Research Plan to the active and planned research projects and activities funded by FTA. FTA's strategic research goals are:

- Goal 1. Provide national transit research leadership
- Goal 2. Support increasing transit's market share
- Goal 3. Support improving the performance of transit operations and systems

This year's Program Plan updates the FY 2008 – FY 2012 Program Plan. It identifies FTA research projects and activities for FY 2009 through FY 2013, and clearly shows whether and how these projects and activities support FTA's strategic research objectives. It also identifies transit industry research needs and potential future research projects for funding consideration. In addition, the Program Plan provides more detail about the development process for new transit research within the major programs that make up FTA's research portfolio. FTA expects to make a significant effort this year to identify potential future projects as part of the FY 2010 – FY 2014 Program Plan.

We are grateful to our research partners and stakeholders for their continuing support in working with us to achieve our goals and objectives. Our FY 2008 Annual Research Report will be published in mid-2009. We are also grateful for the support of the Transit Research Analysis Committee (TRAC) in commenting and advising on our research activities at FTA.

Sincerely,

A handwritten signature in black ink, appearing to read "Vincent Valdes", with a long horizontal flourish extending to the right.

Vincent Valdes  
Associate Administrator for  
Research, Demonstration, and Innovation

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## ACRONYMS AND ABBREVIATIONS

ADA	Americans with Disabilities Act
APTA	American Public Transportation Association
APTS	Advanced Public Transportation Systems
BRT	bus rapid transit
CBTC	communication based train control
CNG	compressed natural gas
CO	carbon monoxide
COOP	continuity of operations planning
COTA	Central Ohio Transit Authority
CFR	Code of Federal Regulations
CTAA	Community Transportation Association of America
DBE	disadvantaged business enterprise
DHS	U.S. Department of Homeland Security
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
EDAPTS	Efficient Deployment of Advanced Public Transportation Systems
EDSP	Electric Drive Strategic Plan
EEO	equal employment opportunity
EPA	U.S. Environmental Protection Agency
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
FY	fiscal year
GIS	geographic information systems
GPS	global positioning systems
HC	hydrocarbon
HRT	heavy rail transit
ICMS	Integrated Corridor Management System
IMTP	International Mass Transportation Program
ITS	intelligent transportation systems
ITS-JPO	ITS Joint Program Office
JARC	Job Access and Reverse Commute
JPO	Joint Program Office

## ACRONYMS AND ABBREVIATIONS (CONTINUED)

kW	kilowatt
LRT	light rail transit
LRV	light rail vehicle
MMIS	maintenance management information system
MOU	Memorandum of Understanding
NAS	National Academy of Sciences
NHTS	National Household Travel Survey
NO <sub>x</sub>	nitrogen oxides
NRTP	National Research and Technology Program
NTD	National Transit Database
NTI	National Transit Institute
OMB	Office of Management and Budget
OST	Office of Secretary of Transportation
OTC	Oklahoma Transportation Center
PART	Program Analysis Rating Tool
PM	particulate matter
RIAS	Remote Infrared Audible Signage
RITA	Research and Innovative Technology Administration
ROI	return on investment
R&D	research and development
SAFETEA-LU	Safe, Accountable, Flexible, and Efficient Transportation Equity Act – A Legacy for Users
SBIR	Small Business Innovation Research
SEPTA	Southeastern Pennsylvania Transportation Authority
TAD	FTA Office of Administration
TBP	FTA Office of Budget and Planning
TCA	FTA Office of Communications and Congressional Affairs
TCC	FTA Office of Chief Council
TCIP	transit communications interface profile
TCR	FTA Office of Civil Rights
TCRP	Transit Cooperative Research Program
TERM	Transit Economic Requirements Model
TMCC	Travel Management Coordination Center
TOA	FTA Office of the Administrator
TOPS	TCRP Oversight and Project Selection
TPE	FTA Office of Planning and Environment
TRAC	Transit Research Analysis Committee
TRANSPO	National Center for Transportation Needs of Special Populations



## **ACRONYMS AND ABBREVIATIONS (CONTINUED)**

TRB	Transportation Research Board
TRI	FTA Office of Research, Demonstration, and Innovation
TRIS	Transportation Research Information Service
TPM	FTA Office of Program Management
TRO	FTA Regional Offices
TSA	Transportation Security Administration
TSI	Transportation Safety Institute
ULSD	ultra-low sulfur diesel
USC	United States Code
UTC	University Transportation Center
UTCP	University Transportation Centers Program
UTFS	Universal Transit Farecard Stakeholder
UWR	United We Ride
WMATA	Washington Metropolitan Area Transit Authority

# FTA MULTI-YEAR RESEARCH PROGRAM PLAN (FY 2009 – FY 2013)

## 1.0 BACKGROUND

This Multi-Year Research Program Plan (Program Plan) is a part of the Federal Transit Administration's (FTA) Office of Research, Demonstration, and Innovation (TRI) strategic planning process. It supports the FTA Strategic Research Plan,<sup>1</sup> and is updated on an annual basis. This year's Program Plan summarizes existing FTA research projects and activities for fiscal year (FY) 2009 through 2013, and identifies transit industry research needs and research projects. In addition, the Program Plan expands several topics addressed in last year's Program Plan.<sup>2</sup> TRI also reports on accomplishments in an Annual Research Report.<sup>3</sup> TRI's strategic research planning documents are available at <http://www.fta.dot.gov/research>.

In 2003, FTA requested that the Transportation Research Board (TRB) establish an advisory committee to assist in its strategic planning process. The Transit Research Analysis Committee (TRAC), created in October 2003, includes members from transit authorities, community service agencies, state departments of transportation, research institutes, consulting firms, and equipment manufacturers. Since 2003, TRAC has provided independent review and assessment of the needs of the public transportation industry that could be met through future investment in a national research and technology program. TRAC has also advised FTA as the agency developed its strategic agenda for transit research and identified the roles that FTA and industry stakeholders could play in carrying out that agenda.

FTA published its current Strategic Research Plan in September 2005. This plan described FTA's research mission, vision, goals, objectives, programs, and projects. Subsequent to the publication of the Strategic Research Plan, TRAC recommended several activities that FTA should conduct, including ongoing updates of the Strategic Research Plan, and the creation and annual update of a three- to five-year Research Program Plan, which became the Multi-Year Research Program Plan (Program Plan). Letter reports from the TRAC to FTA are available at <http://www8.nationalacademies.org/cp/projectview.aspx?key=71>.

In 2008, with the concurrence of TRAC, FTA updated its research goals and objectives in response to the changing needs of the U.S. population for safe, efficient, and less costly transportation options (see Section 2.0, FTA Strategic Research Goals). This year's Program Plan links these new goals and objectives to current programs and projects. Further, because it addresses future research project development directly connected to the budgeting process, the Program Plan assists FTA in determining future funding.

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<sup>1</sup> *FTA Strategic Research Plan*, September 30, 2005.

<sup>2</sup> *FTA Multi-Year Research Program Plan (FY 2008 – FY 2012)*, July 28, 2008.

<sup>3</sup> *FTA National Research Programs, Annual Research Report 2007*, June 17, 2008.

## 2.0 FTA STRATEGIC RESEARCH GOALS

In 2008, FTA revised its research goals and objectives to reflect changing national priorities and to better link research projects to needs and objectives. Table 2-1 presents the new research goals and their objectives. This section discusses the new goals. Section 5.0, FTA Research Projects, discusses FTA’s revised research objectives and the research programs and projects aligned with them.

**Table 2-1. FTA’s Three Strategic Research Goals and Their Objectives**

Goals	Objectives
<b>Goal 1: Provide National Transit Research Leadership</b>	1.1 Provide vision and prepare the nation for transit advancements
	1.2 Explore strategic partnerships to achieve transit research goals
	1.3 Synthesize research results to provide useful bodies of knowledge for transit industry decision makers and to shape the national transit research agenda
<b>Goal 2: Support Increasing Transit’s Market Share</b>	2.1 Identify methods to increase transit system capacity (e.g. operations planning, technology, infrastructure, vehicles, workforce, financing)
	2.2 Investigate methods to reduce the time needed to plan and build infrastructure (systems and facilities)
	2.3 Perform research to improve the rider experience (e.g., travel time; service reliability, frequency, and quality; customer information)
<b>Goal 3: Support Improving the Performance of Transit Operations and Systems</b>	3.1 Perform research to improve capital and operating efficiencies (capital, operating, and maintenance costs)
	3.2 Perform research to improve transit planning and forecasting (e.g., operations, linking transportation systems, transit-oriented development and land use, solving the last mile)
	3.3 Perform research to improve mobility, rural services, and services for targeted populations
	3.4 Investigate the use of high-efficiency technologies and alternative energy sources (vehicles and facilities)
	3.5 Perform research to reduce transit environmental impacts (e.g., emissions, waste streams, recycling)
	3.6 Perform research to improve safety, security, and emergency preparedness

### Changing Conditions and Priorities

As the agency responsible for addressing transit research from a national perspective, FTA revised its research goals in response to changing national conditions. Current priorities for transit research address helping the transit industry prepare for and respond to:

- Surging energy and operating costs
- Significant ridership increases
- Upgrading and maintenance of transit infrastructure in a state of good repair
- Transit access for an increasingly aging and diverse population
- Reducing CO<sub>2</sub> emissions to combat global climate change
- Reauthorization of surface transportation funding.

In 2008, the increasing price of crude oil on the world market resulted in significant increases in the price of petroleum-based fuels. The national agenda turned to increasing energy efficiency and reducing the consumption of these fuels. The public agenda turned toward finding less expensive means of reliable transportation. As a result, transit systems saw large increases in ridership, reaching operating capacity during peak hours in many systems. At the same time and in contrast, transit agencies were also struggling with the higher fuel costs causing significant budget deficits and a need for service reductions.

In 2009, the federal surface transportation spending legislation, the successor to *Safe, Accountable, Flexible, and Efficient Transportation Equity Act – A Legacy for Users* (SAFETEA-LU), is due for reauthorization. In preparation, FTA (along with other DOT modal administrations) has revisited its plans for future research. In doing so, it recognized the need for a bolder research goal supporting a significant increase in the use of transit.

Because of tight budgets within transit agencies, state departments of transportation, and the federal government, the state of repair of our national transportation infrastructure has arisen as a significant issue over the past few years. Recent events, such as the bridge collapse in Minneapolis, brought this issue into sharp focus. The national transit research agenda continues with research to facilitate assessing and improving the condition (state of good repair) of transit systems.

### **Goal 1: Provide National Transit Research Leadership**

Many organizations throughout the United States, including the FTA, state departments of transportation, transit agencies, universities, and manufacturers, carry out transit research. FTA alone, however, has the responsibility for addressing transit research from a national perspective.

FTA will continue to provide leadership to advance research in areas that are beyond the scope and funding capacity of the administration itself. FTA will encourage strategic research partnerships through better communication and coordination to minimize duplication and maximize completion of needed transit research. FTA will also better define transit research needs through outreach with potential strategic partners and the transit industry at large.

The results of transit research are often in the form of information with little integration, synthesis, or context for how they might be applied to decision making. Over the next few years, FTA will categorically identify relevant research areas and collate and synthesize research results from these areas into bodies of knowledge that the transit industry can use in decision making. FTA will also use these syntheses to identify relevant new research critical to transit (see Section 4.0, Future Research Project Development).

### **Goal 2: Support Increasing Transit's Market Share**

With gasoline prices soaring in 2008, in many cities, public transportation ridership swelled to maximum capacity during peak hours, as people looked for safe and cheaper ways to commute to work. Although transit's share of the overall "transportation market" remains small, it is

growing, and it is vital to segments of the population whose income is not growing proportionate to fuel prices.

It's great to have this increase in ridership, but even more important is to sustain and grow transit market share. To do so, we need research in how to improve rider experience, how to expand transit system capacity to eliminate crowding during peak hours and to accommodate more riders in general, and how to reduce the time needed to plan and construct new or additional facilities and systems. Further, increasing transit ridership also supports the DOT's national initiative to address congestion.<sup>4</sup> This transit research needs to support transportation decisions and appropriate land use, especially if it supports transit oriented design.

FTA research now focuses on supporting significant increases in transit's market share, including:

- Increasing in all types of capacity at transit agencies
- Reducing the time required to build and update transit infrastructure
- Improving rider experience to attract and maintain the ridership for a vital transit industry.

### **Goal 3: Support Improving the Performance of Transit Operations and Systems**

The Federal Government has invested billions of dollars in U.S. transit systems. These assets must be maintained and strengthened to accommodate growing demand for safe, reliable, and affordable public transit, as well as a cleaner environment.

Research under Goal 3 supports improving the capital and operating conditions of transit systems, the availability of transit service to all populations, and transit's effects on the larger environment. Specifically, research under Goal 3 addresses:

- Increasing capital and operating efficiencies
- Improving transit planning and forecasting methods
- Improving mobility, rural services, and services for targeted populations
- Developing and testing high-efficiency technologies and alternative energy sources
- Reducing transit environmental impacts
- Improving transit safety, security, and emergency preparedness.

### **Alignment with Strategic Plans**

Table 2-2 shows how FTA's new research goals align with DOT strategic goals, and with the research, development, and technology strategies advanced by the DOT.<sup>5</sup> In 2009, FTA will update its Strategic Research Plan to incorporate these new goals. The updated Strategic Research Plan will also reflect FTA's overall Strategic Plan expected to be released early in FY 2009.

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<sup>4</sup> *National Strategy to Reduce Congestion on America's Transportation Network*. DOT. May 2006.

<sup>5</sup> *Transportation Research, Development, and Technology Strategic Plan, 2006-2010*. DOT/RITA. November 2006.

**Table 2-2. FTA's Research Goals are Aligned with DOT's Goals and Research Strategies**

DOT Goal	RD&T Strategies	FTA Research Goals
<b>Safety</b>	Understand and address causal factors and risks – emerging research priority is human-automation interaction enhanced safety data	<b>Goal 3.</b> Support Improving the Performance of Transit Operations and Systems
	Mitigate accidents and incidents	<b>Goal 3.</b> Support Improving the Performance of Transit Operations and Systems
<b>Reduced congestion</b>	Reduce passenger and freight congestion in air and surface modes – emerging research priority is congestion reduction policy research and technologies	<b>Goal 2.</b> Support Increasing Transit's Market Share
	Extend system life and improve durability	<b>Goal 3.</b> Support Improving the Performance of Transit Operations and Systems
	Improve planning, operations, and management	<b>Goal 2.</b> Support Increasing Transit's Market Share <b>Goal 3.</b> Support Improving the Performance of Transit Operations and Systems
	Improve services for underserved areas and populations	<b>Goal 3.</b> Support Improving the Performance of Transit Operations and Systems
	Advance the nation's transportation research capability	<b>Goal 1.</b> Provide National Transit Research Leadership
<b>Global connectivity</b>	Harmonize standards and support leadership for U.S. transportation providers	<b>Goal 3.</b> Support Improving the Performance of Transit Operations and Systems
<b>Environmental stewardship</b>	Understand and mitigate transportation impacts – emerging research priority is energy efficiency and alternative fuels	<b>Goal 3.</b> Support Improving the Performance of Transit Operations and Systems
	Improve the environmental review process	<b>Goal 3.</b> Support Improving the Performance of Transit Operations and Systems
<b>Security, preparedness, and response</b>	Reduce vulnerability and improve preparedness and recovery	<b>Goal 3.</b> Support Improving the Performance of Transit Operations and Systems
<b>Organizational excellence</b>	Consistently apply the research and development (R&D) investment criteria	<b>Goal 1.</b> Provide National Transit Research Leadership

### 3.0 ORGANIZATIONAL RESOURCES AND FUNDING

Multiple organizations, both within and outside the Federal government, support FTA’s transit research program, including carrying out and managing FTA-funded research. These organizations include FTA’s Office of Research, Demonstration, and Innovation (TRI), which directs FTA’s research program; other FTA offices; other DOT administrative offices and agencies; University Transportation Centers (UTCs); and several non-governmental organizations and agencies. This section describes TRI and discusses budgets and funding for FTA’s research program.

#### Office of Research, Demonstration, and Innovation

As the office responsible for maintaining the national perspective for transit research, TRI manages and oversees FTA’s transit research program and provides industry and policy-makers with the information to make good business decisions about transit technology, operations, and capital investments. As shown in Figure 3-1, TRI has seven administrative divisions to administer and oversee FTA’s research agenda and to disseminate results and information.

#### FTA Office of Research, Demonstration, and Innovation

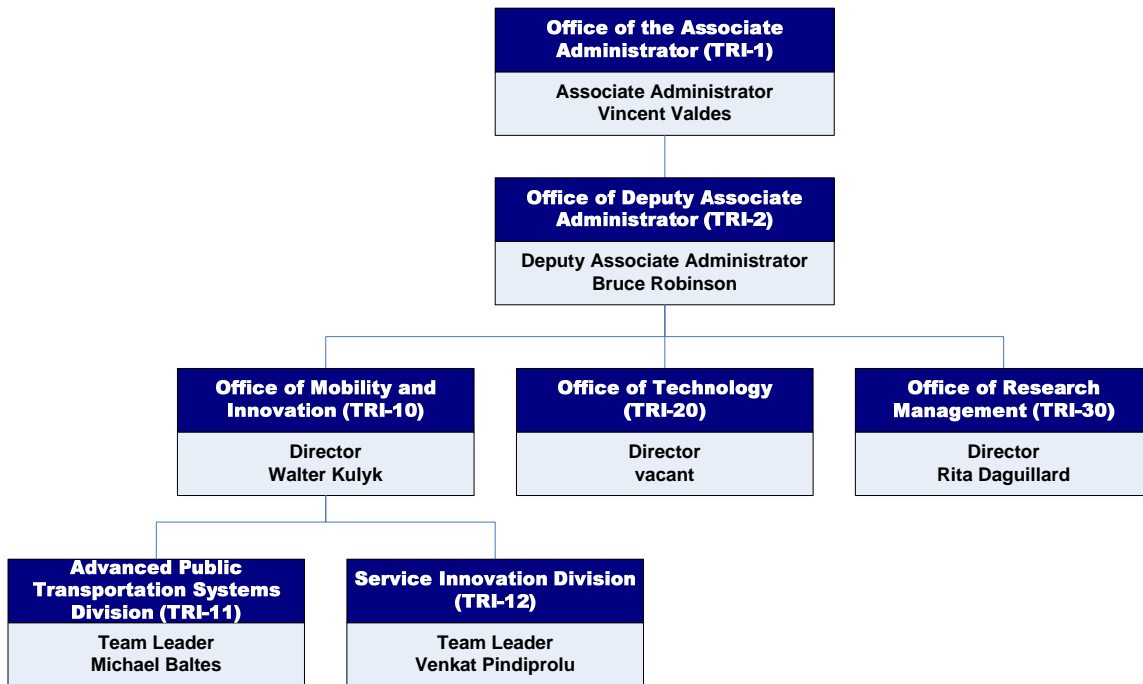


Figure 3-1. TRI Organization Chart

Among the larger programs and organizations funded or managed through TRI are the National Research and Technology Program (NRTP), the Transit Cooperative Research Program (TCRP), the National Transit Institute (NTI), the University Transportation Centers Program (UTCP), the International Mass Transportation Program (IMTP), the National Fuel Cell Bus Program, the Bus Testing Facility, several Maglev programs, and the transit portion of the Intelligent Transportation Systems (ITS) programs.

Although TRI is the office within FTA primarily responsible for the national transit research agenda, the research projects are managed across FTA, as well as by other organizations both within and outside of the Federal government.

### **Budgets and Funding**

Table 3-1 shows the FTA research budget for FY 2006 through FY 2009 as prescribed in *Safe, Accountable, Flexible, and Efficient Transportation Equity Act – A Legacy for Users* (SAFETEA-LU). The top half of the table lists the total amounts appropriated for FY 2006 – FY 2008 and the total amounts authorized for FY 2009 for Bus and Bus Facility Grants, the NRTP, the TCRP, the NTI, and the UTCP funded by FTA. The bottom part of the table shows the earmarks and designated funds within the NRTP’s total appropriation or authorization. The balances that comprise FTA’s discretionary research funds are also shown as percentages of the total NRTP and UTCP appropriation or authorization levels.

Although Table 3-1 shows an apparent increase in discretionary research funds for FY 2009, the values shown are existing authorization levels. Because budget appropriations are made annually, the actual level of earmarking or designation of funds from FY 2009 forward during the SAFETEA-LU authorization period is unknown. Funding levels for FY 2010 will be determined by the next authorization bill. FTA and DOT are currently brainstorming methods to improve the operations of research in the next authorization.

The current FTA research program is significantly constrained by earmarked and designated programs,<sup>6</sup> some of which do not directly address FTA research goals and objectives.<sup>7</sup>

The high percentage of earmarked funds also makes it impossible for FTA to achieve a relevant and comprehensive research program. For example, the current lack of coordination among bus research projects makes it difficult for FTA to develop a cohesive program of bus research and to eliminate duplication and overlap of effort.<sup>8</sup> Thus, earmarks and designated funding, although they may fund useful transit research, limit FTA’s ability to achieve a relevant and cohesive portfolio of research to meet its strategic goals.

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<sup>6</sup> Earmarking of research funds occurs when Congress designates a research area or project, a funding amount, and a recipient organization (Brach and Wachs 2005). If a recipient organization is not specified, the term “designated,” instead of “earmarked,” is used.

<sup>7</sup> About \$1.9 million (about 5 percent) of the funds earmarked from FTA’s research budget are not related to transit.

<sup>8</sup> Analyses show that the combined earmarks in the NRTP budget from the authorizers and appropriators in Objective 3.4 total more than \$13 million. Three authorization earmarks total about \$5.8 million over the life of SAFETEA-LU. The seven appropriation earmarks for FY2006 total \$7.4 million. Appropriators may earmark more funding in subsequent fiscal years during the SAFETEA-LU authorization period.



With the implementation FTA's new process for soliciting, evaluating, and funding research projects (see Section 4.0, Future Research Project Development), FTA will be better able to select and fund the most critical and relevant transit research and direct research dollars to those institutions and groups most qualified to perform them.

**Table 3-1. The FTA Research Program Authorization Levels as Defined in SAFETEA-LU**

<b>Formula and Bus Grants in SAFETEA –LU (\$000)</b>	<b>FY 2006</b>	<b>FY 2007</b>	<b>FY 2008</b>	<b>FY 2009</b>
Fuel Cell Bus Program (Section 5309)	\$11,250	\$11,500	\$12,750	\$13,500
Bus Testing Facility (Section 5318)	\$3,000	\$3,000	\$3,000	\$3,000
<b>FTA Research Budget in SAFETEA LU (\$000)</b>	<b>FY 2006</b>	<b>FY 2007</b>	<b>FY 2008</b>	<b>FY 2009</b>
National Research and Technology Programs (NRTP) (Section 5314)	\$53,658 <sup>9</sup>	\$40,400	\$44,763	\$48,450
Transit Cooperative Research Program (Section 5313)	\$8,910	\$9,300	\$9,300	\$10,000
National Transit Institute (Section 5315)	\$4,257	\$4,300	\$4,300	\$4,300
University Transportation Centers Program (UTCP) (Section 5506)	\$6,930	\$7,000	\$7,000	\$7,000
<b>Total</b>	<b>\$73,755</b>	<b>\$61,000</b>	<b>\$65,363</b>	<b>\$69,750</b>
<b>Earmarks and Designated Funds in the National Research Programs Budget (\$000)</b>	<b>FY 2006</b>	<b>FY 2007</b>	<b>FY 2008</b>	<b>FY 2009</b>
NRTP (Section 5314)	\$53,658	\$40,400	\$44,600	\$48,450
Project ACTION	(\$2,970)	(\$3,000)	(\$3,000)	(\$3,000)
National Technical Assistance Center for Senior Transportation (Section 5314(b))	(\$990)	(\$1,000)	(\$1,000)	(\$1,000)
NRTP Earmarks (Section 3046 of SAFETEA-LU)	(\$19,389)	(\$18,855)	(\$18,225)	(\$18,615)
Appropriations Earmarks	(\$17,028)	(\$0)	(\$6,718)	(?)
NRTP Discretionary Research Funds	\$13,281	\$17,545	\$15,820	(?)
Discretionary Research Funds as Percent of the FTA Research Budget (Total – NRTP and UTCP) <sup>10</sup>	18.0%	28.8%	24.2%	(?)

<sup>9</sup> Appropriators provided \$17.028 million above the SAFETEA-LU authorization level.

<sup>10</sup> Appropriators included an additional \$17.028 million in earmarks in FY 2006. Discretionary funds in FY 2009 may be affected by additional earmarks in the appropriations process.

## 4.0 FUTURE RESEARCH PROJECT SELECTION

In June 2008, the FTA received TRAC’s most recent letter report. In that report, TRAC reiterated a request that FTA define a process for developing new research projects. This section describes the process that FTA will use to evaluate research ideas and select research projects for funding. FTA will also actively support and encourage new research project development at TCRP, NTI, and UTCs that is focused on FTA’s strategic research goals.

In 2008, FTA, working with the transit industry, developed the Electric Drive Strategic Plan (EDSP) that aligns with FTA’s Strategic Research Objective 3.4, Explore the use of high-efficiency technologies and alternative energy sources (vehicles and facilities). The EDSP establishes long-term (2030) electric drive research goals and outlines six program areas composed of projects to be carried out between 2010 and 2014. These programs and projects are presented in Table 5-8.

In 2009, FTA will replicate the process used to develop the EDSP to complete strategic plans for several of FTA’s other major research areas and to identify needed programs and projects within these areas. Also in 2009, FTA anticipates establishing a Research Council composed of senior FTA staff to assist in guiding research investments.

FTA also developed a process to prioritize projects among these major research areas and programs, especially when resources are constrained. Figure 4-1 is a flow diagram that shows FTA’s process for evaluating and prioritizing research projects for funding.

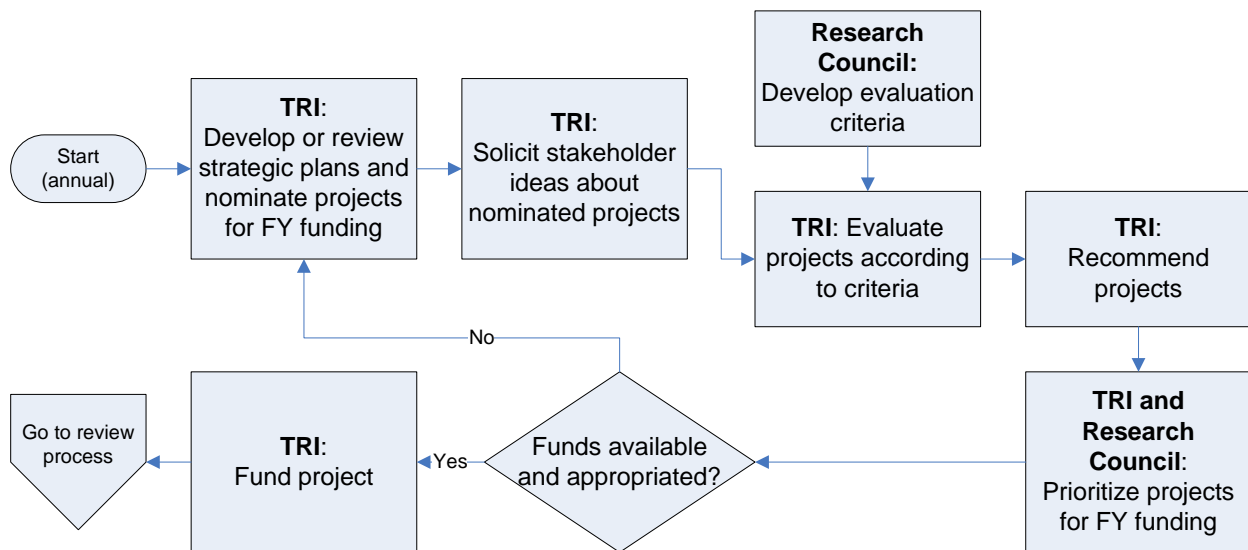


Figure 4-1. Flow Diagram for Selection of Research Projects

As shown in the figure, the annual process begins with the development or review of the strategic plans for TRI's major research areas to nominate pre-identified research projects for FY funding. TRI will then solicit ideas about the nominated projects from its primary stakeholders, including transit agencies, manufacturers, and university centers. Next, TRI will evaluate the proposed research projects using criteria established by the Research Council. These criteria may include, for example, grantee capabilities, immediate need, estimated cost, anticipated progress in one year, overall likelihood of success, and potential for near-term application.

TRI will present the projects that received favorable evaluations to the Research Council. TRI and the Research Council will prioritize projects for FY funding considering such factors as importance or need, funds available, grantee capabilities, and political climate. Those projects that are nominated but not funded in any given year may be nominated again in subsequent years.

## 5.0 FTA RESEARCH PROJECTS

This section is organized by FTA's strategic research goals and objectives, and includes a list of active and planned projects. Except for the EDSP projects identified in objective 3.4, potential future projects were deferred from listing in this year's Program Plan pending implementation of the new project development process.

Also different from previous years, this year's Program Plan contains only research or research-related projects. SAFETEA-LU allowed funding for a variety of activities beyond research, including training programs and technical assistance. These projects along with research projects that do not support TRI's current goals and objectives are presented in Table 5-12.

This section describes FTA's research objectives and provides individual tables of active and potential future FTA research projects for each objective. Although a project may address several objectives, it is mapped to only the primary objective to avoid duplication in the tables.

The tables do not include projects that were recently closed-out or that are in the closing stages as of this document (October 2008). The tables also do not include individual projects undertaken by UTCs or the training courses carried out by NTI. The funding levels for these programs are provided in Appendix A. The tables contain the following information:

**FTA Office** – The FTA offices that manage projects include:

- Office of Research, Demonstration, and Innovation (TRI)
- Office of Administrator (TOA)
- Office of Chief Counsel (TCC)
- Office of Communications and Congressional Affairs (TCA)
- Office of Civil Rights (TCR)
- Office of Administration (TAD)
- Office of Program Management (TPM)
- Office of Budget and Policy (TBP)
- Office of Planning and Environment (TPE)
- Regional Offices (TRO)

**Funding Source** – Funding for research projects is from the following sources within the DOT:

- International Mass Transportation Program Income (International)
- National Research and Technology Program (FTA Research)
- FTA Capital Program (FTA Capital)
- FTA National Fuel Cell Bus Program (FTA Capital)
- Federal Highway Administration (FHWA)
- ITS Joint Program Office (ITS-JPO)
- FTA Oversight (Oversight)
- Transit Cooperative Research Program (TCRP)

**Funding Levels** – Funding levels indicate total project funding if a project has discreet start and end dates. Funding levels for ongoing projects are on a per year basis. Funding levels in FY 2009 or later are estimated and are based on Congressional appropriations and FTA’s discretion. Earmarked projects are also indicated.

**Period of Performance** – Ongoing projects are projects that are expected to continue throughout the period of this plan. They include research program management activities.

## **Goal 1. Provide National Transit Research Leadership**

### ***Objective 1.1 Provide Vision and Prepare the Nation for Transit Advancements***

As the only federal agency with responsibility for assuring the growth and vigor of the nation’s transit systems, FTA has the responsibility for addressing transit research from a national perspective. Part of that role includes understanding the future of transit in the nation and providing a national vision for its advancement. Another part of that role is identifying needed transit research so that the vision can be realized. A third part is providing leadership and vision for transit agencies and other stakeholders to develop and adopt innovative techniques, processes, and technologies to advance public transit. Table 5-1 presents current and future projects supporting Objective 1.1.

**Table 5-1. Objective 1.1 Provide Vision and Prepare the Nation for Transit Research Advancements**

FTA Office	Project Title and Description	Funding Source	Funding Level	Period of Performance
TRI-02	<p><b>Transit Research Analysis Committee</b> Run by the TRB, TRAC provides an independent review and assessment of the needs of the public transportation industry that could be met through future investment in a national research and technology program. TRAC advises FTA as the agency develops a strategic agenda for transit research and assists in identifying the roles that FTA and industry stakeholders could play in carrying out that agenda.</p>	FTA Research	\$200,000 per year	<b>Ongoing</b> Aug 2004 to Dec 2009
TRI-02	<p><b>Strategic Analysis Technical Support Project</b> Provide technical support for planning and implementing an annual research grantee workshop, developing and updating the Multi-Year Research Program Plan, and developing the Annual Research Report. The Multi-Year Program Plan outlines the types of analysis, development, and implementation projects FTA needs to carry out over the next five years.</p>	FTA Research	\$210,000 per year	<b>Ongoing</b> Feb 2006 to Dec 2009
TRI-02	<p><b>Strategic Research Plan Update</b> Update Strategic Research Plan to align with new FTA Strategic Plan.</p>	FTA Research	TBD	<b>Starts FY09</b> 2009 to 2010

**Objective 1.2 Explore Strategic Partnerships to Achieve Transit Research Goals**

Because FTA’s research funds are limited, FTA must contribute to, leverage, and build upon the research of others to achieve its goals. Many government and non-government entities are engaged in research with potential application to transit, and FTA already has strategic research partnerships with many of them, including DOT, RITA, other DOT modal administrations, FRA, ITS JPO, and FHWA. TRI plans to increase outreach efforts to better communicate and coordinate with transit research stakeholders and validate research needs. As projects and activities under this objective are carried out directly by TRI personnel, no projects are currently listed for Objective 1.2.

**Objective 1.3 Synthesize Research Results to Provide Useful Bodies of Knowledge for Transit Industry Decision Makers and to Shape the National Research Agenda**

Objective 1.3 establishes FTA as the information clearinghouse and center of excellence for synthesizing research data into organized and accessible bodies of knowledge that transit agencies can use in decision making and that the FTA can use in setting the national transit research agenda. FTA’s 2006 update of the *Advanced Public Transportation Systems: The State of the Art*<sup>11</sup> report is an example of such a synthesis of Intelligent Transportation System (ITS) applications for public transit in the United States. It was developed specifically to increase the transit community’s knowledge of new opportunities, as well as problems, in applying advanced technologies to public transit services.

FTA recognizes the need to develop similar bodies of knowledge in other research areas. Once these bodies of research knowledge are created, they will be useful not only to the transit industry in decision making, but also to TRI staff as they develop and select new research projects, to avoid duplicating existing research and to assure that the highest priority research is undertaken. Table 5-2 presents current projects supporting Objective 1.3.

**Table 5-2. Objective 1.3 Synthesize Research Results to Provide Useful Bodies of Knowledge for Transit Industry Decision Makers and to Shape the National Research Agenda**

FTA Office	Project Title and Description	Funding Source	Funding Level	Period of Performance
TRI-11	<b>Advanced Public Transportation Systems (APTS) Information Exchange – APTA Best Practices Workshops</b> Support APTA for the provision of ITS Best Practices Workshop (two or three per year) and dissemination of ITS Transit information to the industry.	ITS-JPO	\$50,000 per year	Ongoing
TRI-20	<b>TRB Core Technical Activities Program</b> Support TRB activities, including public transportation sessions at the TRB annual meeting, committee meetings, and the dissemination of publications. Support the Transportation Research Information Service (TRIS).	FTA Research	\$200,000 per year	Ongoing
<b>TCRP</b>				
TRI-20	<b>TCRP Research Dissemination and Information (J-01)</b>	TCRP	\$750,000 per year	Ongoing

<sup>11</sup> FTA-NJ-26-7062-06.1.

## Goal 2. Support Increasing Transit's Market Share

### Objective 2.1 Identify Methods to Increase Transit System Capacity

Objective 2.1 addresses improving transit system capacity, which includes improving workforce recruitment and capabilities, developing and strengthening transit manufacturers and suppliers, adopting new and better planning and forecasting technologies, increasing operational efficiencies, increasing vehicle numbers and infrastructure, increasing overall system throughput, and exploring innovative financing. This objective is focused on ensuring that transit system capacity exists to accommodate increasing ridership. Table 5-3 presents current projects supporting Objective 2.1.

**Table 5-3. Objective 2.1 Identify Methods to Increase Transit System Capacity**

FTA Office	Project Title and Description	Funding Source	Funding Level	Period of Performance
TRI	<b>Rail System Capacity Improvement Study</b> Examine the costs and improvements to the infrastructure that could support the largest growth in ridership.	FTA Research	\$300,000	<b>Starts FY08</b>
TRI	<b>Communication Based Train Control (CBTC) Before/After Cost Effectiveness Study</b> Collect and analyze cost/benefit information for CBTC systems. CBTC systems permit more efficient operations by allowing trains to operate at closer headways with appropriate safety protection.	FTA Research	\$200,000	<b>Starts FY08</b>
TBP	<b>Transit Infrastructure Needs Report (Rail Modernization Study)</b> Review past funding levels, investment needs, and asset management strategies to evaluate future funding options.	FTA Research	\$218,000	<b>Starts FY08</b>
TBP	<b>Transit Conditions and Performance Report</b> Support data collection to enhance the accuracy of the transit economic requirements model (TERM), and support updating and running TERM for the Report.	FTA Research	\$300,000 per year	<b>Ongoing</b> 2006 to 2008
TRI-20	<b>Shared Track – Safe Transit Operations</b> Develop parameters for a future rail shared use demonstration and three case studies on equivalent safety analysis of shared track operations.	FTA Research	\$500,000	<b>Starts FY08</b> 2008 to 2009
<b>National Transit Institute</b>				
TRI-30	<b>National Transit Institute</b> Develop and deliver training courses for the transit industry; establish performance outcomes for measuring effectiveness of training; develop alternative delivery methods for selected courses; implement a project management system; and develop and implement a strategic marketing plan.	NTI Earmark	\$4,300,000 per year	<b>SAFETEA-LU</b> 2006 to 2009

**Table 5-3. Objective 2.1 Identify Methods to Increase Transit System Capacity (Continued)**

FTA Office	Project Title and Description	Funding Source	Funding Level	Period of Performance
<b>Development</b>				
TRI-20	<b>Portland Streetcar Prototype Purchase and Deployment</b> Develop a new Streetcar.	FTA Research Earmark	\$1,000,000 per year	<b>SAFETEA-LU</b> 2006 to 2009
<b>TCRP</b>				
TRI-20	<b>Transit Bus Mechanics: Building for Success--The ASE Transit Bus Maintenance Certification Test Series (E-06)</b>	TCRP	\$450,000 (04) \$300,000 (05) \$300,000 (07) \$275,000 (08)	<b>Ongoing</b>
TRI-20	<b>Extending and Deepening National Transit Training Standards (E-08)</b>	TCRP	\$250,000	<b>TBD</b>
TRI-20	<b>Establishing a National Transit Industry Rail Vehicle Technician Certification Program (E-07)</b>	TCRP	\$400,000	<b>TBD</b>
TRI-20	<b>A Practice Guide for Recruiting Minorities for Chief Executive Officers at Public Transportation Agencies (F-15)</b>	TCRP	\$250,000	<b>TBD</b>
TRI-20	<b>Addressing Critical Shortfalls: Recruitment, Development, and Retention of High-Quality Managers for Public Transportation Systems (F-14)</b>	TCRP	\$250,000	<b>TBD</b>
TRI-20	<b>State and National Transit Investment Analysis: Additional Analyses for AASHTO Bottom Line Report and Related APTA Reports (H-33)</b>	TCRP	\$100,000	<b>Ends FY09</b> Oct 2007 to Oct 2008
TRI-20	<b>Reinventing the Interstate: A "New Paradigm" for Multimodal Transportation Facilities (H-36)</b>	TCRP	\$350,000	<b>Ends FY09</b> Oct 2007 to Apr 2009
TRI-20	<b>Joint Track-Related Research With the Association of American Railroads/TCC, Inc. (D-07)</b>	TCRP	\$250,000	<b>Ongoing</b>

**Objective 2.2 Investigate Methods to Reduce the Time Needed to Plan and Build Infrastructure**

Because infrastructure planning and construction take a long time, they can reduce transit systems' ability to grow significantly in a timely manner to accommodate growth in market share. Objective 2.2 addresses exploring options for speeding up planning and completion of expansion projects and construction projects in general. This objective is new for FTA research and currently has no projects aligned with it. Projects aligned with this objective will be considered in the FY 2010 development cycle.

**Objective 2.3 Perform Research to Improve the Rider Experience**

Objective 2.3 addresses gaining a better understanding of 1) public perceptions and attitudes toward transit and 2) riders' experience and desires as transit customers. Research in this area examines why some individuals choose to ride transit and others do not, and addresses how to better serve existing passengers as well as attract and maintain new ones.



FTA funds research to analyze and evaluate how transit operating practices affect ridership. Ongoing research examines new forms of transit service, parking policies, fare strategies, and service design to determine which have the potential to attract new and retain existing customers. Table 5-4 presents current projects supporting Objective 2.3.

**Table 5-4. Objective 2.3 Perform Research to Improve the Rider Experience**

FTA Office	Project Title and Description	Funding Source	Funding Level	Period of Performance
<b>Transit Intelligent Transportation Systems</b>				
TRI-11	<b>Universal Transit Farecard Standards Support</b> Facilitate the committees and subcommittees for APTA's Universal Transit Farecard Stakeholders (UTFS) Program to develop and implement guidelines, standards, and recommended practices to assist in achieving regional standardization for transit systems' planning, designing, procuring, and implementing revenue management programs.	ITS-JPO	\$250,000	<b>Ends FY09</b> Apr 2006 to Oct 2008
TRI-11	<b>Door-to-Door Multimodal Trip Planning Demonstration</b> Develop and demonstrate a Multimodal Trip Planner System at the Regional Transportation Authority to provide regional coverage of the six-county RTA region of Northeast Illinois.	ITS-JPO	\$1,080,000	<b>Ends FY09</b> Oct 2004 to Dec 2009
TRI-11	<b>WMATA Lot-Full Signs</b> The Washington Metropolitan Area Transit Authority (WMATA) will 1) upgrade communications links between bus control center and bus supervisors, 2) demonstrate automatic capacity notification at parking garages, 3) develop a fare clearinghouse, and 4) provide real-time and static information to employees who are in direct contact with transit customers.	ITS-JPO <b>Earmark</b>	\$1,250,000	<b>Ends FY09</b> Dec 2000 to Dec 2008
TRI-11	<b>ITS Pilot Project</b> Support The Ohio State University in researching ITS applications to advance the knowledge or practice of public transit planning and operations. This program is still under development.	FTA Research <b>Earmark</b>	\$465,000 per year	<b>SAFETEA-LU</b> 2006 to 2009
TRI-11	<b>Cleveland – Integrated Center for Multimodal Services</b> The Greater Cleveland Regional Transit Authority will design, construct, and operate a Traffic Management and Integrated Communications Center to provide multimodal transportation services.	ITS-JPO <b>Earmark</b>	\$791,469	<b>Ends FY09</b> Apr 2001 to Dec 2008
TBP	<b>National Household Travel Survey (NHTS)</b> Conduct periodic telephone survey of 20,000+ households.	FTA Research	\$200,000	<b>Starts FY08</b> 2008 to 2009
TBP	<b>National Household Travel Survey-Non Response Bias</b> Support NHTS Federal surveys failing to achieve certain response levels.	FTA Research	\$100,000	<b>Starts FY08</b> 2008 to 2009

**Table 5-4. Objective 2.3 Perform Research to Improve the Rider Experience (Continued)**

FTA Office	Project Title and Description	Funding Source	Funding Level	Period of Performance
<b>Bus Rapid Transit</b>				
TRI-11	<b>Vehicle Guidance and Accessibility</b> Evaluate vehicle guidance technologies (i.e., lane keeping technologies) to determine their operational issues and effectiveness.	FTA Research	\$1,300,000	<b>Starts FY08</b> 2008 to 2009
TRI-12	<b>National Bus Rapid Transit Institute</b> Facilitate the sharing of knowledge and innovation for increasing the speed, efficiency, and reliability of high-capacity bus service through the implementation of BRT systems in the United States. Serve as a resource to transportation professionals, consultants, and the transit community.	FTA Research <b>Earmark</b>	\$1,750,000 per year	<b>SAFETEA-LU</b> 2006 to 2009
TRI-12	<b>Advanced Technology Bus Rapid Transit</b> Collect and analyze advanced vehicle data, alongside data on existing vehicles, to provide operating cost, performance, and reliability comparisons of advanced vehicles over a range of seasonal operating conditions. These data will aid transit planners and operators in making effective vehicle selections, and in finding the best use of these vehicles.	FTA Research <b>Earmark</b>	\$495,000 – 06 \$540,000 – 07 \$550,000 – 08 \$625,000 – 09	<b>SAFETEA-LU</b> 2006 to 2009
TRI	<b>Incremental BRT: Research of Concept and Demonstration</b> Examine costs and benefits of incremental BRT strategies.	FTA Research	\$250,000	<b>Starts FY08</b>

### **Goal 3. Support Improving the Performance of Transit Operations and Systems**

Goal 3 addresses FTA’s plans to seek methods to facilitate and improve the monitoring and maintenance of transit infrastructure, including the development of improved and integrated maintenance and management systems to monitor the state of defects and repairs on transit systems.

Adequately maintaining transit infrastructure, both real estate and vehicle assets, in the face of increasing budgetary pressure to delay maintenance is challenging. The riding public, who demand safe, clean, and operationally reliable systems, constantly reminds transit agencies of the need to use the latest methods to keep their capital assets in top condition.

#### **Objective 3.1 Perform Research to Improve Capital and Operating Efficiencies**

Over the past 15 years, transit construction and operating costs have escalated rapidly. The American Association of State Highway and Transportation Officials (AASHTO) estimated that construction costs increased nearly 30% between 1993 and 2006 and projected that they will rise to nearly 50% by 2010. These escalating capital costs are severely impeding transit agencies ability to meet the growing demand for bus and rail service.

Objective 3.1 explores ways to improve capital costs and efficiencies. Reducing and controlling the capital costs of both infrastructure and vehicles helps assure that capital projects are completed on time and within budget, and that increasing ridership can be accommodated. Research is needed to determine better ways to control costs through improved design and improved cost control methods.

Transit operations also face considerable challenges to controlling operating and maintenance costs. Objective 3.1 addresses operational efficiencies in bus, light rail, heavy rail, and demand response operations. Taking inflation into account, between 1997 and 2006, total operating expenses increased nearly 38% to a total of \$24.6 billion.<sup>12</sup> This increase was due primarily to the addition of new systems. To improve operational efficiencies, the transit industry needs information to make appropriate decisions on technologies as well as service operations. FTA will examine methods and technologies to improve fleet operations, mobility management, and ITS. Research is also planned for improving the efficiency of demand response services.

Despite multi-billion dollar subsidies and frequent fare increases, many transit agencies face increasing operating deficits, with some near financial collapse. New low-cost technologies for transit must be identified, developed, tested, and deployed. FTA will examine the role of technology, particularly ITS, in improving operational efficiency. Table 5-5 presents current projects supporting Objective 3.1.

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<sup>12</sup> 2006 *National Transit Summaries and Trends*, p.17. Figures indexed for inflation, constant 2000 dollars).

**Table 5-5. Objective 3.1 Perform Research to Improve Capital and Operating Efficiencies**

FTA Office	Project Title and Description	Funding Source	Funding Level	Period of Performance
<b>General Research</b>				
TBP	<b>Performance Management Outreach</b> In cooperation with APTA and transit agencies, provide outreach to develop potential performance management goals for the transit industry.	FTA Research	\$285,000	<b>Starts FY08</b>
TRI-20	<b>Third Rail Insulator Cleaning</b> This SBIR project examines the feasibility of cleaning third rail insulators with high-pressure water jets or focused intense lights.	FTA Research (SBIR)	\$200,000	<b>Ends FY08</b> Jan 2008 to Sep 2008
TRI-20	<b>Analysis of Monitoring Tools</b> Develop a cost/benefit analysis tool for use by individual train operators to assess opportunities for implementing performance monitoring technologies.	FTA Research	\$90,000	<b>Starts FY08</b>
<b>Standards Development</b>				
TRI-30	<b>Maintain and Develop Transit Standards</b> Develop, implement, and maintain identified, cost-effective transit standards, recommended practices, and design guidelines to achieve safety, reliability, and efficiency in transit system design and operation.	FTA Research	\$4,000,000	<b>Ongoing</b> 2005 to 2009
TRI-11	<b>UTFS Facilitation</b> Facilitate the committees and subcommittees of APTA's Universal Transit Farecard Stakeholders (UTFS) Program.	ITS-JPO	\$100,000	<b>Ends FY09</b> Apr 2006 to Oct 2008
TRI-11	<b>Transit Communications Interface Profile (TCIP)</b> Develop TCIP dialogues, document the dialogues, and submit them to an open consensus process via an APTA Technical Committee.	ITS-JPO	\$3,096,300	<b>Ends FY09</b> Aug 2001 to Oct 2008
TRI-11	<b>TCIP TIRCE Development</b> APTA is building a software tool, "TIRCE," to help transit agencies navigate the TCIP standard and generate specifications for TCIP subsystems. TIRCE is based on "Turbo Tax" for completing income tax filings.	ITS-JPO	\$155,000	<b>Ends FY09</b> April 2006 to Oct 2008
TRI-11	<b>TCIP Program Management/Tech. Costs</b>	ITS-JPO	\$100,000	<b>Ends FY09</b> Apr 2006 to Oct 2008
<b>Transit Intelligent Transportation Systems</b>				
TRI-11	<b>California Smart Traveler (EDAPTS)</b> Make ITS more available to small transit systems. Perform a hands-off test deployment of EDAPTS in San Luis Obispo, California.	FTA Research	\$1,520,000	<b>Ends FY09</b> Oct 1992 to Feb 2009
<b>Bus Programs</b>				
TRI-12	<b>BusSolutions Prototype</b> Develop lightweight modular manufacturing techniques to reduce the capital and maintenance costs of buses while improving fuel economy and reducing emissions.	FTA Capital & Research Earmark	\$693,000 & \$1,446,930	<b>Ends FY09</b> Sep 2006 to May 2009

**Table 5-5. Objective 3.1 Perform Research to Improve Capital and Operating Efficiencies  
(Continued)**

<b>FTA Office</b>	<b>Project Title and Description</b>	<b>Funding Source</b>	<b>Funding Level</b>	<b>Period of Performance</b>
<b>Bus Testing</b>				
TRI-12	<b>Bus Testing</b> The Pennsylvania Transportation Institute operates and maintains the Altoona Bus Testing Center to test new bus models for maintainability, reliability, safety, performance (including braking performance), structural integrity, fuel economy, emissions, and noise in accordance with 49 Code of Federal Regulations (CFR) Part 665.	FTA Capital Earmark	\$3,000,000 per year	<b>SAFETEA-LU</b> 2006 to 2009
<b>TCRP</b>				
TRI-20	<b>Practical Measures to Increase Transit Industry Advertising Revenues (B-33)</b>	TCRP	\$285,000	<b>TBD</b>
TRI-20	<b>Methodology for Performance Measurement and Peer Comparison in the Public Transportation Industry (G-11)</b>	TCRP	\$300,000	<b>TBD</b> 21 Months
TRI-20	<b>Passenger Counting Technologies and Procedures Update</b>	TCRP	\$25,000	<b>Ends FY09</b> Sep 2007 to Oct 2008
TRI-20	<b>A Guide for Implementing Bus-On-Shoulder Systems (D-13)</b>	TCRP	\$200,000	<b>Ends FY08</b> Sep 2006 to Mar 2008
TRI-20	<b>Transit Call Centers and 511: A Guide for Decision Makers (A-31)</b>	TCRP	\$250,000	<b>Ends FY08</b> Dec 2006 to Aug 2008
TRI-20	<b>Industry Assessment of Radio Frequency and Wireless Data Systems (C-18)</b>	TCRP	\$225,000	<b>TBD</b>
TRI-20	<b>Operation of Light Rail Transit through Ungated Crossings at Speeds over 35 mph (A-32)</b>	TCRP	\$295,000	<b>TBD</b>

**Objective 3.2 Perform Research to Improve Transit Planning and Forecasting**

Objective 3.2 addresses research for improving transit planning and forecasting. It includes research for:

- Developing and implementing more efficient and cost effective operating regimes, for example, for paratransit
- Optimizing operations outside of peak hours, for example, for full-size buses
- Developing and testing forecasting models
- Developing and demonstrating transit-oriented design and planning concepts
- Exploring innovative financing options for sustainable funding, including public-private partnerships to supplement federal funding.

Table 5-6 presents current projects supporting Objective 3.2.

**Table 5-6. Objective 3.2 Perform Research to Improve Transit Planning and Forecasting**

<b>FTA Office</b>	<b>Project Title and Description</b>	<b>Funding Source</b>	<b>Funding Level</b>	<b>Period of Performance</b>
<b>General Research</b>				
TPM	<b>FTA Rail Cost Database Update and Training</b> Provide information on past rail costs and analysis of cost drivers and requirements for commuter rail systems.	FTA Research	\$250,000	<b>Starts FY08</b>
TPE	<b>The Taxi Cab, Limousine and Paratransit Association Partnership Project</b> Assist private transportation operators in becoming more involved in the Metropolitan Planning Organization, state department of transportation, and transit agencies' planning process.	FTA Research	\$200,000 per year	<b>Starts FY08</b>
TPE	<b>Center for Transit Oriented Development</b> Develop standards and definitions for transit-oriented development adjacent to public transportation facilities. Develop system planning guidance, performance criteria, and modeling techniques, and provide research and technical assistance.	FTA Research <b>Earmark</b>	\$1,000,000 per year	<b>SAFETEA-LU 2006 to 2009</b>
<b>Planning</b>				
TPE	<b>Improve New Starts Forecasts</b> Continued improvement of methods and tools for technical planning activities, such as travel demand forecasting analyses, and development of refinements to New Starts criteria measurements.	FTA Research	\$1,550,000	<b>Ongoing 2005 to 2009</b>
TPE	<b>Public Transportation Participation Pilot Program</b> Support for planning and public transportation activities related to public transportation projects, such as data collection and communication and coordination.	FTA Research <b>Earmark</b>	\$1,000,000 per year	<b>SAFETEA-LU 2006 to 2009</b>
<b>TCRP</b>				
TRI-20	<b>Local and Regional Funding Mechanisms for Public Transportation (H-34)</b>	TCRP	\$250,000	<b>Ends FY09</b> Aug 2006 to Nov 2008
TRI-20	<b>Methodology for Determining the Economic Development Impacts of Transit Projects (H-39)</b>	TCRP	\$400,000	<b>TBD</b>
TRI-20	<b>Controlling System Costs: Basic and Advanced Scheduling Manuals and Contemporary Issues in Transit Alignments (A-29)</b>	TCRP	\$375,000	<b>Ends FY08</b> Jul 2006 to Jan 2008
TRI-20	<b>Guidebook for Estimating "Soft Costs" for Major Public Transportation Capital Infrastructure Projects (G-10)</b>	TCRP	\$300,000	<b>Ends FY09</b> Aug 2007 to Feb 2009
TRI-20	<b>A Guide for Planning and Operating Flexible Public Transportation Services (B-35)</b>	TCRP	\$300,000	<b>Ends FY09</b> Aug 2007 to Feb 2009
TRI-20	<b>Characteristics of Premium Transit Services that Affect Choice of Mode (H-37)</b>	TCRP	\$375,000	<b>Ends FY11</b> Dec 2007 to Oct 2010
TRI-20	<b>Ground-Borne Noise and Vibration in Buildings Caused by Rail Vehicles (D-12)</b>	TCRP	\$425,000	<b>Ends FY09</b> Sep 2005 to Apr 2009
TRI-20	<b>Guidelines for Ferry Transportation Services – A National Overview (H-40)</b>	TCRP	\$200,000	<b>TBD</b>
TRI-20	<b>Guidelines for Providing Access to Public Transportation Stations (B-38)</b>	TCRP	\$500,000	<b>TBD</b>

### **Objective 3.3 Perform Research to Improve Mobility, Rural Services, and Services for Targeted Populations**

The U.S. population is changing rapidly, becoming older and more diverse. Within the next 20 years, more people will drive less and have a greater need to be closer to necessary services. Public transit systems that fail to accommodate this transition will not adequately serve the nation's populace, especially in rural areas.

Public transit is important for rural America's 30 million transit-dependent persons, not only older Americans, but also low-income families, and people with disabilities. However, currently, 40% of America's rural populations have no access to public transit, and another 25% have very little access.<sup>13</sup>

Objective 3.3 addresses cost-effective transit service in rural areas as well as services for targeted populations and their diverse public transportation needs and interests. Research focuses on cost-effective methods to provide service to rural and targeted populations. Investigations of "universal design" for targeted populations and mainstream service technologies also fit under this objective.

Research is needed to determine a reasonable stratification of rural transit services and logical approaches to providing transit services in rural areas with different characteristics and requirements. Additionally, research is needed to examine appropriate vehicles and technologies, such as ITS and appropriately sized and designed buses.

Continued research and testing to improve coordination among different service providers is needed to deploy coordinated transportation management centers for wide use by rural public transit providers. Additionally, better methods are needed for communicating best practices and cost-effective ways to operate and maintain rural transit system services, including use of websites and webinars for rural operators and riders. Table 5-7 presents current projects supporting Objective 3.3.

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<sup>13</sup> American Public Transportation Association. 2008. *2008 Public Transportation Fact Book*. June.

**Table 5-7. Objective 3.3 Perform Research to Improve Mobility, Rural Services, and Services for Targeted Populations**

<b>FTA Office</b>	<b>Project Title and Description</b>	<b>Funding Source</b>	<b>Funding Level</b>	<b>Period of Performance</b>
<b>General Research</b>				
TRI-20	<b>Small Urban and Rural Transportation Center</b> Research at the Small and Urban Rural Transportation Center at North Dakota State University addresses management and institutional issues faced by transit client groups, and technical and operating issues with emphasis on ITS.	FTA Research Earmark	\$800,000 per year 2006-2007 \$1,200,000 per year 2008-2009	<b>SAFETEA-LU</b> 2006 to 2009
TRI-11	<b>National Center for Transportation Needs of Special Populations</b> The National Center for Transportation Needs of Special Populations (TRANSPON) of Florida International University and the University of Miami supports FTA's United We Ride program by identifying and developing solutions to problems and issues associated with coordinating human services transportation to create a continued, standardized, and uniform database that allows policymakers, stakeholders, and service providers to monitor trends and performance and identify areas for improvement.	FTA Capital Earmark	\$1,713,917	<b>Ends FY10</b> Feb 2006 to Nov 2009
TRI-20	<b>Universal Boarding Device</b> This SBIR project examines a combined lift and ramp for commuter rail cars.	FTA Research (SBIR)	\$600,000	<b>Ends FY09</b>
TCR	<b>Transportation Equity Research Program</b> Conduct research and demonstrate activities that address the impacts of land-use and transportation planning, investment, and operations on low-income and minority populations that are transit- dependent.	FTA Research Earmark	\$1,000,000 per year	<b>SAFETEA-LU</b> 2006 to 2009
TRI	<b>Remote Infrared Audible Signage (RIAS) Support</b> Support the RIAS project with discretionary research.	FTA Research	\$70,000	<b>Starts FY08</b>
TRI-11	<b>Remote Infrared Audible Signage</b> Sound Transit will purchase, install, and demonstrate Remote Infrared Audible Signage (RIAS) technology at various multimodal and regional transit stations, and transit vehicles to provide way-finding and direction information to persons with visual, cognitive, or learning disabilities.	FTA Research Earmark	\$395,000 - 06 \$500,000 per year 07-09	<b>SAFETEA-LU</b> 2006 to 2009



**Table 5-7. Objective 3.3 Perform Research to Improve Mobility, Rural Services, and Services for Targeted Populations (Continued)**

FTA Office	Project Title and Description	Funding Source	Funding Level	Period of Performance
<b>Mobility Services for All Americans</b>				
TRI-11	<b>Travel Management Coordination Center (TMCC), Aiken, South Carolina</b> Plan and design a Travel Management Coordination Center (TMCC) using ITS. Design a national model TMCC that could be replicated anywhere.	FTA Research and ITS-JPO	\$300,032	<b>Ends FY09</b> Feb 2007 to Dec 2008
TRI-11	<b>TMCC, Atlanta Georgia</b> Plan and design a TMCC using ITS. Design a national model TMCC that could be replicated anywhere.	FTA Research and ITS-JPO	\$400,000	<b>Ends FY09</b> Feb 2007 to Dec 2008
TRI-11	<b>TMCC, Camden County, NJ</b> Plan and design a TMCC using ITS. Design a national model TMCC that could be replicated anywhere.	FTA Research and ITS-JPO	\$413,451	<b>Ends FY09</b> Feb 2007 to Dec 2008
TRI-11	<b>TMCC, Fitchburg, MA</b> Plan and design a TMCC using ITS. Design a national model TMCC that could be replicated anywhere.	FTA Research and ITS-JPO	\$298,080	<b>Ends FY09</b> Feb 2007 to Dec 2008
TRI-11	<b>TMCC, Kent, Ohio</b> Plan and design a TMCC using ITS. Design a national model TMCC that could be replicated anywhere.	FTA Research and ITS-JPO	\$321,135	<b>Ends FY09</b> Feb 2007 to Dec 2008
TRI-11	<b>TMCC, Louisville, KY</b> Plan and design a TMCC using ITS. Design a national model TMCC that could be replicated anywhere.	FTA Research and ITS-JPO	\$254,235	<b>Ends FY09</b> Feb 2007 to Dec 2008
TRI-11	<b>TMCC, Orlando, FL</b> Plan and design a TMCC using ITS. Design a national model TMCC that could be replicated anywhere.	FTA Research and ITS-JPO	\$400,000	<b>Ends FY09</b> Feb 2007 to Dec 2008
TRI-11	<b>TMCC, Paducah, KY</b> Plan and design a TMCC using ITS. Design a national model TMCC that could be replicated anywhere.	FTA Research and ITS-JPO	\$319,112	<b>Ends FY09</b> Feb 2007 to Dec 2008

**Table 5-7. Objective 3.3 Perform Research to Improve Mobility, Rural Services, and Services for Targeted Populations (Continued)**

FTA Office	Project Title and Description	Funding Source	Funding Level	Period of Performance
<b>TCRP</b>				
TRI-20	<b>Human Services Transportation Cost Reporting to Facilitate Cost Sharing Agreements (G-09)</b>	TCRP	\$250,000	<b>Ends FY09</b> Oct 2006 to Oct 2008
TRI-20	<b>Guidebook for Commingling ADA-Eligible and Other Passengers on ADA-Complementary Paratransit Services (B-34)</b>	TCRP	\$300,000	<b>Ends FY09</b> Aug 2006 to Oct 2008
TRI-20	<b>Vehicle Operator Recruitment, Retention, and Performance in ADA Complementary Paratransit Services (F-13)</b>	TCRP	\$300,000	<b>Ends FY09</b> Sep 2007 to Mar 09
TRI-20	<b>Improving ADA Complementary Paratransit Demand Estimation – Phase II Regional Travel Demand Forecasting (B-28)</b>	TCRP	\$330,000	<b>Ends FY10</b> May 2008 to May 2010
TRI-20	<b>Tribal Transit Service, Training and Funding Challenges (H-38)</b>	TCRP	\$400,000	<b>TBD</b>
TRI-20	<b>Innovative Rural Transit Routes</b>	TCRP	\$25,000	<b>Ends FY09</b> Oct 2007 Nov 2008
TRI-20	<b>Methods for Estimating Demand and Quantifying Need for Rural Passenger Transportation (B-36)</b>	TCRP	\$300,000	<b>Ends FY09</b> Dec 2007 to Aug 2009
TRI-20	<b>Estimation of Demand for Rural Intercity Bus Services (B-37)</b>	TCRP	\$200,000	<b>Ends FY09</b> Dec 2007 to Dec 2008
TRI-20	<b>Rural Transit Achievements: Assessing the Outcomes of Increased SAFETEA-LU Funding for Rural Passenger Services</b>	TCRP	\$75,000	<b>FY08</b>

**Objective 3.4 Investigate the Use of High-Efficiency Technologies and Alternative Energy Sources**

Objective 3.4 addresses research, development, and demonstration of energy efficient technologies such as hybrid electric and fuel cell bus and rail vehicles as well as the use of alternative fuels for emissions. These clean and efficient technologies are many times required to address emissions standards by the U.S. Environmental Protection Agency (EPA) and state agencies, such as the California Air Resources Board as well as local community pressure.

Certain fuels and technologies can significantly improve operational efficiency. Some technologies involving hybrid-electric and all-electric drive propulsion systems have been commercialized and are being deployed. However, more data are needed on their life-cycle costs and the operational lessons learned. Operational guidelines are also needed to assist transit agencies in the optimal use of these propulsion technologies.

In FY 2008, FTA developed the Electric Drive Strategic Plan (EDSP) for electric drive bus and rail vehicles. The plan established a 20-year vision and a 5-year program for transit electric drive research, beginning in 2010. Figure 5-1 shows the EDSP projects for FY 2010 through FY 2014 in five high-priority program areas: program implementation; vehicle energy management; electrification; bus design; rail energy management; and locomotive design. In addition, all projects are categorized according to research stage as analysis and development, demonstration and validation, or deployment and implementation.

Table 5-8 presents the EDSP projects for FY 2010 through 2014.

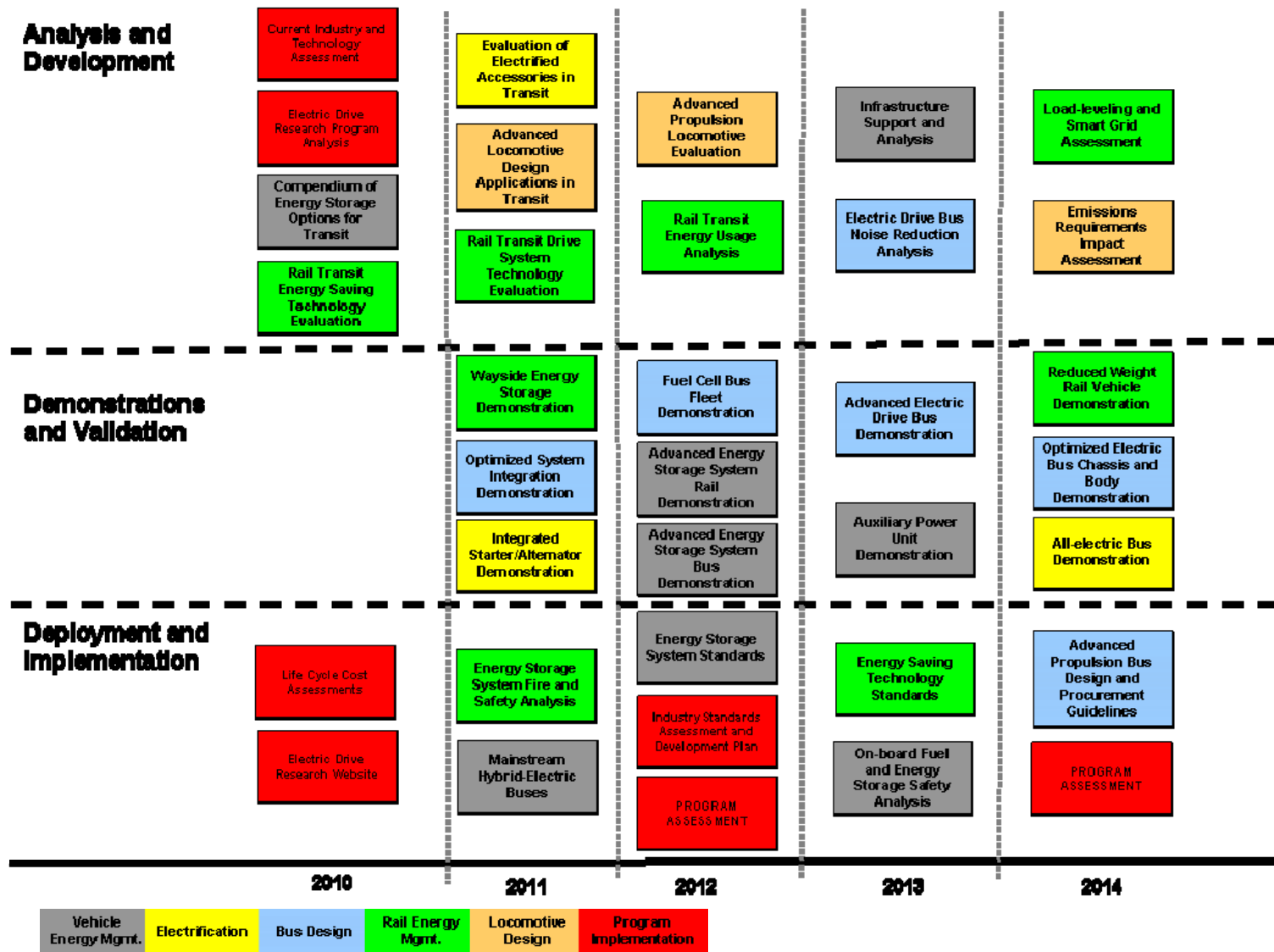


Figure 5-1. Projects within FTA's Electric Drive Program Are Categorized According to Research Stage and Program Area

**Table 5-8. EDSP Program Plan Project Descriptions**

Project Title and Description	Required Completion Date
<b>Program Implementation (P)</b>	
<b>P1. Current Industry and Technology Assessment</b> Provide FTA and transit agencies a thorough report of current state-of-the-art technologies including an analysis of the technical progress of developing technologies and projections for near term advancements. Assist FTA in identifying and prioritizing research needs for electric drive.	FY2010
<b>P2. FTA Electric Drive Research Program Analysis</b> Provide FTA the necessary information and procedures to effectively execute the EDSP.	FY2010
<b>P3. Life Cycle Cost Assessments</b> Provide the industry, specifically transit agencies, the most recent information to allow cost-benefit analyses in developing and purchasing new transit vehicles.	FY2010
<b>P4. Industry Standards Assessment and Development Plan</b> Standards improve the quality and aid in lowering the cost of innovative new technologies, and are an important step in the commercialization process.	FY2012
<b>P5. Web-Based Electric Drive Research Dissemination Tool</b> To ensure FTA research products are useful to the transit industry, remain up-to-date and are readily available.	FY2010
<b>Vehicle Energy Management (V)</b>	
<b>V1. Compendium of Energy Storage Technology Options for Transit</b> Provide FTA and transit agencies an objective source of the most recent information available for vehicle energy storage systems.	FY2010
<b>V2. Development of Performance Interface Standards for Energy Storage Systems</b> Develop and support the use of standards to improve the quality and reduce the cost of advanced energy storage systems for transit vehicles.	FY2012
<b>V3. Demonstration of Advanced Energy Storage Solutions for Transit Buses</b> Facilitate the improvement and validation of advanced vehicle energy storage systems to improve capacity and reliability.	FY2012
<b>V4. Demonstration of Advanced Energy Storage Solutions for Rail Vehicles</b> Facilitate the improvement and validation of advanced vehicle energy storage systems to improve capacity and reliability.	FY2012
<b>V5. Infrastructure Support for Hydrogen and Battery-Dominant Vehicles</b> The successful commercialization of advanced propulsion transit vehicles will require significant new investment in fueling and support infrastructure, which can be mitigated through effective partnerships.	FY2013
<b>V6. Mainstream Commercialization of Hybrid-Electric Buses</b> Support the continued deployment of hybrid-electric transit buses and provide the necessary information and outreach to finalize their commercialization.	FY2011
<b>V7. Evaluation of On-Board Energy and Fuel Safety</b> Address transit agency and public concerns of increasing hydrogen and electricity use in transportation. Assist transit agencies and municipalities in dealing with publicity and insurance barriers to hydrogen deployment.	FY2013
<b>V8. Demonstration of APU for Non-Propulsion Power</b> Improve vehicle efficiency through innovative vehicle energy systems. Assist transit agencies in selecting the most cost-effective propulsion systems.	FY2013

**Table 5-8. EDSP Program Plan Project Descriptions (Continued)**

Project Title and Description	Required Completion Date
<b>Electrification of Accessories (E)</b>	
<b>E1. Evaluation of Electrified Accessories in Transit Use</b> Provide FTA and transit agencies an objective evaluation of current electrified accessories and identify areas for improvement.	FY2011
<b>E2. Demonstration of Integrated Starter/Alternator Technology</b> Produce the information to support independent analysis of the business case for deploying integrated starter/alternators, which have the potential to provide a near-term, low-cost improvement to transit bus efficiency.	FY2011
<b>E3. Demonstration of All-Electric Transit Bus</b> Validate the performance of electrified accessories in different configurations and optimize specifications for different power sources.	FY2014
<b>Bus Design (B)</b>	
<b>B1. Demonstration of Optimized Electric-Drive Bus Chassis and Body</b> Provide transit industry with a cost-benefit of innovative vehicle designs, and encourage bus manufacturers to consider advanced propulsion systems during production.	FY2014
<b>B2. Demonstration of Fuel Cell Bus Fleets</b> Validate and identify further research needs in the commercialization and deployment of fuel cell buses.	FY2012
<b>B3. Demonstration of Optimized System Integration</b> Provide transit industry with objective, real world evaluations and lessons learned to optimize advanced propulsion system integration in transit buses.	FY2011
<b>B4. Measurement and Reduction of Noise in Transit Buses with Electric-Drive Technologies</b> Identify options transit agencies can pursue to reduce vehicle noise where desired, and ensure deploying electric drive technologies does not have reduced safety performance.	FY2013
<b>B5. Advanced Electric Drive Bus Demonstration Program</b> Develop and support alternative advanced low-emission, high-efficiency transit buses to ensure the transit industry is not limited to a single technical pathway and is provided multiple technical options where politically necessary.	FY2013
<b>B6. Development of Advanced Propulsion Transit Vehicle Design and Procurement Guidelines</b> Develop and support the use of standards to improve the quality and reduce the cost of advanced propulsion transit vehicles.	FY2014

**Table 5-8. EDSP Program Plan Project Descriptions (Continued)**

Project Title and Description	Required Completion Date
<b>Rail Energy Management (R)</b>	
<b>R1. Evaluation of New Energy-Saving Technologies for Rail Transit</b> Provide FTA and transit agencies an objective source of the most recent information available for energy saving systems.	FY2010
<b>R2. Component Standardization and analysis of Costs and Benefits of Current Technologies in Various Rail Transit Configurations</b> Provide the transit industry with guidance and standards to facilitate the most cost effective deployment of energy saving technologies for rail transit systems.	FY2013
<b>R3. Synthesis of Available Energy-Saving Drive System Options</b> Provide FTA and transit agencies an objective source of the most recent information available for energy saving systems.	FY2011
<b>R4. Analysis of Fire and High-Voltage Safety for Energy Storage Systems</b> Provide transit agencies and first responders a thorough and user-friendly analysis of fire and safety concerns of electrification issues in rail transit systems.	FY2011
<b>R5. Assessment of Load-Leveling and Smart Grid Research</b> Provide the FTA and transit industry information to support the development of load-leveling technologies for rail transit systems, and define transit's role in deployment of smart grid technologies.	FY2014
<b>R6. Demonstration of Wayside Energy Storage Systems</b> Facilitate the improvement and validation of wayside energy storage systems to improve capacity and reliability.	FY2011
<b>R7. Demonstration of Reduced Weight Energy Recovery, Cooling and Drive Systems</b> Provide the transit industry with lessons learned to facilitate the commercialization of technologies to reduce vehicle weight and increase operational efficiency.	FY2014
<b>R8. Analysis of Rail Energy Use</b> Provide FTA and the transit industry with a thorough analysis of rail transit energy usage to aid in identifying best practices and future research needs.	FY2012
<b>Locomotive Design (L)</b>	
<b>L1. Evaluation of Advanced Propulsion Commuter Rail Locomotives</b> Assess the feasibility of deploying alternatives to diesel locomotives for commuter rail systems.	FY2012
<b>L2. Analysis of Advanced Locomotive Design Applications in Transit</b> Identify the ideal applications for advanced propulsion locomotives in transit systems.	FY2011
<b>L3. Assessment of Required Locomotive and DMU Emissions Control Equipment Impacts</b> Identify the potential impacts on transit agencies of a range of emissions control equipment and regulations.	FY2014

Table 5-9 presents current projects supporting Objective 3.4.

**Table 5-9. Objective 3.4 Investigate the Use of High-Efficiency Technologies and Alternative Energy Sources**

FTA Office	Project Title and Description	Funding Source	Funding Level	Period of Performance
<b>General Research</b>				
TRI-12	<b>Clean Car Sharing and Mobility Program</b> Linked with mass transit, this program will maximize the benefits from existing transportation resources by allowing commuters from dispersed suburban neighborhoods to Car Share (Car Pool) to transit stations, leave their vehicle, and ride mass transit the last link of their trip into the city.	FTA Research Earmark	\$1,948,000	<b>Ends FY09</b> 2006 to Jan 2009
TBP	<b>DOT Center for Climate Change</b> Support the study of the effects of transportation on climate variability and the impacts of climate change on transportation infrastructure.	FTA Research	\$100,000 per year	<b>Ongoing</b>
<b>Bus Programs</b>				
TRI-12	<b>Advanced Transit Technology</b> Support WestStart-CALSTART in conducting Clean Fuels, Clean Propulsion Systems and Transit Enhancement projects for Bus Rapid Transit, Hydrogen and Fuel Cell Bus, Transit Linked Mobility and First Mile Solutions, Advanced Technology Fuels, and Advanced Transportation Technologies Industry Support.	FTA Research Earmark	\$1,980,000	<b>Ends FY09</b> Sep 2006 to Dec 2008
<b>Emissions</b>				
TRI-20	<b>Transit Vehicle Exhaust Emissions Evaluation</b> West Virginia University has an emissions research program that provides public transit agencies, engine and vehicle manufacturers, transit industry associations, government regulatory agencies and other transit industry constituents with information concerning the exhaust emissions of existing and new technology transit vehicles.	FTA Research Earmark	\$6,389,479	<b>Ends FY09</b> Jan 2003 to Dec 2008
TRI	<b>Transit Carbon Management Compendium</b> Examine potential benefits from reducing carbon emissions in transit agency operations.	FTA Research	\$175,000	<b>Starts FY08</b>
<b>Electric Drive</b>				
TRI-12	<b>Hybrid Bus Emission Certification</b>	FTA Research	\$300,000	<b>Ends FY09</b> Dec 2006 to Dec 2008
TRI	<b>Missouri Transportation Institute</b> Support a plug-in electric vehicle demonstration in Kansas City.	FTA Research Earmark	\$1,667,837	<b>Starts FY08</b>
TRI	<b>Hybrid Bus Deployment and Performance Evaluation</b> Provide transit agencies with the results of objective evaluations of the performance of hybrid electric buses.	FTA Research	\$250,000	<b>Starts FY08</b> 2008 to 2009



**Table 5-9. Objective 3.4 Investigate the Use of High-Efficiency Technologies and Alternative Energy Sources (Continued)**

FTA Office	Project Title and Description	Funding Source	Funding Level	Period of Performance
TRI	<b>Energy Storage for Hybrid Electric Buses Assessment</b> Identify best available technologies for energy storage on-board transit vehicles.	FTA Research	\$200,000	<b>Starts FY08</b> 2008 to 2009
TRI	<b>Rail Transit Operating Strategies for Energy Conservation</b> Examine alternative methods for conserving power in transit buses and rail systems.	FTA Research	\$200,000	<b>Starts FY08</b> 2008 to 2009
TRI	<b>Return on Investment of Diesel Electric Energy Storage Technologies</b> Identify state-of-the-art on-board energy storage systems for diesel electric commuter rail systems.	FTA Research	\$150,000	<b>Starts FY08</b>
<b>Fuel Cells</b>				
TRI-12	<b>Dual Variable Output Fuel Cell Hybrid Bus Validation and Testing Center for Transportation and Environment</b> Develop battery-dominant 35-foot plug-in hybrid fuel cell bus (Hydrogenics) and demonstrate it in Birmingham, Columbia, SC, and in cities in CT.	FTA Capital: National Fuel Cell Bus Program	\$5,668,000	<b>SAFETEA-LU</b> 2006 to 2009
TRI-12	<b>Survey and Analysis of Bus Demonstrations Center for Transportation and Environment</b> Document and analyze bus demonstrations around the world from 2002-2007.	FTA Capital: National Fuel Cell Bus Program	\$84,000	<b>SAFETEA-LU</b> 2006 to 2009
TRI-12	<b>Fuel Cell Bus Demonstration Northeast Advanced Vehicle Consortium</b> Advanced bus development and in-service evaluation of hybrid 40-foot fuel cell buses. Enhanced UTC 120 kW Proton exchange membrane fuel cell with upgraded seals, catalysts, bipolar plates, balance of plant.	FTA Capital: National Fuel Cell Bus Program	\$8,355,000	<b>SAFETEA-LU</b> 2006 to 2009
TRI-12	<b>Lightweight Fuel Cell Hybrid Bus Northeast Advanced Vehicle Consortium</b> Develop advanced propulsion system and integrate on mule bus, then lightweight bus platform with field evaluation. Ballard Mark 1100 Light Duty fuel cell Module, (75 kW) with ultracapacitors or Lithium-ion batteries.	FTA Capital: National Fuel Cell Bus Program	\$6,695,000	<b>SAFETEA-LU</b> 2006 to 2009
TRI-12	<b>MA Hydrogen Fuel Cell Powered Bus Fleet Northeast Advanced Vehicle Consortium</b> Advanced bus development and in-service demonstration. Integrate Nuvera 82 kW fuel cell with rive system from ISE Corp. and advanced energy storage. Demonstration includes Nuvera's novel PowerTap refueling infrastructure.	FTA Capital: National Fuel Cell Bus Program	\$4,875,000	<b>SAFETEA-LU</b> 2006 to 2009

**Table 5-9. Objective 3.4 Investigate the Use of High-Efficiency Technologies and Alternative Energy Sources (Continued)**

<b>FTA Office</b>	<b>Project Title and Description</b>	<b>Funding Source</b>	<b>Funding Level</b>	<b>Period of Performance</b>
TRI-12	<b>Fuel Cell Bus Program Northeast Advanced Vehicle Consortium</b> Develop and demonstrate 40-foot buses, one prototype and one pre-commercial bus for up to 2 years. Bus may benefit from similar design to 2010 BC Transit design for Olympics. Next generation Ballard 155 KW automotive fuel cell stack (Mk902) in hybrid configuration with ISE drive ultracapacitors or batteries.	FTA Capital: National Fuel Cell Bus Program	\$6,120,000	<b>SAFETEA-LU</b> 2006 to 2009
TRI-12	<b>American Advanced Fuel Cell Bus Program – Weststart-CALSTART</b> Design and demonstrate 40-foot fuel cell bus with design improvements; in service evaluation in hot desert climate.	FTA Capital: National Fuel Cell Bus Program	\$2,832,000	<b>SAFETEA-LU</b> 2006 to 2009
TRI-12	<b>Compound Fuel Cell Hybrid Bus for 2010 – Weststart-CALSTART</b> Develop 40-foot fuel cell bus with fuel cell auxiliary power unit coupled with diesel engine. Demonstrate for one year at San Francisco MUNI.	FTA Capital: National Fuel Cell Bus Program	\$5,350,000	<b>SAFETEA-LU</b> 2006 to 2009
TRI-12	<b>AC Transit HyRoad: Commercialization of Fuel Cells for Public Transit Weststart-CALSTART</b> Accelerated testing to failure (partial phase 1) of existing fuel cell buses. Partners include Alameda-Contra Costa Transit District	FTA Capital: National Fuel Cell Bus Program	\$3,575,000	<b>SAFETEA-LU</b> 2006 to 2009
TRI-12	<b>Hybrid Fuel Cell Power Converter – Weststart-CALSTART</b> Design and bench-test bi-directional, DC-DC converter for reduced cost, weight, and volume.	FTA Capital: National Fuel Cell Bus Program	\$152,550	<b>SAFETEA-LU</b> 2006 to 2009
TRI-12	<b>Integrated Auxiliary Module for Fuel Cell Buses – Weststart-CALSTART</b> Design, fabricate, and bench test Integrated Auxiliary Module.	FTA Capital: National Fuel Cell Bus Program	\$138,450	<b>SAFETEA-LU</b> 2006 to 2009
TRI-12	<b>National Fuel Cell Bus Program Support</b> Provide program support for the National Fuel Cell Bus Program.	FTA Research	\$1,245,000	<b>Ends FY09</b> Jan 2004 to Jan 2009
TRI-12	<b>Greater New Haven Transit District Fuel Cell Powered Bus Research</b> Design and develop two hydrogen-powered buses and related infrastructure for revenue service in New Haven, Connecticut.	FTA Research <b>Earmark</b>	\$482,130 – 06 \$540,000 – 07 \$550,000 – 08 \$625,000 – 09	<b>SAFETEA-LU</b> 2006 to 2009
TRI-12	<b>Alabama Fuel Cell Vehicle Consortium</b> Develop a 30-foot fuel cell bus.	FTA Capital <b>Earmark</b>	\$1,980,630	<b>Ends FY09</b> Sep 2004 to Jun 2009

**Table 5-9. Objective 3.4 Investigate the Use of High-Efficiency Technologies and Alternative Energy Sources (Continued)**

FTA Office	Project Title and Description	Funding Source	Funding Level	Period of Performance
TRI-12	<b>Delaware Auto Fuel Cell Vehicle Consortium</b> The Delaware Automotive Fuel Cell Consortium, the University of Delaware, the Electric Power Research Institute, and the Delaware Transit Corporation, will conduct research to design, build, operate and test an automotive-based fuel cell transit vehicle. The project is testing an Ebus 22 ft battery electric containing a Ballard 19.3 KW fuel cell stack.	FTA Capital Earmark	\$2,942,608	<b>Ends FY09</b> Aug 2005 to Oct 2008
TRI-12	<b>Phase 1 Hydrogen Powered Vehicles</b> To increase ridership and reduce pollution, the Greater New Haven Transit District will develop hydrogen powered transit vehicles and their operational support infrastructure.	FTA Capital Earmark	\$3,430,019	<b>Ends FY09</b> Jul 2005 to Dec 2008
TRI	<b>East Tennessee Hydrogen Initiative</b> Demonstrate (pilot) a hydrogen-generating fueling facility.	FTA Research Earmark	\$667,135	<b>Starts FY08</b>
<b>TCRP</b>				
TRI-20	<b>Guidebook for Evaluating Fuel Choices for Post-2010 Transit Bus Procurements: Update of TCRP Report 38 (C-19)</b>	TCRP	\$150,000	<b>Ends FY09</b> Nov 2007 to Feb 2009

**Objective 3.5 Perform Research to Reduce Transit Environmental Impacts**

Many transit agencies have already begun to purchase cleaner buses to respond to the non-attainment status of their communities under the Clean Air Act. Many newer buses are being fueled by alternative fuels such as compressed natural gas (CNG), liquefied natural gas (LNG), propane, and hydrogen fuel cells. These types of vehicles, along with various hybrid electrics, improve air quality and reduce public transit’s reliance on oil-based fuels.

Objective 3.5 addresses research to reduce emissions beyond technical improvements to vehicles and facilities. This includes efforts to recycle and reduce waste streams, and to minimize transits environmental “footprint.” Because they have a leadership role in transportation in many large cities with air pollution issues, transit agencies are aware that they need to make their bus fleets less polluting and more energy efficient. Increasing such transit service will reduce pollution, as well as congestion, by getting people out of their cars and into more energy efficient and environmentally friendly transit service. Table 5-10 presents current projects supporting Objective 3.5.

**Table 5-10. Objective 3.5 Perform Research to Reduce Transit Environmental Impacts**

FTA Office	Project Title and Description	Funding Source	Funding Level	Period of Performance
<b>General Research</b>				
TPE	<b>Air Quality and Environmental Research</b> Conduct highly specialized research in environmental quality.	FTA Research	\$785,000	<b>Ends FY09</b> 2007 to 2009

**Objective 3.6 Perform Research to Improve Safety, Security, and Emergency Preparedness**

Objective 3.6 addresses safety, security, and emergency response practices and technologies for vehicles (bus and rail) and stations, transit centers, and other transit facilities, and focuses on the integration of safety and security into transit programs, operations, and infrastructure. The Office of Safety and Security is working with TRI to propose research projects based on an all-hazards management analysis of needs. By identifying safety and emergency preparedness research based on need, FTA can better prioritize its research funding. Table 5-11 presents current projects supporting Objective 3.6.

**Table 5-11. Objective 3.6 Perform Research to Improve Safety, Security, and Emergency Preparedness**

FTA Office	Project Title and Description	Funding Source	Funding Level	Period of Performance
<b>Safety and Emergency Preparedness</b>				
TPM	<b>Safety First</b> Prepare a final report to show trends and best practices in mass transit safety. Focus on awareness and outreach.	FTA Research	\$200,000	<b>Starts FY08</b> 2008 to 2010
TPM	<b>Evaluation of Safety and Security Training Courses</b> Evaluate existing transit safety and security training courses to better plan new and updated training.	FTA Research	\$100,000	<b>Starts FY08</b>
TRI	<b>Emergency Communication System in Subway Trains</b> Demonstrate the use of wireless or other technology to provide communication with subway train passengers from a remote location if the train operator is unable to make announcements.	FTA Research	\$200,000	<b>Starts FY08</b>
TRI	<b>Real-Time Subway Train Location Demonstration</b> Support transit agencies in improving their ability to identify the exact locations of trains.	FTA Research	\$400,000	<b>Starts FY08</b>
TRI-20	<b>Research on Preventing Rail Transit Suicides</b> Phase I will identify the scope of the problem of suicides that occur on commuter rail and subway systems' rights of way in the United States.	FTA Research	\$200,000	<b>Starts FY08</b> 2007 to 2008
TRI-20	<b>Crash Energy Management of Light Rail Vehicles</b> Evaluate the standard leading end configuration of LRVs and make recommendations for modifications to reduce the severity of damage/injury to motor vehicles and motor vehicle occupants involved in collisions.	FTA Research	\$275,000	<b>Starts FY08</b> 2008 to 2009

**Table 5-11. Objective 3.6 Perform Research to Improve Safety, Security, and Emergency Preparedness (Continued)**

<b>FTA Office</b>	<b>Project Title and Description</b>	<b>Funding Source</b>	<b>Funding Level</b>	<b>Period of Performance</b>
TRI-11	<b>Object Detection System Early Adopter Evaluation</b> Evaluate three early deployments of the enhanced object detection system (WMATA, Cleveland, Utah Transit Authority). Develop an evaluation plan, conduct the evaluation, and provide an evaluation report that highlights the expected return-on-investment.	ITS-JPO	\$399,988	<b>Ends FY08</b> Jul 2004 to Apr 2008
TPM	<b>Model for Developing a Transit Agency Emergency Management Program</b> Create a model for establishing an emergency management program within transit agencies nationwide.	FTA Research	\$556,000	<b>Starts FY08</b> 2008
<b>TCRP</b>				
TRI-20	<b>Improving Pedestrian and Motorist Safety Along Light Rail Transit Alignments (A-30)</b>	TCRP	\$300,000	<b>Ends FY08</b> Sep 2006 to Sep 2008
TRI-20	<b>Light Rail Transit / Motor Vehicle Left Turn Collisions</b>	TCRP	\$25,000	<b>Ends FY09</b> Sep 2007 to Nov 2008
TRI-20	<b>Supplement to SAFETEA-LU NAS/TRB Policy Study on Transit Evacuations in Urbanized Areas (H-35)</b>	TCRP	\$65,000	<b>Ends FY09</b> Nov 2006 to Nov 2008

***Training, Technical Assistance, and Strategically Unaligned Research Projects***

A variety of non-research projects and activities, including training and technical assistance, are currently funded out of the NRTP. Although important for FTA’s mission, these projects and activities do not fit within FTA’s Strategic Research Plan and do not align with FTA’s strategic research goals and objectives. In some cases, they have little relation to public transportation, address local needs rather than national priorities, replicate previous research, or are not research at all. Some are funded out of proportion to their value. Table 5-12 presents the training and capacity building; safety programs; technical assistance; and strategically unaligned research projects currently funded by TRI.

**Table 5-12. Non-Research and Strategically Unaligned Research Projects**

<b>Project Title and Description</b>	<b>Funding Source</b>	<b>Funding Level</b>	<b>Period of Performance</b>
<b>Training and Capacity Building</b>			
<b>American Cities Transportation Institute</b> Provide outreach to students regarding careers in transit. Open opportunities for minority contractors to work with Philadelphia transit providers.	FTA Research <b>Earmark</b>	\$294,000	<b>Starts FY08</b>
<b>CTAA of America Nationwide Joblinks</b> Support the Community Transportation Association of America (CTAA) Joblinks program as designated by Congress.	FTA Research <b>Earmark</b>	\$1,666,000	<b>Starts FY08</b>
<b>Transit Technology Career Ladder Partnership Program</b> Address the skills gap for hourly transit maintenance employees by 1) building and supporting state and local partnership programs that address skills training needs of the current workforce and 2) documenting the relationship between training and organizational improvement in transit systems capacity.	FTA Research <b>Earmark</b>	\$1,000,000	<b>SAFETEA-LU</b> 2006 to 2009
<b>Regional Transit Training Consortium</b> Support the Southern California Regional Transit Training Consortium Pilot Program.	FTA Research <b>Earmark</b>	\$267,300 – 06 \$380,000 – 07 \$380,000 – 08 \$450,000 – 09	<b>SAFETEA-LU</b> 2006 to 2009
<b>Transportation Planning Capacity Building Program and Peer Exchanges</b> Revise, update, and expand the Program based on solicited stakeholder needs.	FTA Research	\$185,000 per year	<b>Ongoing</b>
<b>Careers in Transportation Internship Program</b> The Conference of Minority Transportation Officials will implement an internship program to develop future transit industry professionals.	FTA Research	\$200,000	<b>Ends FY09</b> 2008 to 2009
<b>International Transit Studies Program (J-03)</b>	TCRP	\$425,000 per year	<b>Ongoing</b>
<b>Major Capital Projects, Project Management Outreach</b> Develop and implement a NTI pilot course and curriculum materials for risk management and project strategy development for capital projects.	FTA Research	\$150,000	<b>Ends FY09</b> 2008 to 2009
<b>Safety and Security Training</b> Support the transit safety and security training program. Most of the safety and security courses were developed at the Transportation Safety Institute (TSI) and are taught by members of the Associate Staff.	FTA Research	\$1,600,000 per year	<b>Ongoing</b>
<b>Safety Audit Training</b> Develop a training course on rail transit safety auditing.	FTA Research	\$275,000	<b>Starts FY08</b> 2008 to 2009
<b>Safety Programs</b>			
<b>Transit Safety and Security Information Sharing and Public Awareness</b> The FTA Safety and Security clearinghouse and website contains current resources for the transit industry on topics of safety and security and related technologies.	FTA Research	\$300,000 per year	<b>Ongoing</b>
<b>Transit Safety and Security Statistics Analysis</b> Provide enhanced safety and security data analysis for FTA and the transit industry to identify important safety and security problems.	FTA Research	\$200,000 per year	<b>Ongoing</b>

**Table 5-12. Non-Research and Strategically Unaligned Research Projects (Continued)**

Project Title and Description	Funding Source	Funding Level	Period of Performance
<b>Drug and Alcohol Testing Compliance</b> Support compliance with the Omnibus Transportation Employee Testing Act of 1991, which authorized FTA to mandate drug and alcohol testing of grantees, sub-recipients, and their contractors' safety sensitive employees. FTA implementing rules require grantees to submit annual reports using the Drug and Alcohol Management Information System.	FTA Research	\$1,350,000 per year	Ongoing
<b>Transit Fire Safety &amp; Analysis Program for Transit Rail &amp; Bus Equipment</b> Assess the performance of fire safety materials and products used in constructing the interiors of railcars and buses.	FTA Research	\$50,000 per year	Ongoing
<b>Operation Lifesaver – Safety Awareness Outreach</b> Develop light rail training materials, update marketing strategies, and disseminate information.	FTA Research	\$100,000 per year	Ongoing
<b>Connecting Communities</b> Promote the safety and security of mass transit passengers, employees, and properties through the collection and sharing of policies, procedures, resources, and best practices with local first responders.	FTA Research	\$880,000	Ongoing 2002 to 2009
<b>Continuity of Operations Planning (COOP)</b> Support COOP planning for FTA to continue critical functions during an emergency.	FTA Research	\$221,978	Ongoing 2005 to 2009
<b>Technical Assistance</b>			
<b>FTA Strategic Plan Support</b> Develop a new agency-wide strategic plan to guide future programs and link performance and budget decisions.	FTA Research	\$200,000	Starts FY08
<b>Reauthorization Research and Outreach</b> Support development of FTA's reauthorization proposals.	FTA Research	\$300,000	Starts FY08
<b>Sponsorship and Participation in Transit Industry Forums</b> Participate in and support critical forums of national profile with transit industry stakeholders and partners.	FTA Research	\$185,000 per year	Ongoing
<b>New Starts Roundtable and New Starts/Small Starts Outreach</b> Support two national New Starts roundtables and other New Starts/Small Starts outreach meetings and two technical workshops.	FTA Research	\$200,000 per year	Ongoing
<b>Transit Security Roundtable</b> Support DHS/TSA and FTA semi-annual roundtables for the transit industry to share experiences and best practices on safeguarding public transit.	FTA Research	\$200,000 per year	Ongoing
<b>Major Capital Projects Roundtable</b> Support for the roundtable, a three-day conference held semi-annually in cities with on-going major capital projects in significant stages of construction. FTA facilitates the roundtable, which is hosted by the local grantees. Participants include the chief engineers or construction chiefs for the 50 largest transit agencies in the United States.	FTA Research	\$160,000 per year	Ongoing

**Table 5-12. Non-Research and Strategically Unaligned Research Projects (Continued)**

<b>Project Title and Description</b>	<b>Funding Source</b>	<b>Funding Level</b>	<b>Period of Performance</b>
<b>Trade Promotion, Technical Assistance, and Training</b> Pursue technology transfer with developed countries with which FTA has Memorandums of Understanding and with developing countries where trade opportunities exist. Provide increased trade support to the domestic transit industry through trade missions, reverse trade missions, market research, and other trade related activities.	FTA Research	\$400,000 per year	Ongoing
<b>Planning Partnerships for Improved Transit Planning</b> The Association of Metropolitan Planning Organizations, APTA, and the National Association of Regional Councils will promote facilitated membership dialogue and case studies of effective practice.	FTA Research	\$150,000 per year	Ongoing
<b>Support for Meeting ADA Requirements</b> Prepare technical assistance manuals outlining requirements, past FTA positions, and best practices.	FTA Research	\$250,000 per year	Ongoing
<b>Human Services Transportation Coordination</b> Support program management to improve the coordination of Federal resources for human services transportation with those of the Department of Transportation.	FTA Research Earmark	\$1,600,000 per year	SAFETEA-LU 2006 to 2009
<b>Easter Seals Project ACTION</b> Provide technical assistance to the disability community, transportation industry, government, human service agencies, advocacy and professional organizations, and others on the full range of issues associated with the provision of accessible transportation for people with disabilities of any age. Emphasize implementation of the Americans with Disabilities Act (ADA).	FTA Research Earmark	\$3,000,000 per year	SAFETEA-LU 2006 to 2009
<b>National Technical Assistance Center for Senior Transportation</b> Provide technical assistance to provide transportation for seniors.	FTA Research Earmark	\$1,000,000 per year	SAFETEA-LU 2006 to 2009
<b>United We Ride State Coordination Grants</b> Assist states in developing coordination planning and implementation.	FTA Research	\$3,750,000	Ends FY09 2000 to 2009
<b>JARC and New Freedom Evaluation</b> Support the collection and analysis of Job Access and Reverse Commute (JARC) and New Freedom program evaluation data and measures for FY07, and provide resources to develop the JARC Congressional Report due August 2008.	FTA Research	\$1,120,000	Ends FY09 2006 to 2009
<b>Electronic Government (E-Gov) Initiatives</b>	FTA Research	\$204,000 per year	Ongoing
<b>FTA Workforce Planning</b>	FTA Research	\$160,000	Starts FY08
<b>DBE Electronic Reporting Project</b>	FTA Research	\$200,000	Starts FY08
<b>Strategically Unaligned Research</b>			
<b>Staten Island Transit Enhancement Plan – Phase II</b>	FTA Research Earmark	\$220,500	Starts FY08



**Table 5-12. Non-Research and Strategically Unaligned Research Projects (Continued)**

<b>Project Title and Description</b>	<b>Funding Source</b>	<b>Funding Level</b>	<b>Period of Performance</b>
<b>Wisconsin Supplemental Transportation Rural Assistance Program</b> WI DOT	FTA Research <b>Earmark</b>	\$8,000,000 authorized	<b>SAFETEA-LU</b> 2006 to 2009
<b>Silverliner IV Electric Commuter Car Propulsion System Upgrade</b> SEPTA	FTA Research <b>Earmark</b>	\$7,788,877	<b>Ends FY08</b> 1999 to 2008
<b>Purchase Vehicles and Technical Assistance</b> Advanced Transportation Technology Institute	FTA Capital <b>Earmark</b>	\$5,414,462	<b>Ends FY08</b> 2002 to 2008
<b>Oklahoma Transportation Center</b> The University of Oklahoma, Oklahoma State University, and Langston University.	FTA Research & Capital <b>Earmark</b>	\$3,475,150 & \$1,943,557	<b>Ends FY10</b> Jul 2004 to Dec 2010
<b>Transit Security Training Facility</b> Chester County Community College	FTA Research <b>Earmark</b>	\$3,000,000 Authorized	<b>SAFETEA-LU</b> 2006 to 2009
<b>Transportation, Economic, and Land Use System</b> New Jersey Institute of Technology	FTA Research <b>Earmark</b>	\$2,205,000 authorized	<b>SAFETEA-LU</b> 2006 to 2009
<b>Center for Advanced Transit Initiatives</b> Rutgers, The State University (2510)	FTA Research <b>Earmark</b>	\$2,205,000 authorized	<b>SAFETEA-LU</b> 2006 to 2009
<b>Hybrid Electric and Fuel Cell Research</b> University of Alabama	FTA Research <b>Earmark</b>	\$2,000,000 authorized	<b>SAFETEA-LU</b> 2006 to 2009
<b>Transportation Infrastructure and Logistics</b> Univ Alabama in Huntsville	FTA Research <b>Earmark</b>	\$2,000,000 authorized	<b>SAFETEA-LU</b> 2006 to 2009
<b>Trauma Care System Research and Development</b> University of Alabama-Birmingham	FTA Research <b>Earmark</b>	\$2,000,000 authorized	<b>SAFETEA-LU</b> 2006 to 2009
<b>Regional Public Safety Training Center</b> Lehigh Carbon Community	FTA Research <b>Earmark</b>	\$2,000,000 authorized	<b>SAFETEA-LU</b> 2006 to 2009
<b>Application of Information Technology to Transportation Logistics and Security</b> Northern Kentucky University	FTA Research <b>Earmark</b>	\$1,600,000 authorized	<b>SAFETEA-LU</b> 2006 to 2009
<b>Charleston Monobeam Project</b> Charleston Area Regional Transportation Authority	FTA Capital <b>Earmark</b>	\$1,495,150	<b>Ends FY08</b> 1999 to 2007
<b>Energy Management Study</b> West Virginia University	FTA Research <b>Earmark</b>	\$971,860	<b>Ends FY08</b> 2004 to 2007
<b>Low-Speed Urban Maglev Program</b> California University of Pennsylvania	FHWA	\$1,900,000	<b>Ends FY09</b> 2007 to 2009
<b>Low-Speed Urban Maglev Support</b> Volpe National Transportation Systems' Center	FHWA	\$300,000	<b>Ends FY08</b> 2006 to 2007

## 6.0 TRACKING PROGRESS

In 2006, FTA completed the Office of Management and Budget (OMB) Program Analysis Rating Tool (PART) process,<sup>14</sup> receiving the highest ranking possible – an “effective” rating with a score of 95 out of 100. FTA’s research program includes the following performance objectives developed originally in response to PART:

1. Assure that 90 percent of all projects are on-time and on-budget
2. Increase transit ridership by one percent per year
3. Reduce transit fatalities
4. Deliver six innovations or products per year (30 over 5-year period) across the goals.

These performance objectives are included in FTA’s internal Annual Performance Plan, which defines the projects, deliverables, and major milestones expected for a given fiscal year. FTA updates the projects and accomplishments for PART annually. The updates are posted with the PART assessment and are discussed in greater detail in the Annual Research Report.

Over the next five years, FTA will track the maturation of its newly-defined project development process (see Section 4.0, Future Research Project Development). In 2008, FTA undertook a major effort to develop the Electric Drive Strategic Plan. In 2009 and subsequent years, FTA intends to replicate this effort for FTA’s other major research program areas in order to define specific targets for research and the projects necessary to accomplish them. As these individual efforts are inserted into the Multi-Year Program Plan – FTA will need to closely track project implementation to ensure the Program Plan remains valid and to examine how well the process of project selection is working. FTA will also need to track project progress against the project selection criteria defined by the Research Council.

Over the next five years, FTA will also track its synthesis of research findings into relevant and useful bodies of knowledge that the transit industry can use in decision making. In addition, FTA will track its use of these syntheses to identify relevant new research critical to transit (see Section 4.0, Future Research Project Development). FTA’s research produces a wide array of knowledge that is presently captured in individual project reports. FTA will undertake an effort to better manage the knowledge resulting from research so that it can be used both by the transit industry and to inform future research selection. FTA will need to closely track how these results are used for both of these purposes.

These accomplishments will be discussed in greater detail in the Annual Research Report.

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<sup>14</sup> FTA’s research program PART assessment is shown at <http://www.whitehouse.gov/omb/expectmore/detail/10004008.2006.html>

## 7.0 CONTACT FOR COMMENTS AND QUESTIONS

Comments and questions regarding this Program Plan or any research strategic planning at FTA should be directed to:

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## APPENDIX A – PROGRAM FUNDING LEVELS

The tables in Appendix A describe the purpose and annual funding levels for FTA’s research programs. Funding levels are those authorized by SAFETEA-LU.

<b>National Research and Technology Program (49 United States Code [USC] 5314, 49 USC 5312)</b>			
Administered by FTA for both earmarked and discretionary research. Under this program, FTA may make grants, contracts, cooperative agreements, or other agreements for research, development, demonstration, and deployment projects, and evaluation of technology of national significance to public transportation. Research under this program should improve public transportation service and help public transportation service meet transportation needs at a minimum cost.			
FY 2006	FY 2007	FY 2008	FY 2009
\$53,658,000 <sup>15</sup>	\$40,400,000	\$44,600,000	\$48,450,000

<b>Transit Cooperative Research Program (TCRP) (49 USC 5313)</b>			
Administered by the Transportation Research Board of the National Academies of Sciences. TCRP funds research for innovative near-term solutions in response to the needs of transit service providers. Projects are competitively selected for a variety of transit research fields including planning, service configuration, equipment, facilities, operations, human resources, maintenance, policy, and administrative practices.			
FY 2006	FY 2007	FY 2008	FY 2009
\$9,000,000	\$9,300,000	\$9,600,000	\$10,000,000

<b>University Transportation Centers (UTC) (49 USC 5506)</b>			
Administered by the Research and Innovative Technology Administration. Funds are transferred to universities designated by Congress to advance significantly the state-of-the-art in transportation research and expand the workforce of transportation professionals through research, education, and technology transfer.			
FY 2006	FY 2007	FY 2008	FY 2009
\$7,000,000	\$7,000,000	\$7,000,000	\$7,000,000

<sup>15</sup> An additional \$17.028 million was appropriated above the SAFETEA-LU level of \$37.7 million.

**National Transit Institute (49 USC 5315)**

Administered by Rutgers University. NTI develops and conducts training on public transportation issues for Federal, State, and local transportation officials and members of the transit industry.

FY 2006	FY 2007	FY 2008	FY 2009
\$4,300,000	\$4,300,000	\$4,300,000	\$4,300,000

**Bus Testing Facility (49 USC 5309, 49 USC 5318)**

Administered by Pennsylvania State University. All new bus models acquired using FTA funds are tested at the facility for maintainability, reliability, safety, performance (including braking performance), structural integrity, fuel economy, emissions, and noise.

FY 2006	FY 2007	FY 2008	FY 2009
\$3,000,000	\$3,000,000	\$3,000,000	\$3,000,000

**National Fuel Cell Bus Technology Development Program**

Three non-profit consortia that include multiple fuel cell and other component manufacturers are conducting fuel cell bus technology and infrastructure research to facilitate the development of commercially-available fuel cell bus technology. The consortia are developing and testing components, conducting outreach, and demonstrating fuel cell buses in a variety of geographic locations and climates across the United States.

FY 2006	FY 2007	FY 2008	FY 2009
\$11,250,000	\$11,500,000	\$12,750,000	\$13,500,000