

## Creative Procurements to Improve Transit Cost and Effectiveness

FEBRUARY 2021

FTA Report No. 0186  
Federal Transit Administration

**PREPARED BY**

Sarah Plotnick  
Sean Peirce  
John A. Volpe National  
Transportation Systems Center



## COVER PHOTO

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Federal Transit Administration  
Office of Research, Demonstration and Innovation  
U.S. Department of Transportation  
1200 New Jersey Avenue, SE  
Washington, DC 20590

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## Metric Conversion Table

SYMBOL	WHEN YOU KNOW	MULTIPLY BY	TO FIND	SYMBOL
<b>LENGTH</b>				
<b>in</b>	inches	25.4	millimeters	mm
<b>ft</b>	feet	0.305	meters	m
<b>yd</b>	yards	0.914	meters	m
<b>mi</b>	miles	1.61	kilometers	km
<b>VOLUME</b>				
<b>fl oz</b>	fluid ounces	29.57	milliliters	mL
<b>gal</b>	gallons	3.785	liter	L
<b>ft<sup>3</sup></b>	cubic feet	0.028	cubic meters	m <sup>3</sup>
<b>yd<sup>3</sup></b>	cubic yards	0.765	cubic meters	m <sup>3</sup>
NOTE: volumes greater than 1000 L shall be shown in m <sup>3</sup>				
<b>MASS</b>				
<b>oz</b>	ounces	28.35	grams	g
<b>lb</b>	pounds	0.454	kilograms	kg
<b>T</b>	short tons (2000 lb)	0.907	megagrams (or “metric ton”)	Mg (or “t”)
<b>TEMPERATURE (exact degrees)</b>				
<b>°F</b>	Fahrenheit	5 (F-32)/9 or (F-32)/1.8	Celsius	°C

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## ABSTRACT

This project focused on two main areas of analysis: (1) the extent to which federal policy barriers limit the use of innovative practices in federally-assisted procurements and (2) the influence of procurement practices on transit agency ability to adopt new technologies and advances in rolling stock. For the purposes of this project, creative or innovative procurements include a broad range of approaches that deviate in some way from the typical Request for Proposal (RFP) process. This report summarizes the current state of transit procurement, determines transit agency utilization of innovative practices, determines how (and to what degree) FTA procurement rules are impeding the adoption of newer vehicles and new technologies, and identifies other issues or barriers that may be present. Key topics within the research scope include several types of innovative procurement methods for rolling stock and other transit investments. Research highlights include procurement of electric vehicles, automation technologies, and intelligent transportation systems onboard technology. The analysis consisted of a literature review and six case studies.

## EXECUTIVE SUMMARY

This study is one part of a project series implemented by the USDOT Volpe National Transportation Systems Center in partnership with the Federal Transit Administration (FTA). It study builds on existing FTA work seeking to understand how new approaches to procurement can result in substantive cost savings for long-term fleet operations.

This study focused on two main areas of analysis: (1) the extent to which federal policy barriers limit the use of innovative practices in federally-assisted procurements and (2) the influence of procurement practices on transit agency ability to adopt new technologies and advances in rolling stock.

“Innovative” or “creative” procurement does not have a formal definition in the transit industry. For the purposes of this project, creative or innovative procurements include a broad range of approaches that deviate in some way from the typical Request for Proposal (RFP) process. The intent of the project was to examine procurement methods that yield real improvements in cost-effectiveness rather than techniques aimed at exploiting small loopholes in regulatory policies. This report summarizes the current state of transit procurement, determines transit agency use of innovative practices in relation to the adoption of new technologies and procurement of rolling stock, determines how (and to what degree) FTA procurement rules are impeding the adoption of newer vehicles and new technologies, and identifies other issues or barriers that may be present.

Key topics within the research scope include several types of innovative procurement methods for rolling stock and other transit investments. Research highlights include procurement of electric vehicles (EVs), automation technologies, and intelligent transportation systems (ITS) onboard technology.

The analysis consisted of a literature review and six case studies. The literature review was conducted through a search of FTA regulations and guidance, press releases and news articles, and previously-completed studies on FTA procurement practices. Case studies were conducted for several transit agencies pursuing innovative procurement methods, including Los Angeles County Metropolitan Transportation Authority (LA Metro), the Iowa Department of Transportation, Metro Transit, Everett Transit, and the Virginia Department of Rail and Public Transportation. An additional case study, the Next Generation Equipment Committee (NGEC) for equipment standardization, is included to shed light on standardization as a procurement strategy in inter-city passenger rail, with potential relevance to transit. This case study was conducted through a review of published reports rather than through direct interviews.

Clear cross-cutting themes exist between the literature and case studies that summarize federal policy barriers to innovative procurement methods and the influence of procurement practices on a transit agency’s ability to adopt new technologies.



The most common methods of conventional procurement for transit assets or other products include RFP or Invitation for Bid (IFB). More recently, several agencies began pursuing innovative procurement practices such as joint procurements, State cooperative procurement schedules, performance-based procurement, capital leasing, public-private partnerships (P3s), and unsolicited proposals (UPs). Additionally, FTA enacted new legislation within the Fixing America's Surface Transportation (FAST) Act authorization to further encourage the use of these innovative methods.

Innovative procurement methods such as State cooperative purchasing schedules and joint procurements introduce new benefits of reduced administrative burden and increased purchasing power. Capital leasing provides a new business model for transit agencies but presents additional administrative challenges, especially for smaller agencies. UPs and P3s enable transit agencies to take advantage of private sector innovation but presents challenges due to the complexity of fulfilling open competition. Performance-based procurements are efficient and highly beneficial for Connected Vehicle (CV) technology and ITS procurements. NGEC found that a coordinated program of vehicle standardization resulted in reduced acquisition timelines and cost savings. Pooled acquisitions by states and rail operators increased order size and realized economies of scale that reduced unit price.

Many agencies currently are dealing with barriers and challenges to conventional procurements. Staffing and resource limitations at many smaller and mid-size transit agencies are often more of a barrier to innovative procurement methods than specific FTA regulations; as such, they are typically more focused on getting the basics of procurement correct rather than being innovators in the field. Many transit agencies also have their own formal and informal institutional barriers outside of the FTA regulations that can influence innovative procurements. For example, LA Metro stated that many of the barriers to working with UPs came from its own internal agency culture issues and administrative barriers and that it had to work hard to foster cross-department collaboration.

New technologies such as EVs, autonomous vehicles, and ITS onboard technology introduce procurement complexities and associated risks from factors such as incomplete information, rapidly-changing markets, evolving technology standards, vehicles types, and different business models. State procurement schedules mitigate risk by providing additional buying power, reducing information costs, and providing other non-price benefits (e.g., production schedule, delivery time, warranties). New technologies also create new considerations and challenges of data management and proprietary information. As such, data availability, ownership, and propriety technology are areas that agencies need to manage carefully. Generally, however, these limitations were described as technical issues rather than challenges from federal procurement regulation or policy.

Federal policy barriers to innovative procurement were noted with respect to private sector partnerships. LA Metro observed that FTA's standard practices for due-diligence are oriented to the standard procurement model but have not translated well to P3s or UPs in their experience.

FTA's minimum useful life policy is not a barrier to conventional procurements; indeed, agencies typically do not have funds available to replace buses more frequently than the minimum useful life. However, this regulation discourages investment in emerging technology, where the lifespan and durability are unknown or where capabilities change quickly. LA Metro described the 12-year requirement for buses as constraining innovation when advanced technology is still emerging and changing rapidly. Additionally, FTA's Local Preference policy can go against a State's processes for preference of in-state vendors. LA Metro notes that this limitation in federal policy makes it more difficult to build community support for large projects, as they cannot cite the benefits of local job creation.

Increased guidance and timely updates to FTA's Circulars and *Best Practices Procurement & Lessons Learned Manual* could ensure better compliance to federal requirements. Many agencies are continuously looking to FTA for increased clarification and guidance. As changes have taken place due to the FAST Act and other legislation, it becomes challenging for agencies to keep pace.

The FAST Act provided additional flexibilities but it could take time for non-lead adopter agencies to adjust to the new rules and distance from previous FTA negative rulings. Even as transit agencies pursue innovation, they typically are cautious with regard to federal policy compliance, so any instance of unclear guidance or regulation can reduce the willingness to try innovative procurement methods. At least one agency also suggested that programs or policies to incentivize innovative procurement would be more effective than simply removing barriers.

These findings suggest innovative transit procurement has been constrained, generally, by unclear guidance, regulatory complexities, limited training opportunities, and lack of easily-accessible data on innovative approaches. Some efforts to address these limitations are already underway, such as the Joint Procurement Clearinghouse and an FTA-sponsored four-part technical assistance course on transit procurement through the National Transit Institute (NTI). Other suggested next steps include the following:

- Greater awareness and expansion of the Joint Procurement Clearinghouse as a resource for information on successful joint procurements, risks, and lessons learned.
- Objective information and data on the benefits and costs of innovative procurement methods at the federal level for agencies to analyze tradeoffs; transit agencies can learn from their peers' use of innovative approaches without each agency having to experiment with each approach.

- National guidance for transit and State agencies summarizing the tradeoffs associated with innovative methods; this could include step-by-step guidance on several innovative procurement methods addressing continued uncertainties, perceived barriers, and suggestions for when their uses are most appropriate.
- Increased training opportunities for the development of specialized procurement officers at the local and State levels; along with the NTI courses, it may be possible to leverage the relationship transit agencies have with their FTA Regional Offices to provide more in-person trainings and webinars.
- Best practices documents specifically for the procurement of advanced technologies experiencing rapid change (e.g., connected vehicles, transit automation technologies, ITS onboarding technologies), including procurement flexibilities for the least cost or lowest risk way to enable adoption of advanced technologies.
- Clear and timely updates to guidance, best practices, and circulars after new regulation and standards are in place; this includes outdated interpretation letters and other materials to be removed from the FTA website (or clearly annotated) to avoid confusion with current policies.

# Introduction

## Project Background

The U.S. Department of Transportation (USDOT) and its Office of the Assistant Secretary for Research and Technology (OST-R) launched a series of projects to explore existing challenges and questions across several USDOT Operating Administrations (OAs). These issues and associated projects align with the objectives of the USDOT Strategic Plan for FY 2018–2022 and address topics such as infrastructure resilience, public-private partnerships, cyber security, impact of new transportation providers and emerging technologies, regulatory impacts, shared service capabilities, rural transportation needs, mitigation of government barriers to market development, and economic benefits. This study, “Creative Procurement to Improve Transit Cost and Effectiveness,” is one part of this project series implemented by the USDOT Volpe National Transportation Systems Center in partnership with the Federal Transit Administration (FTA). It study builds on existing FTA work seeking to understand how new approaches to procurement can result in substantive cost savings for long-term fleet operations.

Recent reports by transit agencies claim the need for more flexible procurement policies, especially related to the integration of new technology and rolling stock. This report summarizes the current state of transit procurement, determines transit agency use of innovative practices in relation to the adoption of new technologies and procurement of rolling stock, determines how (and to what degree) FTA procurement rules are impeding the adoption of newer vehicles and new technologies, and identifies other issues or barriers that may be present. The Volpe Center completed this report through a comprehensive literature review and interviews with relevant stakeholders in transit agencies and at FTA. The research revealed valuable insight into FTA regulations and policies related to innovative procurements and how procurement policy could aid in the cost-effective adoption of new transit technology.

## Scope of Work and Limitations

Within the topic of innovative procurements, this project focused on two main areas of analysis: (1) the extent to which federal policy barriers limit the use of innovative practices in federally-assisted procurements and (2) the influence of procurement practices on transit agency ability to adopt advanced technologies and rolling stock. For the purposes of this project, creative or innovative procurements include a broad range of approaches that deviate in some way from the conventional Request for Proposal (RFP) process, including joint procurements, leasing, performance-based procurement, and public-private partnerships, among others. The intent of the project was to examine

procurement methods that yield real improvements in cost-effectiveness rather than techniques aimed at exploiting small loopholes in regulatory policies.

The research scope includes rolling stock, Connected Vehicle (CV) technology for transit vehicles, and other transit investments. Procurement of electric vehicles (EVs) and associated battery/charging systems as well as automation technologies and intelligent transportation systems (ITS) onboard technology are particularly relevant to the transit industry and are highlighted in the research.

Ultimately, this research was intended to provide decision-support to USDOT and focused on key policy issues rather than the details of procurement administration or work flow. Similarly, the analysis was generally limited to large purchases (over \$250,000) rather than micro- and small purchases, as these larger purchases are more likely to involve federal policy issues and potential tradeoffs. However, longstanding statutory provisions such as Buy America, Davis-Bacon, and Disadvantaged Business Enterprise requirements are not the focus of the report and are assumed to remain in place. The analysis focused on U.S. transit agencies and, with limited exceptions, does not draw on international comparisons.

## Structure of Document

This report is divided into four sections

- Section 1 describes the project background and the scope of the report.
- Section 2 summarizes the literature review, methodology, and associated findings. Topics include the current state of the practice in transit procurement, federal procurement regulation and recent changes, identified best practices, innovative procurement methods, and barriers to transit procurements. This section also highlights impacts to advanced technologies—electric vehicles, automation technologies, and ITS onboard technology.
- Section 3 presents case studies and includes a description of the methodology and selected cases that demonstrate creative or innovative procurement techniques and reviews equipment standardization in passenger rail as it might relate to innovative transit procurements.
- Section 4 summarizes findings from the literature review and case studies and outlines potential next steps.

# Literature Review

## Methodology

A comprehensive study of the relevant literature was designed to gather information on current procurement practices, identify different forms of creative or innovative procurement, and understand federal procurement regulation and policies as it relates to conventional and innovative transit procurements.

To understand the current regulatory environment, the Volpe project team reviewed current FTA Circulars, FTA guidance, interpretation letters related to innovative procurement, and Fixing America's Surface Transportation (FAST) Act language related to transit procurement. Additionally, although not included in the final analysis, content from FTA's "Frequently Asked Questions" webpage related to capital leasing, cooperative purchasing, and piggybacking provided valuable insight on procurement policies directly from transit agencies.

The second phase included review of relevant materials to understand current procurement practices, use of innovative procurements, and barriers and challenges faced by transit agencies in the procurement process. The literature search comprised the Transit Cooperative Research Program (TCRP) database on procurement issues as well as reports issued by industry groups such as the American Public Transportation Association's (APTA) *Process of Transit Procurement* and APTA's *Standard Bus Procurement Guidelines*.<sup>1</sup> Press releases and media outlets were searched for topics related to innovative procurement or challenges to State or local transit procurements. Additionally, included in the literature review findings are insights from an interview with an FTA employee with experience and expertise in transit procurement.

As previously noted, the scope of this report was limited to the U.S. and excludes procurement complications from Buy America, Davis-Bacon, and Disadvantaged Business Enterprise legislation. Additionally, the initial literature review was technology- and vehicle-neutral—designed to encompass all methods and challenges to procurement. However, this study does have a strong focus on the adoption and procurement of new technology in transit.

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<sup>1</sup>Additional databases and search guidelines for the literature review included a search of the Transport Research International Documentation (TRID) and ROSA P databases as well as Google Scholar. Keywords such as "creative procurement," "innovative procurement," "cooperative procurement," "joint procurement," "transit leasing," "electric vehicle procurement," and "transit automation," among others, were used. All literature was tracked in a spreadsheet and analyzed in MAXQDA, a qualitative data analysis software.

## Findings

### Current State of the Practice

“Innovative” or “creative” procurement does not have a formal definition in the transit industry. For the purposes of this report, “innovative procurement” is defined as the use of one or more practices that deviate in some way from the conventional process for federally-supported procurements of rolling stock (i.e., transit vehicles) and other assets.

FTA offers several conventional paths of procurement that allow for agencies to choose the method best suited to their needs, budget constraints, and staff resources. Typically, these methods are vendor-agnostic, such as RFPs or Invitations for Bid (IFBs); however, agencies are able to procure from specific vendors via a Sole-Source under specific circumstances.<sup>2</sup> To initiate an RFP or IFB procurement, a transit agency begins by drafting a statement of work and a description of needs for the desired transit vehicle or product (e.g., ITS technology). The statement of work moves through a review process at the agency and is sent out as a general announcement to the public. Next, a more detailed description of the desired transit vehicle or product, commonly referred to as the technical specifications, is drafted by the transit agency. Finally, price estimates (bids) are received from potential vendors, manufacturers, or contractors (bidders).

The RFP process invites potential bidders to submit bids to the transit agency for fulfillment of the requested order. This structure enables “competitive processes designed to obtain the lowest cost and best quantity bids from multiple manufacturers that benefit the customer [transit agency]” (Liu, 2019, p. 16). The transit agency or RFP-requesting agency evaluates each bid and selects a bid best suited for its needs based on a series of criteria. Alternatively, the IFB process also invites potential bidders to submit bids to the transit agency but with greater emphasis on cost; the IFB process typically ends with the transit agency selecting the lowest-cost bid. The decision process removes other factors such as delivery time, warranties, and customer satisfaction. The benefit of the IFB process is that it “takes less time than an RFP and is useful for straightforward purchases of standard items or ones with well-defined specifications” (Sullivan, 2017, 14). For all federally-funded procurement methods, the transit agency is required to meet all federal regulations, include all mandated contract clauses, and can only award a contract to a vendor conditional upon an FTA review of those regulations and clauses.

Conventional procurement, as defined in this report, is the method of procurement as explained above. A single transit agency, using federal funds,

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<sup>2</sup>Sole-Source is a procurement method “through solicitation of a proposal from only one source and may be used when on or more of the following circumstances apply: (1) the item is available only from a single source; (2) the public exigency or emergency for the requirement will not permit a delay resulting from competitive solicitation; (3) FTA or the pass-through entity expressly authorizes noncompetitive proposals in response to a written request from the recipient; or (4) after solicitation of a number of sources, competition is determined inadequate” (FTA, 2016b, 97).

will propose an RFP or IFB and follow all the steps as mandated by FTA. Transit agencies not using federal funds are allowed greater flexibility with their procurement methods and contracts.

Table 2-1 briefly describes the main methods of transit procurement that deviate from the conventional process, as encountered during the literature review. Each non-conventional procurement method is discussed in detail in the Innovative Procurement Methods section. All discussed procurement methods are generally allowed with the use of federal funds.

**Table 2-1**

*Methods of  
Innovative  
Procurement*

Innovative Procurement Method	Description
State Cooperative Procurement Schedule	A State agency (usually a State DOT) acts as the lead agency, conducts the procurement, and forms a contract with a vendor. Local transit agencies within the state can then purchase off the schedule at negotiated prices. In some cases, the schedule is opened to agencies outside the state.
Joint Procurement	Two or more transit agencies, together, enter a procurement contract with the vendor. All transit agencies involved will agree to the same terms and are required to specify quantities of the transit vehicle or other product.
Public-Private Partnership (P3)	This term covers a wide range of partnership approaches. For example, a transit agency may partner with a private sector entity to produce or test a vehicle or other transit product.
Unsolicited Proposals (UP)	A third-party entity (typically from the private sector) will submit a project proposal to the transit agency without the transit agency's posting of a public announcement.
Performance-Based Procurement	As part of the bid selection process, the transit agency will conduct a testing phase with each vendor's product. This provides the transit agency with more detailed performance information as a measure of bid quality. This term also applies more generally to procurements that set performance-based standards rather than technical specifications, allowing vendors to propose a wider range of potentially innovative approaches.
Capital Leasing	A transit agency chooses to lease a vehicle or other transit asset (e.g., the battery for an electric vehicle) from a vendor instead of purchasing. Maintenance or technology upgrades may or may not also be a part of the leasing agreement.

## Federal Procurement Regulation

Dozens of mandatory procurement standards are required of an agency awarded with federal funds, and FTA has the “legal responsibility to ensure that its grantees expend federal funds in accordance with FTA regulations” (FTA, 2016a, 1). The most current circular, written in 2013, *FTA Circular 4220.1F, Third Party Contracting Requirements*, contains all requirements applicable to a grantee of federal funds. FTA's *Best Practices Procurement Manual and Guide for Procurement System Review* establishes the FTA grantee review process for each procurement method with easy reference to the circular's procurement standards. These documents are accessible to transit agencies and encouraged for use when conducting procurements to ensure correct



compliance with regulations. For additional assistance, FTA sponsors a four-part technical assistance course on transit procurement through the National Transit Institute (NTI).

FTA's oversight review process has found 10 common areas of deficiency within the conventional method of transit procurement. FTA publishes these deficiencies with discussions and references to guidance documents as assistance to transit agencies for the encouragement of correct practices (see Table 2-2) (FTA, 2016a).

**Table 2-2**

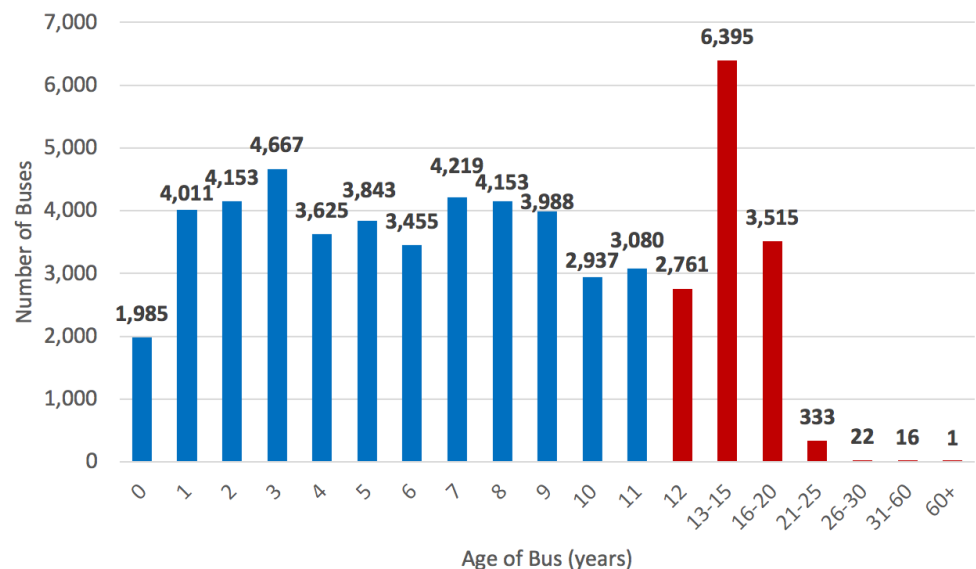
*FTA Findings for Most Common Deficiencies in Procurement Regulation*

Regulation Deficiency	Discussion
1. Inadequate Policies and Procedures	A grantee must include language in the procurement contract that meets all federal standards. This language does not need to be identical to the FTA Circular but it must achieve the same purpose. Across the board, FTA found inadequate policies and procedures that did not meet FTA Circular standards. FTA expects all missing requirement to be added. The more notable clauses include full and open competition, no in-state or local geographical preference, and a cost or price analysis.
2. Lack of Effective Cost or Price Analysis	A grantee must include documentation that an effective cost or price analysis was completed with every procurement action and contract modification. FTA found that some grantees are not receiving independent cost estimates, not requesting cost breakdowns, not evaluating cost estimates, and/or not using federal cost principles. Reviews also find that grantees are not negotiating prices with vendors or at least there is a lack of documentation about a price negotiation or discussion.
3. Poor Sole-Source Justification	Only under certain federal, State, and local circumstances can a grantee perform a sole-source procurement. However, FTA reviews find a consistent lack of detailed justification for a sole-source procurement that does not include full background information or the required approvals or certification for a sole-source.
4. Inadequate Contract Administration	Grantees are required to maintain a contract administration system that accurately documents the responsibilities of each division or staff member within the procurement process. FTA found that a lack of or insufficient contract administration leads to missed requirements, duplicated efforts, and inability to retrieve documentation later.
5. Deficient Documentation of Procurement History	Grantees are required to maintain a detailed procurement history as it relates to ensuring fair and open competition and efficient use of federal funds. One of the most consistent deficiencies FTA finds is the inadequate documentation of previous procurement decisions, justifications, reviews, and analyses completed.
6. Lack of Responsibility Determination	Grantees may procure only from responsible contractors and must provide FTA with documentation about the discussion around the contractor's ability to uphold the contract and a cross-check with the List of Parties Excluded from Federal Procurement. FTA frequently finds this documentation insufficient in detail or missing.
7. Use of Brooks-Act Procedures for Non-Architect/Engineering Type Procurements	The Brooks Act designates qualifications-based procurement <i>only for architectural or engineering services</i> . FTA reviews find grantees try to use the Brooks Act to procure other services that are clearly not architectural or engineering services.
8. Incomplete Inclusion of Required Federal Contract Clauses	Grantees are required to evaluate all federal clauses in the FTA Master Agreement (e.g., Davis-Bacon Act, Clean Air, and Buy America) and determine which clauses are required for each procurement. FTA review consistently finds several procurements that do not include the necessary clauses.
9. Contracts Found Not to Be Sound and Complete Agreements	Grantees are required to make procurement contracts sound and complete agreements. FTA review consistently finds procurement contracts that do not include remedies for breach of contract or termination clauses as well as contracts with missing elements such as delivery dates, conflicting labor rates, unpriced options, missing performance periods, etc.
10. Inadequate Evaluation of Options	Grantees are allowed to specify the use of options in a procurement contract. FTA review consistently finds that requirements for the inclusion and use of contract options are not met. Options must have a price evaluation or treated as a sole-source, and the use of options must follow the conditions of the original contract.

### *Federal Requirements in Practice*

Among FTA's Policy and Procedure clauses required of any transit agency using federal funds are two requirements repeatedly referenced in the literature—Minimum Useful Life and Local Preference. FTA's Minimum Useful Life requirement states that all heavy-duty buses purchased with federal funds must be kept for 12 years or 500,000 miles. With FTA approval, a transit agency can decide to dispose of an asset and reimburse the remaining value to FTA or can transfer the asset to another recipient conditional on certain factors. Although this option is stated in FTA guidance, it appears to be used very rarely in practice. Reflecting FTA's minimum lifespan of 12 years, thousands of buses, about 23%, are, in fact, over the required lifespan, with the majority being 13–15 years old (as shown in Figure 2-1). It is common for agencies to “keep their vehicles for 14 years to minimize their lifetime costs of ownership on a per-mile basis” (Ambrose, 2017, 27).

**Figure 2-1**  
U.S. Distribution of  
Existing Buses by  
Age, 2017



Source: Compiled by Liu (2019) from FTA's (2018) “National Transit Database: 2017 Vehicles” dataset.

An FTA study by Laver (2007) confirms this finding, based on an industry analysis and outreach—“Few transit buses and vans are retired at the minimum service age requirement. Thus, the current retirement minimums are not constraining the vehicle retirement decisions” (viii). As discussed in the Case Studies section, it is, instead, the adoption of innovative and rapidly-changing ITS technology or zero-emission buses that could be discouraged with minimum useful life policies.

FTA's in-state or local geographical restrictions prohibit limiting bid selection to in-state or local vendors. This specific federal requirement has not cultivated much analysis in academic literature, but it has garnered public news articles from the largest transit agencies (Washington, New York, Boston,

Chicago, Los Angeles) about the benefits of in-state preference when not using federal funds. Capital expenditures at these large transit agencies often exceed the amount of federal funding received. This allows for the opportunity to strategically determine which transit procurements are conducted outside federal procurement requirements. In public procurements not using federal funds, these large transit agencies have awarded contracts for rail vehicles conditioned upon their in-state construction and assembly as a way to stimulate local industry and job growth (McCartney, 2019). In-state or local geographical restrictions are discussed more in the Case Studies section.

### *Federal Contract Clauses*

In addition to the federal regulations and standards discussed above, there are federally-mandated clauses that must be included in all federally-funded third-party contracts for an agency to complete a procurement. These contract clauses are included in FTA's *Best Practices Procurement & Lessons Learned Manual*, Appendix A and listed in Table 2-3.

**Table 2-3**

*FTA Procurement Contract Clauses*

Contract Clause	Discussion
Access to Records and Reports	FTA has the right to examine and inspect all records, documents, and papers, including contracts, related to any FTA project financed with federal assistance. This extends to all third-party contractors and subrecipients at every tier.
Bonding Requirements	Bonds are required for all construction or facility improvement contracts and subcontracts exceeding the simplified acquisition threshold. Minimum requirements include the submission of a bid guarantee, a performance bond, and a payment bond from the contractor.
Bus Testing	Requirements pertain to the purchase or lease of any new bus model or any bus model with a major change in configuration or components to be acquired or leased with FTA funds. Recipients must certify compliance with FTA's bus testing requirements.
Buy America	Stipulates minimum U.S. content requirements for projects that involve the purchase of more than \$150,000 of iron, steel, manufactured goods, or rolling stock to be delivered to the recipient to be used in an FTA assisted project.
Cargo Preference	Requires the use of U.S.-flagged vessels, where possible, on all contracts that involve ocean transport of equipment, materials, or commodities.
Charter Service	Requirements apply to contracts for operating public transportation service. Restricts contractor from providing charter service using federally-funded equipment or facilities in competition with other providers.
Clean Air and Federal Water Pollution Control Act	Each contract and subcontract contains a provision that requires the recipient to agree to comply with all applicable standards, orders, or regulations issued in the Clean Air Act and the Federal Water Pollution Control Act.
Civil Rights Laws and Regulations	All contracts must follow Federal Equal Employment Opportunity Requirements, nondiscrimination regulations, and the Americans with Disabilities Act.
Disadvantaged Business Enterprise	Requires all recipients to have a Disadvantaged Business Enterprise program with submitted goals to FTA. All transit vehicle manufacturers must be on FTA's certified list of Transit Vehicle Manufacturers.
Employee Protections	Primarily for contracting projects, recipient will ensure that each third-party contractor complies with prevailing wage requirements, anti-kickback prohibitions, and contract work hours and safety standards.

**Table 2-3 (cont.)***FTA Procurement Contract Clauses*

Contract Clause	Discussion
Energy Conservation	Contract recipients must comply with energy standards and policies within the applicable State energy conservation plans under the Energy Policy and Conservation Act.
Fly America	Requires the use of U.S. air carriers for all transportation of persons or property by air, except under certain circumstances.
Government-wide Debarment and Suspension	Contracts of \$25,000 or more must not be made with parties listed on the government-wide exclusions in the System for Award Management (parties previously debarred or suspended from federal work).
Lobbying Restrictions	All contracts of \$100,000 or more are prohibited from being used for lobbying if federal funds are involved; if federal funds are not involved, requires registration as a lobbyist.
No Government Obligation to Third Parties	Applies to all federally-funded third-party contracts; the Federal Government is not a party to the agreement and is not liable for payment.
Patent Rights and Rights in Data	In federally-funded contracts with small businesses or non-profits, the Federal Government is entitled to a non-exclusive, royalty free license to use the resulting invention, patent the invention, and all rights to the data produced.
Pre-Award and Post Delivery Audits of Rolling Stock Purchases	Extends Buy America requirements to pre- and post-delivery audits in the purchase of rolling stock with federal funds.
Program Fraud and False or Fraudulent Statements and Related Acts	All federally-funded third-party contracts prohibit contractors from making false or fraudulent statements; contract includes potential legal penalties.
Public Transportation Employee Protective Arrangements	All contracts for transit operations require certification by U.S. Department of Labor and extend protection to transit employees affected by federally-funded projects.
Recycled Products	State and local government authorities must require competitive preference to products and services that conserve natural resources, protect the environment, and are energy efficient.
Safe Operation of Motor Vehicles	All federally-funded third-party contracts are required to encourage safe driving practices, including seatbelt use and limiting distracted driving.
School Bus Operations	All contracts operating public transportation services are prohibited from engaging in school bus operations using federally-funded equipment or facilities in competition with other providers.
Seismic Safety	All contracts for the construction of new buildings or additions to existing buildings are required to comply with seismic safety regulations.
Substance Abuse Requirements	All contractors that perform safety-sensitive functions must comply with FTA's Substance Abuse Management Program. Safety-sensitive functions include vehicle operations, dispatch, and maintenance.
Termination	All contracts over \$10,000 must include a termination clause for cause and for convenience.
Violation and Breach of Contract	All contracts over the Simplified Acquisition Threshold (currently \$150,000) are required to contain administrative, contractual, or legal remedies in instances where contractors violate or breach contract terms and provide for such sanctions and penalties as appropriate.

As a whole, federally-mandated contract clauses substantially lengthen a procurement contract. An incomplete list of required clauses is one of the deficiencies within conventional procurement cited in Table 2-2. As discussed in the Case Studies section, these contract clauses are well-known within the

public transit industry but cause potential barriers to an innovative procurement involving a partnership with the private sector.

Individually, contract clauses are not known to cause major challenges to procurement, but vendors may incur a compliance cost to meet specific provisions that may impact prices and limit competition. Although not within the scope of this report, FTA contract clauses such as Buy America and Disadvantaged Business Enterprise are commonly discussed in the literature. Bus testing requirements, also known as Altoona Testing, are discussed briefly in the Electric Buses section of this report but are not widely known to cause challenges. However, as discovered and discussed in the Case Studies section, federally-mandated contract clauses related to FTA's right to see all records and reports and its right to all data, patents, and intellectual property have the potential to cause issues in a public-private partnership where the private sector partner wants to protect proprietary information.

A theory about how increased federal regulations can discourage innovative procurements as a whole comes from Kalman (2002), who explains the inherent and underlying decision-making process of transit agencies as an effect of federal regulations creating a “rule-based system” (Kelman, 2002, 598). This system focuses on regulating the procurement process rather than the goals or end result. The study stresses that when rules place greater emphasis on the processes and inputs of procurement rather than on the outcome, procurements fall into “the phenomenon of ‘displacement of goals’, where means come to be valued more than ends” (Kelman, 2002, 598). He further notes that regulatory streamlining could contribute to the solution—encouraging government to be more employee-friendly and encourage innovation—but is only a small part of what procurement reform should be focused on. He believes that procurement reform should remove the psychological barriers of the rules and encourage “new practices that would create more value” (Kelman, 2002, 609). When the set of rules become too large, it creates a system where “people are to assume that anything not permitted by the rules is prohibited” and directs attention away from the end result and from the concept of an innovative procurement (Kelman, 2002, 597).

### *Changes to Federal Regulation*

In the most recent federal re-authorization, the FAST Act (2015), federal regulations were adjusted to encourage the use of more innovative procurement methods including “significant new latitude for State purchasing practices and for interstate use of State arrangements” (Hsu & Baker, 2016, 1). FAST Act Section 3019 addresses new initiatives for FTA, including a pilot program for non-profit cooperative procurements, a joint procurement clearinghouse, and new, innovative procurement methods available to agencies with federal funds.

Significant changes for transit agencies include FTA's encouragement of leasing rolling stock in lieu of purchasing (specifically for zero-emission vehicle components), the ability to enter into a cooperative procurement contract with a non-profit organization, and the ability of a State agency to open its State purchasing schedule to agencies outside of their state (FTA, 2016d). Previously, State purchasing schedules were available only to agencies within the state, as discussed later in the Barriers and Challenges section. Despite the FAST Act's encouragement of new innovative procurement methods, it is important to note that the use of an innovative procurement method does not excuse any requirement of federal regulations, standards, and clauses when the agency is using federal funds.

### Identified Best Practices

Review of FTA's *Best Practices Procurement & Lessons Learned Manual* revealed a few more best practices implemented in transit procurement.

#### *Conventional Procurements*

In the conventional method of procurement, there are comparative pros and cons of the RFP and IFB processes. The RFP process is inherently a competitive process among bidders “typically generat[ing] more competitive prices and better performance outcomes” (Sullivan, 2017, 14). However, “the tradeoff is the RFPs can be time-intensive and complex to design, release, and evaluate. Consultants and independent evaluators are sometimes brought in to facilitate RFPs, which adds cost” (Liu, 2019, 16). Not every transit agency will have the time, budget, or expertise to design or conduct a full RFP process. The lowest-cost bid option of an IFB is more straightforward than an RFP and is easier for a smaller agency to correctly complete and pay for. However, according to American Public Transportation Association (APTA), “Since the IFB process requires selection decisions to be made on price and price-related factors, ... the IFB process is ill-suited for procurements where there is likely to be significant variations among offers” (Sullivan, 2017, 14). Furthermore, “use of the low-bid procurement method with establishing some critical pre-bid requirements can result in the purchase of a lower quality [asset], with a below-average life expectancy” (Laver, 2007, 26).

Before a transit agency begins the procurement process, many factors affect their decisions. Li, Khan, and Nickelsburg (2014) built a model of the transit bus industry to determine the factors that drive the replacement and procurement of transit buses. The “statistically significant determinants of scrappage rates” are a transit bus current age and total mileage (Li et al., 2014, 18). The probability of replacement for a 15-year-old bus increases by 10 percentage points with each additional year; similarly, the probability of replacement for a bus at 200,000 increases by 2 percentage points with an additional 100,000 miles. An increase in federal air quality regulation was shown to have a positive effect on

the replacement of older buses, and an increase in federal funding was shown to be “associated with earlier retirement of old buses as transit agencies take advantage of these funding to purchase new buses” (Li et al., 2014, 19). As a result of increased regulation and funding, agencies could be looking to conduct procurement for transit buses more often than before. Additional determinants of procurement decisions include preferences for buses manufactured in the same state, possibly due to a positive effect on local employment or a positive relationship with the bus manufacturers, as well as a lock-in effect (i.e., the preference for buses of the same model as previously purchased). Transit agencies are likely to experience a lock-in effect when they have already made significant investments in physical and human capital related to a specific bus make and model and want to continue to leverage these investments.

### *Innovative Procurements and Advanced Technologies*

Moving beyond transit buses, the Florida DOT identified several best practices in the procurement of CV technology. It noted that it is important to keep in mind during procurement that CVs “are technology-based, and therefore, are similar to other ITS projects” (Sando, 2019, 54). Also, the development of a testing component included as a prequalification to the RFP was proven to improve the vendor/contracting selection process. This is discussed later in Performance-Based Procurement. The requirement of a Federal Communication Commission (FCC) license for CV equipment use in the public right-of-way should be confirmed by the vendor/contractor during the bid process; all CV devices using Dedicated Short Range Communication (DSRC) must be FCC-compliant, and a deployment that has not confirmed such compliance in the procurement phase will be met with significant project delays. At the Florida DOT, “no documentation of such compliance was requested in the RFP,” and “the selected vendor was unaware of [FCC requirements] at the time the technical proposal was submitted to FDOT. To resolve this issue, considerable time was required” (Sando, 2019, 45). Additionally, FDOT notes that the Utah DOT “has streamlined this process by acquiring a statewide license and delegating the registering of all devices to a single staff member familiar with the process” (Sando, 2019, 43).

In an international case study comparing public transit in Germany to the U.S., Buehler and Pucher (2011) praised a best practice in Germany aimed at reducing costs. Two public transit companies jointly entered the commuter rail market, purchasing vehicles and operating the rail together, noted as “an endeavor which the two companies, with little or no experience in commuter rail operation, would likely not have undertaken individually” (Buehler and Pucher, 2011, 16). The idea is similar to the innovative practice of joint procurement in the U.S. but is also a further emphasis that transit agencies could be working and procuring together and share knowledge of the industry. Buehler and Pucher recommended to the U.S. public transit industry from lessons learned in Germany to “encourage regulated competition and private sector involvement”



and “collaborate with other agencies,” specifically noting to “make joint supply purchases at lower marginal costs” as an example but also recognizing that “facilitating regional collaboration between public transport providers and establishing state-wide coordination of public transport service takes time and requires government involvement” (Buehler and Pucher, 2011, 29).

## Innovative Procurement Methods

Transit agencies across the U.S. are actively using several methods of procurement that fall under the umbrella of innovative procurement, including State cooperative procurement schedules, joint procurement, public-private partnerships (P3), unsolicited proposals (UP), capital leasing, and performance-based procurement. Many transit agencies have embraced these innovative procurement methods as strategies to increase efficiency and remove conventional barriers.

### *State Cooperative Procurement Schedules*

A State cooperative procurement schedule is an innovative method for State agencies to act as the lead procurement agency for other (typically, local level) agencies and enter into a procurement contract with one or more vendors. Part of the contract agreement is for the vendor(s) to provide a purchasing option of transit vehicles or other products to the State agency and any other participant that chooses to use the contract. The addition of “cooperative” means any State purchasing schedule is available to any transit agency regardless of its location. Prior to the FAST Act, State purchasing schedules were not cooperative and available only to transit agencies within the contracting state (FTA, 2016d).

The Mississippi DOT conducted a review of its state procurement method and found several key benefits (Sullivan and Houghton, 2017). When the State agency takes the lead on procurement contracts, individual agencies are able to take advantage of aggregation, which results in better prices from bulk-purchasing and administrative time savings. Specifically, a State agency can use economies of scale when contracting with vendors to deliver lower prices to transit agencies statewide. A dedicated and specialized procurement staff at the State level can ensure FTA compliance with all rules and regulations, thereby reducing administrative oversight and procurement burdens at individual agencies. State-led procurement also reduces contracting time, as it is more “cost-effective for local transit agencies” to develop one transit vehicle base model and complete one bidding process (Sullivan, 2017, 11).

Within a State procurement schedule, the chosen vendor(s) provides an option list with individual prices, allowing transit vehicles to become customizable to the transit agency while not requiring an additional bidding process. This increases flexibility without increasing costs to the State (Sullivan, 2017). Additionally, this ability to effectively customize vehicles along with the



increased confidence of the State's due-diligence allows transit agencies to feel that, by using a State procurement schedule, they are more likely to acquire vehicles that match their operating needs (Hsu and Baker, 2016). Many states have also found it beneficial to award contracts to multiple vendors; all qualified vendors receive contracts for the base transit vehicle model and allow each vendor to specialize their vehicle options. Effectively, awarding to multiple vendors "encourages suppliers to compete not only on cost, but also on the quality of parts and services" (Sullivan, 2017, 27).

A Virginia State transit agency developed a State procurement schedule to acquire Driver Assistance System (DAS) technology for all public transportation providers in the state (Webb, 2017). This arrangement was the first statewide procurement of its kind, allowing Virginia to promote technology in public transportation while also reducing cost burdens on local transit agencies (Webb, 2017). This example is featured in the Case Study section.

Other examples of State cooperative procurement schedules include Texas DOT's Cooperative Procurement Pilot Project, which facilitates the cooperative procurement of transit vehicles, (Texas DOT, 2019) and Washington State's State Cooperative Purchasing Contract for transit buses, which is awarded to multiple vendors and open to transit agencies in other states (Washington State Department of Enterprise Services, n.d.).

### *Joint Procurement*

Joint procurements or cooperative procurements are similar to State Procurements, as they provide a similar increase in effectiveness, but they can involve as few as two parties. FTA Circular 4220.1F defines Joint Procurements as "a method of contracting in which two or more purchasers agree from the outset to use a single solicitation document and enter into a single contract with a vendor" (FTA, 2016c). Joint Procurements are different from a State Procurement Schedule, as they are not ongoing and are not created for other transit agencies to participate in later on. Instead, Joint Procurements are similar to the conventional procurement process, as they are single contracts between the partnering agencies and the vendor. Entering a Joint Procurement also does not preclude the participating agencies from awarding individual agreements. For example, "one approach that has been known to work with joint bus procurements is for a lead agency to award the basic contract with the pricing, specifications, and terms and conditions. Then, participating agencies can issue individual purchase orders against the basic contract as funding becomes available to the agencies during the contract's life cycle" (FTA, 2016b, 48).

Joint procurements can be executed by one larger lead agency to allow other smaller, regional transit agencies to sign on or can be multiple smaller agencies teaming up as equal partners. Either way, the benefits include reduced administrative burden by avoiding individual conventional RFP procurements,

ability to pool staff and resources between two or more transit agencies, and larger purchasing orders, creating economies of scale and lowering the unit cost from the manufacturers (Liu, 2019). It is also possible for participants of a Joint Procurement to “agree to share responsibility for different portions of the process, e.g., one recipient may prepare the technical specifications and another prepares and conducts the solicitation process” (FTA, 2016b, 48).

FTA is clear that a joint procurement structure does not preclude all participating agencies from agreeing to all terms of the contract and accept all responsibilities and federal requirements. All participants in the Joint Procurement must prove that their contract order is reasonable to avoid excess assets being purchased or as options for the sole purpose of passing them off later to another transit agency. This practice, known commonly as “piggybacking,” is discussed later in the Barriers and Challenges section. Joint procurements are not designed to accommodate more piggybacking; instead, they are encouraged by FTA as a replacement to the practice of piggybacking all together.

### *Public-Private Partnerships*

Transit agencies have turned to public-private partnerships (P3s) to capture the benefits of the private sector. P3s allow transit agencies to take advantage of private sector innovation while allowing the private sector to benefit from the technical expertise and experience of the transit agency. FTA defines a P3 as a “formal contractual arrangement between a public recipient and one or more private partners establishing a mechanism for procuring property and services under which the private sector assumes some of the public sector’s customary role in the planning, financing, design, construction, operation, and maintenance of a transportation facility compared to traditional procurement methods, many of which activities are generally controlled by the public sector partner” (FTA, 2013, 7).

A USDOT (2017) discussion paper on P3s identified key tradeoffs to the involvement of the private sector within public sector procurement. When the private sector is involved early, there is increased information-sharing, which can indirectly lead to an early stage lock-in effect with a specific private sector partner. Although this lock-in effect potentially can reduce competition, it also has the potential to foster innovation, reduce a private sector partner’s perceived risk, and increase investment. Proposing a partnership is a resource commitment, so the private sector must determine financial viability, whether or not the transit agency can deliver on the project, the rigor of the procurement process, how likely they are to be awarded the contract, their return on the project, and if the appropriate legal and regulatory framework is in place (Greene, 2017). Although P3s are a risk for the private sector, early-stage resource commitment and participation can “produce efficiencies later in the process, expediting project implementation” (Greene, 2017, viii).

### *Unsolicited Proposals*

Unsolicited proposals (UPs) are considered a specialized public-private partnership. A UP is “a written proposal for a new or innovative idea that is submitted to an agency on the initiative of the offering company for the purpose of obtaining a contract with the government, and that is not in response to a RFP, broad agency announcement, or any other government-initiated solicitation or program” (Federal Acquisition Regulation [FAR] 2.101). Some transit agencies, such as in Virginia and Pennsylvania, “accept unsolicited proposals twice yearly at specifically defined periods,” whereas LA Metro accepts UPs continuously in any area through a dedicated office, the Office of Extraordinary Innovation (Greene, 2017, 10). “Since the policy’s launch in February 2016, LA Metro has received 101 unsolicited proposals, ... including experimental forays into on-demand ride sharing, tolling, and real-time bus-location software” (Marshall, 2018). LA Metro’s innovative procurement methods are discussed more in the Case Studies section.

FTA requires all federally-funded contracts, even those that began as a UP, to provide full and open competition “unless the unsolicited proposal offers a proprietary concept that is essential to contract performance” (FTA, 2016b, 61). To successfully execute a federally-funded UP, the transit agency must publish an adequate description of the project without disclosing proprietary information, provide opportunity for other third parties to submit proposals, and then publish the intention to award the contract to the original UP or other winning bid. Only if the description of the proposal cannot be made public due to proprietary information can the transit agency move forward with a Sole-Source procurement.

### *Capital Leasing*

Capital leasing is a form of innovative procurement where a transit agency can decide to lease rolling stock or another product instead of purchasing it. In its 2019 “Annual Report on Leasing Arrangements,” FTA reported “28 grants for leases of bus rolling stock and rail rolling stock for a total of approximately \$12.4 million ... [including] more than \$7.2 million for bus rolling stock leases and related equipment expenditures, [and] ... approximately \$5.1 million for rail rolling stock leases” (FTA, 2019, 3). Since FTA awarded a total of \$2.5 billion in grants for rolling stock in fiscal year 2019, these grants for leases accounted for only about 1% of the total grants awarded for rolling stock (FTA, 2019). Thus, although awareness of leasing as an innovative procurement method has grown, this structure remains the exception rather than the rule in terms of rolling stock acquisitions.

The FAST Act streamlined leasing to some extent by eliminating the requirement to submit a cost-effectiveness analysis prior to acquiring vehicles through capital leasing. Instead, grantees now have a reporting requirement to submit a cost-benefit analysis comparing leasing to purchasing within three years of lease

execution. At the time this report was prepared, FTA had received one report, which described the benefits of leasing rolling stock over purchasing.

*"The grant recipient listed cash flow and timing of acquiring the rolling stock as the primary benefit of leasing over purchasing. Leasing allowed the grant recipient to acquire more vehicles at one time; it would have taken between 4 to 5 years to raise the funds to purchase 20 vehicles. By spreading out payments over time, the grant recipient is able to replace more transit vehicles sooner than if the funds had been used for purchasing the vehicles over 4 to 5 years. This also resulted in saving maintenance costs on older vehicles and improving service by eliminating disruptions due to vehicle breakdowns. The interest cost of the lease was partly recovered through the agency avoiding paying higher prices for the vehicles in future years due to inflation of almost four percent per year. The agency also was able to get a discount on buying the 20 buses at one time. Although the full cost of the leased vehicles was slightly higher than the cost of the purchased vehicles, the lease was more beneficial to the transit agency than the purchase option." (FTA, 2019, 2)*

Since the FAST Act was established, FTA has awarded nine grants for the leasing of batteries for electric buses under its Low or No Emission Program (FTA, 2019). The process allows transit agencies to purchase the electric bus while exclusively leaving out the battery to be leased, separately, usually from the same electric bus manufacturer. Leasing the battery allows the transit agency to make scheduled monthly or annual payments for the battery while lowering the upfront capital cost of an electric bus to be more on par with current diesel bus prices. Alternatively, a transit agency can decide to lease both the electric bus chassis and battery. This uses the same monthly or annual payment schedule that lowers upfront capital costs and could include an operational testing period of one to two years. Numerous transit agencies noted that "the main obstacle to the leasing business model is the current reliance on federal grant funding" (Liu, 2019, 24). This means it is more difficult for transit agencies to apply for FTA funds when they are making multiple payments over a period of time versus one lump-sum payment upfront (Liu, 2019).

Additional benefits to leasing electric buses and/or batteries include reduced risk of bus depreciation, as this risk is essentially transferred from the transit agency to the manufacturer. The manufacturer takes ownership back of the used electric bus and/or battery and the transit agency does not need to negotiate replacement before or after the end of useful life. However, disadvantages exist, including increased credit risk and warranty negotiations between the transit agency and the manufacturer and lease payments that strain a transit agency's operational budget (Liu, 2019).

Bloomberg (2018) discussed two case studies related to electric bus leasing—Park City, Utah, and New York’s Metropolitan Transit Authority (MTA). In the interest of lowering upfront capital costs, Park City Transit entered into a 12-year service provider agreement to lease six batteries for its six electric buses. This was a way for the agency to procure more buses with its available federal funds and move the payment of batteries to its operational budget. In 2017, New York MTA was more interested in a short-term lease of electric buses to serve as a pilot test for a future larger deployment of electric buses. MTA leased five electric buses for three years for \$4 million and aimed to gather data and test performance, operational, and environmental benefits. This highlights an additional advantage of leasing for agencies that wish to try new technologies before committing to a longer-term purchase.

### *Performance-Based Procurement*

Performance-based procurement is a term that includes a number of techniques in which the agency sets out performance-based standards rather than detailed technical specifications as the basis of its procurement. This allows the agency to open competition to a wide range of possible technical approaches rather than specifying one in advance—a factor that is particularly important for advanced technologies or other areas in which there may be innovative solutions.

Within the transit industry, a more specific use of the term is for a process by which the agency conducts evaluation of vendor products during a testing phase as part of the overall procurement process. The process also gives the agency more detailed information about real-world performance, which can be considered when selecting the winning bid. In 2018, the Florida DOT successfully conducted a performance-based procurement for CV technology. FDOT required “each responding contractor to successfully demonstrate that their system worked prior to opening the bid proposal” (Sando, 2019, 31). This procurement process is similar to the common Design-Bid-Build (DBB) approach. However, after four vendors responded to the RFP, three vendors were evaluated on their technical proposal and invited to demonstrate their systems. After only two vendors responded to the invitation, only one vendor’s product passed the test and was given the contract after opening bids (Sando, 2019). This best practice increased efficiency and reduced the risk of a project delay if a different vendor was selected that did not have a working system. This is an example of a two-step performance-based procurement method. Metro Transit in Minnesota conducted a similar two-step performance-based procurement, as discussed in the Case Studies section.

Another example of performance-based procurement is in the use of performance metrics in contracts. This has become popular among transit agencies executing construction contracts, as the performance measures incentivize timely or early completion of contracts. However, the approach could

also be applied to contracts for “service, materials, supplies, and rolling stock, as well as payment for maintenance and repair” (Thomas, 2013, 1). One common clause in performance-based contracting is value engineering (VE). In the case of the Massachusetts Bay Transit Authority (MBTA), “the MBTA’s General Conditions include a provision authorizing payments for VE. The provision permits a contractor to submit a proposal for a cost reduction that is based on a ‘sound study’ conducted by the contractor that will result in a net saving to the agency” (Thomas, 2013, 6). In this way, VE clauses create a framework through which the agency and contractor can work together to achieve project goals at a lower cost.

## Barriers and Challenges

Transit agencies have demonstrated growth in their willingness to engage in innovative procurement methods that can be both cost-saving and more effective than conventional methods. Still, some barriers remain, and agencies may hesitate to branch out from tried and true procurement practices. These factors are discussed in more detail below.

Currently, many transit agencies do not meet FTA requirements when using standard procurement techniques, as discussed in Table 2-2. These common deficiencies in meeting FTA requirements are significant mistakes that cause major delays in the procurement process and can be understood in light of information from the literature about the general lack of resources and expertise at smaller agencies, particularly as their limited number of staff make it difficult to specialize in a single technical area (Schweiger, 2020). Even when specialization is possible, small- to medium-size agencies are also known to have difficulty recruiting and retaining specialized procurement officers to their staff.

Thus, although innovative procurement methods are available to smaller agencies, the reality is that even conventional procurements can be challenging. In addition, smaller agencies often do not have the budget to be on the “bleeding edge” and are less equipped and less willing to take on increasing risk associated with innovation (Schweiger, 2020).

Confusion or uncertainty about FTA regulations and guidance can also be a source of hesitation towards innovative procurements for transit agencies. The FAST Act provides additional flexibility to agencies looking for new innovative procurement methods, and FTA encourages these methods (such as joint procurements and State cooperative purchasing schedules). However, there are many examples of cases in which agencies have previously violated regulations in these areas, and negative experiences and previous public rulings can be highly salient for agencies seeking to maintain compliance. Thus, these past experiences can deter the adoption of new innovative procurement practices, even after regulations have changed.

One example is multi-agency purchasing or the practice known as “piggybacking.” FTA defines “piggybacking as ‘the post-award use of a contractual document/ process that allows someone who was not contemplated in the original procurement to purchase the same supplies/equipment through that original document/process’” (Hsu and Baker, 2016, 18). The practice generally occurs when a larger agency executes a contract with a manufacturer but does not intend to acquire the full amount of equipment or has an open option in the contract to purchase more equipment at a later date. This remaining amount of equipment or open option can be transferred to a smaller transit agency for purchase at the previously-negotiated contract price; the practice can be beneficial for smaller agencies unable to negotiate the low prices that result from bulk purchasing. Although piggybacking is explicitly permitted under certain circumstances in FTA’s *Best Practices Procurement & Lessons Learned Manual*, it has also been “generally discouraged due to the complexity and risk involved” and has required FTA to generate “a number of sanctions and clarifications” (Hsu and Baker, 2016, 18-19). Specifically, a “Dear Colleague” letter notes that “FTA permits the assignment of unneeded contract rights to another transit agency—piggybacking—only when a recipient has unintentionally acquired more goods or options than it needs to support its transit system” (Rogoff, 2013). The specific meaning of “unintentional” can be difficult to define for transit agencies looking to benefit from unused contract options and can lead agencies into an area of unclear guidance. FTA encourages the use of joint procurements and State cooperative procurement schedules rather than piggybacking.

Before the flexibility of the FAST Act, several adverse rulings by FTA may have caused agencies to re-examine their interest in some innovative procurement practices. An example is a buying cooperative from the Houston-Galveston Area Council that violated competition policy.

*"In 2011, FTA concluded that its grantees could not purchase assets with FTA assistance from certain buying cooperatives like those developed and marketed by the National Joint Powers Alliance (NJPA) and the Houston-Galveston Area Council (HGAC). The decision was based on the absence of State participation, and the fact that neither agreement identified a finite number of vehicles that was based on the parties' reasonably anticipated needs. Thus, FTA rejected the NJPA and HGAC cooperatives as lacking full and open competition." (Carter, 2013, 2)*

In addition, in 2013, FTA identified multiple procurement contracts incorrectly claiming to be joint procurements when the transit agencies were actually piggybacking. This is not compliant with federal regulations.

*"Most recently, in March of this year my office completed a review of several large-quantity contracts between a bus manufacturer and*



*three transit agencies. Several dozen transit agencies, many of which were not parties to the contracts, used these contracts to purchase buses. After reviewing the contracts and the known purchases, FTA concluded that, to varying degrees, the contracts failed to comply with federal procurement rules. In all of the contracts, the parties contracted for quantities in excess of their current and reasonably expected needs, and with the apparent purpose of assigning contract rights to others at a later date, as was evidenced by numerous "piggyback" purchases. Two of the three contracts were improperly styled as joint procurements, as many of the transit agencies that purchased vehicles were not, in fact, parties to the contract. Following the review, FTA disallowed the use of these contracts by all but the original and actual parties, and only for the amount specified by each party in the contract." (Carter, 2013, 2)*

Agencies previously affected by negative rulings on multi-agency and innovative purchasing or even simply aware of these rulings may be left uncertain and possibly unwilling to try other methods of innovative procurement despite changes from the FAST Act. In other words, there may be lingering perceptions that these methods involve greater risk and possible FTA action.

Most transit agencies are highly-dependent on federal funding, which comes primarily from FTA's Urbanized Area Formula Grants or Formula Grants for Rural Areas and competitive grant programs (e.g., Bus and Bus Facilities Grant Program, Low or No Emission Grant Program, and Capital Investments Grants). Many transit agencies are motivated to take advantage of federal "replacement funds when they become available" at the end of useful life for a particular asset, and determine a replacement rate "based on a set schedule" (Ambrose, 2017, 27). This may influence their thinking about the use of innovative procurement methods. At the same time, smaller transit agencies dependent on competitive grant funding may find it difficult to predict when they will be awarded federal funds, making it difficult to schedule replacement bus procurements.

Additionally, vehicle specifications from transit agencies are not always kept up-to-date with new technology offerings from the bus vendors or manufacturers. Typical information about new vehicle specifications come from "industry publications, trade conferences and vehicle fairs, and through vendors" (Sullivan, 2017, 15). Most transit agencies update their specifications only immediately before releasing a new bid, so it could be "an average of three to five years" before a transit agency is aware of all the technology options (Sullivan, 2017, 15). The process becomes even more burdensome when procuring software products. Project managers at Florida DOT "observed that some of the published standards for software have not been adopted by all vendors; as a result, available software is not standardized throughout the industry" (Sando, 2019, 34).



## Impacts on Advanced Technologies

### *Electric Buses*

The procurement process for new electric buses differs from the procurement of a traditional diesel bus for several reasons. Unique drivers for electric bus adoption can range from new federal or State air quality standards to life-cycle cost analysis, and the barriers include lack of funding to cover high initial capital costs, new electric infrastructure necessities, and technical performance.

Diesel buses pollute more than any other type of bus and contribute to the level of particulate matter and ozone pollutants that negatively affect local air quality. The Federal Clean Air Act passed national air quality standards with goals to lower major types of air pollutants. State governments are tasked with keeping municipalities within these air quality standards, and local municipalities faced with noncompliance of federal standards often look to their transit agencies to replace diesel buses with less-polluting alternatives (Li et al., 2014). This is not to say that all diesel buses are quickly being converted to electric buses. However, LA Metro, for example, under strict California State laws on air quality, converted its entire 2,200 bus fleet from diesel to compressed natural gas (CNG) and now is converting that same fleet to all electric buses by 2030 by directive of the Metro Board for a “reduced carbon footprint” (Metro, 2011, 2019).

Bus testing, also known as Altoona Testing, was noted earlier as a required contract clause for agencies procuring with federal funds. This is a requirement for all new and retrofitted bus models but has been brought up specifically with reference to electric buses. Although more established bus manufacturers are aware of this ruling and can plan ahead, some electric bus manufacturers are new to the bus market and face a greater burden adjusting to testing requirements. In turn, this can create issues for electric vehicle procurements. For example, media coverage of Long Beach Transit’s electric bus procurement cited the electric bus manufacturers’ incomplete Altoona Testing as a significant factor that led to delays in their procurement (Addison, 2013). Altoona Testing has been adapted to electric buses for some time, so it does not constitute a barrier in itself, but lack of knowledge of testing requirements and procedures among new market entrants and local agencies has created procurement issues in this area. This is the main argument Liu (2019) takes when explaining the obstacles behind widespread electric bus adoption.

*"Decision-making is distributed to local transit agencies and municipalities (and to a lesser extent, states), who are responsible for transit investments. The independent nature of transit agency decision-making means that bus purchases are made at the transit agency and municipality level. This means that industry education is needed for each transit manager, maintenance supervisor, and route planner, which places bandwidth restrictions on the*

*sales teams of electric bus manufacturers. As a result, purchases are often made in small, pilot-like volumes as opposed to hundreds at a time." (Liu, 2019, 8-9)*

Agencies contemplating a transition to electric vehicles also face operational constraints that can affect procurement strategy. Electric buses have a shorter range than diesel or CNG buses and require extensive charging infrastructure either on-route and/or at a depot to keep the batteries operating at maximum efficiency. Previously, transit agencies could plan routes based on time and consumer demand, but with electric buses and charging configuration, factors such as “route demands (speeds, grades, stops, length, layovers), bus service or blocking demands (deadheads, duration, and frequency), season temperatures, passenger loads, available garage space and power, layover or transit center locations and space, and utility rate schedules and costs” require attention and additional planning (Hanlin, 2018, 8).

The limited range and additional charging time associated with electric buses also affect a transit agency’s replacement rate, a “function of both effective range and bus daily travel distance, both of which are correlated with the route structure” (Ambrose, 2017, 29). To estimate an exact replacement rate of non-electric bus to electric bus is difficult and cannot be generalized across agencies, but it is extremely likely transit agencies transitioning to electric buses will require a larger fleet size (Ambrose, 2017). The procurement of a larger electric bus fleet brings into question the federal requirement of spare ratios, which requires spare ratios of a bus fleet to not exceed 20% for agencies operating at least 50 fixed-route vehicles, and does not set a limit for smaller agencies. Conceptually, spare ratios could present challenges to electric bus procurement, but no evidence was found in the literature on the interaction between increased replacement rates and FTA spare ratios.

Charging infrastructure is a new cost to transit agencies, and some agencies require costly infrastructure upgrades to support a new fleet of electric buses. For example, “one agency received a very high quote from their utility for the power upgrades they would need if they transitioned their entire fleet and plugged in all buses at once” (Blynn, 2018, 119). In response, this transit agency “instead developed plans to cut their peak load to one third of what it would have been by using charging management software and staggering charging times, which allowed them to avoid that cost” (Blynn, 2018, 119). This highlights the importance of planning ahead, before the actual contractual procurement of the electric buses, and shows the ability to cut initial capital costs and long-run electricity costs through innovative means (Blynn, 2018).

High upfront capital costs are often cited as a barrier among transit agencies to the procurement of electric buses. However, lifecycle costs analysis show electric buses can be less expensive to own over time, depending on fuel and

maintenance cost differentials. It is often the case that transit agencies do not have the immediate budget to pay for the electric buses upfront. Currently, this is a large gap in procurement serviced mostly by FTA grant programs such as Transit Investments for Greenhouse Gas and Energy Reduction (TIGGER) and Low-No Emissions grants. “FTA for the purchase of buses typically covers 80% of the purchase costs to help offset the high capital costs” (Hanlin, 2018, 32). Transit agencies also have the ability to leverage State grants together with their federal dollars. Grant programs such as the California Hybrid and Zero-Emission Truck and Bus Voucher Incentive Projects reduces the upfront burden even more when electric buses are first purchased.

As discussed previously, leasing electric buses and/or the batteries is an increasingly common innovative procurement method designed to help finance greater electric bus deployments. A second, alternative business model comes from a partnership between Portland General Electric and TriMet, the transit agency serving Portland, Oregon. This partnership allows the area’s public utility company to invest in electric charging infrastructure and “shifts the burden of electric system design, distribution system upgrades, and charging load management to companies that specialize in delivering electricity” rather than the transit agency (Liu, 2019, 4). A third business model has been referred to as energy-as-a-service. There are no examples of this type of model at a public transit agency, but “multiple companies have begun making ventures into revenue models such as dollars per mile or dollars per kilowatt-hour charged that align with bus lifetimes” are also meant to be designed to “shift the administrative burden of dealing with charging and electrical infrastructure away from the transit agency” (Liu, 2019, 5).

### *Automation Technologies*

Although the current market is small, there are a few dozen low-speed automated vehicle pilots around the county (Cregger et al., 2018). Both traditional automakers and small start-ups are exploring this emerging industry building from the bottom-up or retrofitting current vehicles (Cregger et al., 2018).

One of the most prevalent barriers to automation technology is patchwork legislation. Patchwork State regulation has resulted in different testing standards across the nation (Cregger et al., 2018). In California, test vehicles must have a communication link between the vehicle and the remote operator, a process to communicate between the vehicle and law enforcement, and an explanation of how the manufacturer will monitor test vehicles (Cregger et al., 2018). Remote operation is only a small part of pilot testing and even this “may vary from state to state and may also depend on the use case or the specific location of the testing” (Cregger et al., 2018, 10). This patchwork regulation can make it difficult for manufacturers in this space that ultimately wish to operate in multiple states.

There are also battery limitations that should be taken into account. Battery performance is a core issue for all electric vehicles, including automated shuttles which could be expected to navigate on a sloped route or in bad weather (Cregger et al., 2018). Some manufacturers are working on inductive charging, which would help address some battery depletion concerns, but this technology is still very new and will require infrastructure to function (Cregger et al., 2018).

Focusing specifically on procurement, in addition to FTA stipulations in grant funding agreements and procurement regulation, there are other federal agency regulations automated shuttles must comply with including Federal Motor Vehicle Safety Standards and Federal Motor Carrier Safety Regulation that make it difficult to purchase automated vehicles (Cregger et al., 2018). Additionally, the desire for transit agencies to stick with tried-and-true vehicle designs makes automated technologies incorporation into RFP specifications unlikely in the near-term (Cregger et al., 2018). Procurement processes with long time requirements make it difficult for transit agencies to act quickly in a field such as automation technologies where the technology market is rapidly changing (Cregger et al., 2018).

### *Intelligent Transportation Systems – Onboard Technologies*

With technology advancements, greater familiarity with technology by transit agencies, and more federal grant programs, more transit agencies are looking to conduct CV deployment and ITS procurements. Most transit agencies procuring CV technology or ITS use the common procurement method of Design-Bid-Build-DBB (Hatcher, 2018). Transit agencies are also trending towards a Design-Build (DB) method of CV and ITS procurements, or slightly adjusted approaches, such as Design-Build-Transfer and Design-Build-Operate-Transfer, “in which the same contractor team designs the system, procures, or purchases the equipment, develops needed software, and installs and potentially integrates the equipment,” providing more consistency for the transit agency across the entire procurement (Hatcher, 2018, 3). It is important to note, however, that CV deployments are increasingly complex as they require “moderate to substantial software development” and more extensive “installation of network infrastructure ... when compared to other standard infrastructure improvements” (Hatcher, 2018, 20).

Transit agencies are looking to include more than simply budget and costs in their procurement contracts. Increasingly, contracts “include both qualifications and cost factors,” as agencies are looking to “avoid the low-bid only method of award, which has traditionally been viewed as a less than optimal approach” (Hatcher, 2018, 26). Qualifications can include a qualitative review of vendor or manufacturer customer survey history or recommendations from other agencies. Some transit agencies deploying CV technology at a smaller scale, most commonly for a testing demonstration, found it helpful and efficient partnering with a local “university or transportation research center for project

procurement and engineering” (Hatcher, 2018, 23). Under this partnership, the university or research center would perform the procurement and integration of the CV equipment, and the transit agency would control the follow-up equipment installation and maintenance (Hatcher, 2018).

In the literature review, several transit agencies noted difficulties with the procurement of CV technology or ITS, including “slow production times, interoperability issues, and system malfunctions.” These general barriers and limitations were related to the fact that “traditional procurement mechanisms are not well suited for CV deployment” or general ITS procurements (Hatcher, 2018, 2). ITS procurements also require a new type of technical specifications (Hatcher, 2018, 26). Additionally, FCC licensing processes are new to transit agencies and require dedicated resources. As was previously discussed, Florida DOT was faced with considerable barriers when working for FCC compliance. When the vendor was not aware of the FCC process, the FCC compliance fell onto FDOT’s staff and caused delays to the entire project as the problem needed to be addressed (Sando, 2019).

TCRP Synthesis 145 found that a focus on performance-based procurement language and vendor services would be helpful in FTA guidance concerning procurement of technology (Staes et al., 2020). Performance-based procurement should be helpful to agencies looking to procure new technology because it can be difficult to meet the specification level needed for an RFP when there are uncertainties. However, the procuring transit agency does need a general idea of the performance capability required. Transit agencies should also attempt to obtain technology support when they negotiate their contracts to decrease costs later on. For example, “74% of the respondents indicated that their vendor agreement did not include terms for upgrading technology as upgrades become available. This potential for upgrading is an important element because these technologies are evolving at a rapid pace” (Staes et al., 2020, 22). The exclusion of updates in cost-benefit analyses will increase costs to transit agencies.

Transit agency commonly-cited barriers to the implementation of collision avoidance technology on buses include return on investment and retrofitting concerns, as the technology is rapidly evolving (Staes et al., 2020). However, the Southeastern Pennsylvania Transportation Authority (SEPTA) is an exception; it has installed new onboard technology on approximately 1,000 buses and expects to retrofit its entire fleet in 2020 (Staes et al., 2020). The agency believes there are benefits to retrofitting the entire fleet, whereas many agencies claim that when useful life considerations are taken into account, retrofitting is undesirable (Staes et al., 2020). In this case, life-cycle costs can be a valuable factor. For example, “as fleets age and their useful life decreases, the time over which the cost of the technology can be amortized is reduced, making the technology less cost-effective. Thus, the cost of a technology may be more reasonable in the context of a longer projected fleet life” (Staes et al., 2020, 36).

# Case Studies

## Methodology

The literature review revealed several innovative procurement methods currently being leveraged in the transit industry. A list of potential case studies was created through report findings, press releases, and news articles to identify a sampling of transit agencies across the U.S. that have used or are currently practicing one or more of the identified innovative procurement methods. The transit agencies contacted for an interview were selected based on a variety of criteria including agency size and location, innovative procurement method used, and type of rolling stock or technology procured (i.e., traditional diesel buses, electric buses, or ITS technologies). These criteria allowed for each case study to cover unique topics and challenges related to a different type of transit (i.e., small vs. large or urban vs. rural).

Eight transit agencies were contacted by email and asked to participate in this research as a case study; five agencies responded, and telephone interviews were scheduled. All interviews were conducted in March 2020 and lasted 30–45 minutes.<sup>3</sup>

The transit agencies and key topics included:

- Los Angeles County Metropolitan Transportation Authority (LA Metro) – Unsolicited Proposals and Public-Private Partnerships
- Iowa Department of Transportation – State Purchasing Schedule
- Metro Transit (Minneapolis-St. Paul) – ITS technology Performance-Based Procurement
- Everett Transit (Washington) – Electric Buses
- Virginia Department of Rail and Public Transportation (DRPT) – State Purchasing Schedule

For context, each interviewee was asked about how the conventional procurement process works at their respective agency (staff, resources, trade-offs), federal or State rules or regulations that have provided challenges or barriers to their procurements, and use of any FTA guidance or resources. Interviewees were then asked to discuss best practices, lessons learned, and challenges specific to the innovative procurement method used.

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<sup>3</sup>The interview phase coincided with the start of the COVID-19 pandemic, when many transit agencies were heavily involved in response planning (service changes, social distancing, cleaning protocols, etc.). At least one agency requested a rescheduling due to a conflict with these planning efforts; other agencies did not respond to interview requests, potentially due to similar conflicts. In consultation with the FTA sponsor, further interview requests were halted due to the nature of the pandemic and the demands that it was placing on agency staff.

One additional case study was conducted outside the transit industry as a point of comparison. The Next Generation Equipment Committee (NGEC) for equipment standardization was included to shed light on standardization as a procurement strategy in inter-city passenger rail, with potential relevance to transit. This case study was conducted in a different manner, through review of published reports rather than through direct interviews.

## LA Metro

Los Angeles County Metropolitan Transportation Authority (LA Metro) is one of the largest transit agencies in the U.S., operating over 2,300 buses and 400 heavy and light rail vehicles, 7 rolling stock contracts (in various stages), and 2 zero-emission bus contracts.<sup>4</sup> In 2015, LA Metro established the Office of Extraordinary Innovation (OEI) as a commitment to new innovative procurement methods, specifically for managing P3 and UP processes.

### Barriers to Conventional Procurement

LA Metro found that FTA's minimum useful life policy, local geographical preference policy, and policies on piggybacking presented challenges to its conventional procurements.

In some cases, LA Metro found FTA's minimum useful life policy to be burdensome. At the time of the interview, the agency was developing two midlife overhaul contracts for its 30-year-old heavy rail vehicles to modernize the onboard technology. A midlife overhaul allows transit agencies to modernize or refurbish their rolling stock and is used as a technique to extend the life of the rolling stock to meet the required minimum useful life. LA Metro discovered that modernizing a 30-year-old railcar costs nearly as much as procuring a new one and believed keeping these older vehicles does not make economic sense. After about 10 years, these vehicles start to face obsolescence, and supply chains become increasingly difficult to navigate (e.g., spare parts and maintenance), as some manufacturers are no longer in business. LA Metro noted there should be benefit-cost and trade-off analyses to decide whether modernization of an older railcar or the procurement of a new railcar with new technology makes more economic sense.

In addition, LA Metro noted that the minimum useful life policy for buses can hurt innovation when technology is still emerging. LA Metro was tasked by its Board of Directors to convert its entire bus fleet to electric by 2030. The service area of LA Metro is 1,400 square miles, with some of the longest bus routes in the country. Although vehicle capacity is improving, the necessary range for electric bus technology remains insufficient. The procurement of electric buses

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<sup>4</sup>LA Metro staff, interview conducted by Sean Peirce, Sarah Plotnick, and Jasmine Boatner on March 5, 2020.



now, with a 12-year minimum requirement, could mean being stuck with out-of-date technology in a few years. This suggests that a shorter useful life, allowing for more frequent product update cycles, might make sense for these kinds of innovative technologies. This could require associated changes to industry engineering practices as well as transit agency specifications.

FTA regulations include clauses for alternative options to the minimum useful life, such as the transfer of the vehicle to another grantee or payment of remaining value back to FTA. In the interview, LA Metro did not mention these clauses. Thus, it is possible these options are either not well-suited for LA Metro or that even larger, more sophisticated agencies such as LA Metro have not explored all potential options on minimum useful life.

LA Metro acknowledges its position as a large transit agency and noted having previously given support to smaller surrounding transit agencies via piggybacking. As noted in the literature review, smaller agencies benefit from administrative savings and bulk discounts (economies of scale) when allowed to piggyback from a larger agency's contract. LA Metro noted its preference for a liberalization of piggybacking rules, allowing for more flexibility to aid smaller local agencies without requiring defined quantities in the fleet plan. FTA policy discourages piggybacking in favor of joint procurements. It was unclear from the interview whether LA Metro could similarly partner with smaller agencies via joint procurement rather than piggybacking.

LA Metro also sees FTA's prohibition against local preference as counterproductive to its goal of building regional support for new transit projects. Because federal regulations prohibit local preferences, LA Metro cannot cite local job creation or other broader economic impacts as part of the benefits of a project, making it more difficult to build political support.

### Unsolicited Proposals and Public-Private Partnerships

The OEI at LA Metro focuses on bringing new ideas from the private sector into the public sector. The office works with the procurement office to accept and implement UPs and P3s and since January 2016 has received over 200 private-sector proposals. LA Metro and OEI's goal is not innovation for the sake of innovation but to use innovation in pursuit of the agency's strategic objectives.

Current FTA due-diligence is based on a typical DBB paradigm, and LA Metro has found it difficult to adjust FTA's internal review processes for the framework of a UP or P3. This has created large inefficiencies in the agency's procurement process for LA Metro, as it needs to essentially shoehorn an innovative procurement method into a conventional format for FTA review. Fortunately, this challenge has not prohibited the agency from any innovative procurement opportunities nor required the deferment of federal funds (and the accompanying federal mandates). Federal funds were mentioned to be too important to give up.



Most of the challenges faced by the OEI are internal rather than formal policy barriers. LA Metro noted the most difficult task is changing the agency's internal culture from the conventional method to a more innovative approach. Additionally, the initial cross-department collaboration caused small administrative barriers.

*"Challenge in trying innovation procurements or something just different from before is what makes something worth doing. Getting different departments to talk and work collectively – that's a hard thing to do and I don't think we knew that was our job when we first started. When we first started, we were looking to get quick wins, and something that we want to do always is demonstrate value. Now, we focus on strategic goals and that's much better for us. We want a clear vision with an innovative procurement with a goal. Can't pursue it just for the sake of innovation."*

LA Metro staff suggested a more effective approach to innovative procurement by FTA would be to promote innovative methods through specific federal incentives rather than the removal of barriers more generally. Although such incentives do not need to be monetary, encouragement from FTA could be beneficial.

Overall, LA Metro did not express much concern about the unclear or confusing nature of federal regulations impeding its procurement process, but it does contact its FTA Regional Office when clarifications are needed. However, it is important to note that LA Metro is a large agency with substantial resources; smaller agencies may not be able to reproduce LA Metro's innovative procurement practices. However, in the long term, there could be opportunities for increased knowledge-sharing between innovative larger agencies and their smaller neighboring agencies.

## Iowa DOT

Iowa DOT oversees transit procurement and rolling stock for the entire state, including 35 transit agencies representing multi-county regions each reporting State and federal funds, oversight, and compliance status to Iowa DOT.

Approximately five years ago, Iowa DOT began conducting procurements as a State agency instead of requiring its transit agencies to procure individually.<sup>5</sup>

### State Purchasing Schedule

Iowa DOT has conducted statewide procurements via State purchasing schedules available to all Iowa transit agencies for the previous five years. It oversees the entire RFP process and typically writes bus contracts on two-year cycles with one-year extensions.

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<sup>5</sup>Iowa DOT staff, interview conducted by Sean Peirce, Sarah Plotnick, and Jasmine Boatner on March 9, 2020.

Iowa DOT cited several benefits from State purchasing schedules for bus procurements, including reduced administrative burden for the individual transit agencies, improved level of compliance, and better unit cost of transit vehicles due to the larger order sizes. Most transit agencies in Iowa buy from the schedule because it is beneficial to them, relieving the administrative work from small, rural agencies that are ill-equipped to handle bus procurements while also ensuring compliance with FTA regulation. Iowa DOT has the staff and expertise to standardize the compliance review process.

Iowa DOT sets the State purchasing schedule as a base model for light-duty and full-size transit buses. Individual agencies can choose to buy the base model or select multiple add-ons included in the State schedule; effectively, this allows each transit agency to create semi-custom buses to fit its region's individual needs. Additionally, multiple vendors are available on the State schedule. Iowa DOT noted that although it continuously works to update the vendor list with new models and options, local transit agencies tend to stick with the same manufacturer due to maintenance familiarity and management of spare parts. For one Iowa town, only one manufacturer continues to make a bus that can travel under its low-hanging bridge. Under Iowa DOT policy, any individual agency is permitted to procure buses on its own without using the State schedule. Feedback on this policy from local transit managers have been positive.

Iowa DOT mentioned it had no major concern with the FTA minimum useful life policy, mostly because it faces a large backlog of transit buses, with a current stock that well-exceeds its minimum useful life and needs replacement. In the agency's experience, federal grant funds are not available in large enough quantities to enable replacement of full-sized transit buses in sooner than 12 years.

Iowa DOT staff are aware that FTA regulations were adjusted in the FAST Act to allow State purchasing schedules to be conducted across state boundaries (cooperative); however, Iowa DOT has not pursued this option. Staff expressed concern about cross-state contracts increasing administrative burden and creating potential liability should the procurement not comply with FTA regulations. Issues were cited resulting from a previous instance of noncompliant cross-state procurement, and Iowa DOT wants to prevent transit agencies, unknown to it, possibly filing complaints. It sees no perceived benefit from opening its State schedule; however, it does acknowledge three exceptions to its policy. In three border cities—Omaha, Davenport, and Sioux City—the local transit agency jurisdiction cross state boundaries. In these cases, Iowa DOT added specific language to the schedule that follows the Metropolitan Planning Organization (MPO) borders and allows these border cities to use the Iowa DOT schedule.

Overall, Iowa DOT staff would like to see updated FTA guidance, specifically the *Best Practices Procurement & Lessons Learned Manual* and the *Third Party Contracting Manual*. They feel it is important to keep these documents updated so they can stay compliant with new regulations. Other suggestions include that NTI

procurement courses on procurement to be fine-tuned to address the needs and perspective of smaller agencies and development of a lifecycle costs estimation tool. Iowa DOT is very interested in looking more at lifecycle costs to help make more informed tradeoff decisions in purchasing (e.g., higher purchase price but lower fuel or maintenance costs). They have used some material from its vendors but would like to see a tool from an objective source.

## Metro Transit (Minneapolis-St. Paul)

Metro Transit is the primary transit provider in the Minneapolis and St. Paul area, operating about 900 buses as well as commuter rail and light rail.<sup>6</sup> It is a subsidiary of the regional MPO with a centralized procurement office. It has its own procurement specialist to develop technical specifications for an RFP; the MPO office handles RFP publishing and administration, contracting, and communication with vendors.

### Performance-Based Procurement of ITS Technology

Metro Transit used an innovative method of procurement for an enhanced next-bus prediction software—specifically, a two-phase performance-based process that incorporated both a pilot test and a long-term contract. This approach to procurement gave Metro Transit a wide range of applicants, all offering Software-as-a-Service, and ensured a performance-based selection, drawing on actual experience with the applicants' proposed systems during the pilot test phase. The pilot testing allowed for multiple applicants with different business plans including open-source software or software requiring compatibility with Metro's servers. Metro was also able to use a best-value approach, considering performance alongside cost in the evaluation of applicants rather than simply choosing the lowest-cost option.

Additionally, the performance-based procurement method eliminated the risk of implementing a new technology after contracting. Metro was under no obligation to choose any of the software options tested and, should it select a bid, it already knew the software was compatible with its current systems.

*"The advantage was that we're able to get a sense of how the system works with our data and our system and our weather and that's something that with just proposals we would not be able to do....Performance-based procurement is the part we wanted to highlight. We were surprised by our results by who we ended up trying to get contracted. So I think it's important we did it this way. It was important to be able to test drive the vendors."*

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<sup>6</sup>Metro Transit staff, interview conducted by Sean Peirce, Sarah Plotnick, and Jasmine Boatner on March 9, 2020.

Metro Transit also noted that applicants/vendors benefited from the pilot test as well. The tests were contracted, so all applicants were paid and received feedback they could use to improve their technology/software for future development.

There were no federal funds used for this procurement; however, Metro Transit staff believed the procurement would not have been different with federal funding note, noting that FTA could clarify through guidance that this type of competitive, two-phase procurement method is explicitly permitted, or even encouraged.

FTA regulations on minimum useful life for hardware and software were mentioned as possible limitations to technology products. Similar to LA Metro, ITS bus technology on buses often has a turnover rate faster than 12 years.

Most processes and procedures at Metro Transit and the MPO generally envision conventional construction projects and vehicle purchases. It can be more difficult to adapt these internal processes to advanced technology projects; nonetheless, Metro Transit has not seen major issues procuring Software-as-a-Service products or other technology products thus far.

## Everett Transit

Everett Transit is a small transit provider about 30 miles north of Seattle. It operates in a 34-square mile service area with 32 buses running at peak on 6 fixed routes.<sup>7</sup> It is owned by its municipality, which means the procurement officer at Everett Transit works very closely with the City's procurement office and the fleet manager at the City's Motor Vehicle Department. Everett Transit works on compliance with all federal regulations and State requirements, and the fleet manager works on the specifications, scope of work, and all pre- and post-inspections of vehicles.

### Electric Bus Procurement

In 2016, Everett Transit applied for a Low or No Emissions (Lo-No) grant to provide initial funding of its electric vehicle procurement to replace its current stock of diesel buses ranging in age from 24–26 years. As a part of the Lo-No program, FTA offered Everett Transit the opportunity to bypass the procurement process using a Sole-Source procurement with a private manufacturer. This opportunity was initially beneficial to Everett Transit as a small agency, as it minimized the burdensome RFP process, and procurement of an advanced technology is often fraught with unforeseen challenges. On the other hand, the short timeline for the grant application meant that Everett Transit could not conduct necessary due-diligence, which created challenges later.

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<sup>7</sup>Everett Transit staff, interview conducted by Sean Peirce, Sarah Plotnick, and Jasmine Boatner on March 11, 2020.

Everett Transit was not aware of certain private-sector contract stipulations, including those regarding data ownership and warranties. After the Sole-Source electric bus procurement, the agency wanted to conduct another procurement through an RFP but experienced difficulties obtaining data from its electric chargers. In addition, the electric vehicles had design elements that made it difficult to service with Everett Transit's current maintenance equipment. The agency was not aware prior to the procurement that the warranty coverage had special maintenance stipulations that were expensive (e.g., additional procurement of costly fall protection equipment required for maintenance staff). More planning and due-diligence prior to procurement, particularly with maintenance staff, could potentially avoid these types of issues. It would be beneficial for agencies to be more aware of the private sector's ability to place proprietary restrictions on data.

Beyond these issues, FTA procurement policies have not been a significant barrier for Everett Transit. In its electric vehicle procurements, the majority of issues were related to vehicle technology and capabilities (e.g., recharging time, maintenance issues, effective range during cold weather) as well as issues with vendor proprietary technology. Additionally, given that funding constraints require Everett Transit to keep its vehicles for much longer periods (roughly 26 years), minimum useful life was not a major constraint. However, when the agency considered the option of leasing electric buses (or the electric bus chassis) rather than owning, the administrative and compliance burden from federal, State, and local requirements proved too great for the agency and staff. As such, Everett Transit had to reject this option.

Everett Transit found the FTA policies, as a whole, could be a barrier to P3s. In its view, the public sector generally understands the typical requirements but the private sector does not. Standard federal clauses on minor issues such as cargo preference and recycled products should not present any concern, but collectively add numerous pages of requirements to the contracts and can be daunting to the private sector.

Everett Transit noted that FTA's Regional Office staff are very helpful when working with federal clauses and that FTA guidance is also helpful but could be streamlined. For example, the Triennial Review guide references many other guidance documents and manuals. Staff also noted that it is difficult to receive a straightforward technical answer, thus risking not getting the procurement correct. Clear and up-to-date guidance would be appreciated.

## Virginia DRPT

The Virginia Department of Rail and Public Transportation (DRPT) is separate from the Virginia DOT and thus differs from a traditional State agency. DRPT is an agency of 60 staff operating one office in Richmond and another in Northern

Virginia. As a State agency, DRPT conducts transit procurements for individual Virginia transit agencies under multiple State purchasing schedules for transit buses and Driver Assistance Systems (DAS) technology.<sup>8</sup>

### State Purchasing Schedule

When pursuing the State cooperative schedule procurement structure, DRPT is the lead writer in bids for bus and technology vendors. It works closely with local transit agencies on technical specifications, as local agencies will ultimately purchase off the schedule. Under State law, the bid is reviewed by the Virginia Department of General Services (DGS), which is responsible for reviewing the bid for FTA compliance and submitting it as a proposal to the public.

DRPT cited benefits in administration, pricing, delivery, and research from the use of a State purchasing schedule. Smaller agencies do not have the qualified procurement staff to correctly conduct procurements under FTA regulations. Under a State schedule, DRPT is responsible for complying with FTA regulations and checking FTA guidance, which removes a large administrative burden from the smaller agencies while allowing them to give input on the technology specifications. Additionally, as high costs can be a procurement barrier for smaller agencies, the State schedule helps them purchase transit buses at a more competitive price. DRPT also noted the ability to use the State contract as leverage with manufacturers to encourage on-time delivery.

These benefits are available to smaller agencies, and larger agencies increasingly purchase from the State schedule for the competitive pricing and delivery time as well.

DRPT used its ITS State purchasing schedule for research benefits. The agency has a strong interest in researching DAS technology and has State ITS funds to conduct it. DRPT used these State ITS funds as an offer to individual agencies to purchase the technology from the State purchasing schedule, allowing DRPT to download the data for current and future research in return.

DRPT noted that when working with a State schedule, choosing vendors is very important, and initial costs are only one factor; length and coverage of manufacturer warranties can lessen costs later.

Similar to LA Metro and Metro Transit's concern about FTA's minimum useful life policy, DRPT noted that minimum useful life could potentially be a barrier to the procurement of advanced ITS technology. DRPT expressed concerns about being stuck with an outdated ITS technology after one year due to quick advancements in the field. However, it is hesitant to retrofit buses approaching the end of their useful life with new ITS technology if the bus will be retired after two years.

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<sup>8</sup>Virginia DRPT staff, interview conducted by Sean Peirce, Sarah Plotnick, and Jasmine Boatner on March 30, 2020.

DRPT did not recall any other federal regulations that cause barriers to the procurement of ITS technology. Generally, price, capabilities, and availability of ITS technology present the greatest challenges to procurement. In a State-led procurement, DRPT noted the importance of manufacturing options, quality of the bid, delivery times, and data availability.

The interview with DRPT highlighted a need for FTA guidance to be clarified and quickly updated between reauthorizations. When addressing FTA regulations related to State purchasing schedules, DRPT thought its State schedule must be open to transit agencies in other states, anticipating more administrative work for its DGS; however, actual language in the FAST Act is that states are allowed to open their State schedules to transit agencies outside their state with certain specifications but it is not required. This highlights the need for increased clarification concerning State procurements. Additionally, DRPT noted a situation in which they were caught between two reauthorization bills; it received complaints and needed to begin the procurement again, resulting in wasted time and effort because the guidance was not updated to the new reauthorization.

Overall, DRPT would like more federal review on its State procurements to ensure compliance, especially related to its electric bus procurement schedule, receive additional feedback outside of negative complaints and formal FTA reviews, and see more guidance on ITS technology, with a possibility for boilerplate language.

## Next Generation Equipment Committee

Section 305 of the Passenger Rail Investment and Improvement Act of 2008 (PRIIA) directed Amtrak to establish a Next Generation Equipment Committee (NGEC) and authorized \$5 million for its associated activities. NGEC was formed in January 2010 with membership comprising Amtrak, the Federal Railroad Administration (FRA), interested states, host railroads, equipment manufacturers, and other railroads as appropriate. Whereas voting membership and executive officers of the committee are limited to Amtrak, FRA, and interested states, according to the committee, over 200 members of the rail manufacturing and equipment industry volunteered time to the committee for its work.<sup>9</sup>

This case study was not conducted in the same manner as the previous case studies. Instead, it is a review of the NGEC's founding legislation and activities and provides any potential applicability for transit projects. No phone interview was conducted for this case study.

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<sup>9</sup>Email correspondence with Steven Hewitt. Program Manager, NGEC, February 2020.



## NGEC Activities

After its inception in January 2010, NGEC developed bylaws and a subcommittee structure and began working on its primary mandate of developing a standard specification for rail equipment types. NGEC has two standing subcommittees—a technical subcommittee and a finance subcommittee (NGEC, 2019, 1).<sup>10</sup>

During the six years since its formation, NGEC membership collaborated to develop six equipment specifications (NGEC, 2010, 1):

- Bi-level passenger car (August 2010)
- Single-level passenger car (February 2011)
- Diesel electric passenger locomotive (March 2011)
- Single-level trainset (August 2011)
- Diesel multiple unit (September 2012)
- Dual mode (direct current third rail) passenger locomotive (February 2016).

The process to develop the specifications included coordination with operators, manufacturers, suppliers, and the FRA to assess the overall equipment needs of states and operators and to evaluate rail technologies that may be included in the standards. In addition to technical topics, issues related to the manufacture of rail equipment were discussed, such as domestic production facilities and Buy America requirements.

Several individual specifications have been used by states and Amtrak, resulting in procurements in varying stages. Seven states have procured locomotives under the standards, and both single- and bi-level cars are in production—VIA Rail (Canada) is in initial stages of procurement for trainsets, and a dual-mode procurement is underway for Metro North (NGEC, 2019, 125).

As part of its duties, the finance subcommittee explored options for funding, finance, and procurement strategies. The subcommittee reviewed various mechanisms such as public-private-partnerships (P3) and Railroad Rehabilitation and Improvement Financing (RRIF) and presented findings internally to the executive committee. The subcommittee is currently developing an equipment acquisition and ownership best practices/lessons learned document that will explore issues related to the use of the specifications in pooled acquisitions.

## Findings

By bringing a wide range of industry stakeholders together to develop standard specifications, NGEC claims two primary benefits were achieved. First, the standardization of technical requirements results in reduced acquisition time

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<sup>10</sup>The technical subcommittee was charged with evaluating technologies, designs, and safety issues for inclusion in the specifications. The finance subcommittee investigated new options for funding and financing equipment, new ownership structures, and other issues related to transactions between manufacturers, owners, and operators of the proposed equipment.



and cost savings. With a specification for six different vehicle types, the range of uncertainty was reduced for all parties facing an equipment acquisition. Each defined vehicle type allows the parties to start development and negotiations from an updated, common specification rather than develop unique requirements from scratch.

Second, a standard specification allows for multiple parties to pool their need for related equipment under a common acquisition, resulting in economies of scale for the purchasers and bringing down unit costs by increasing the overall volume of units. NGECE has found bids resulting from the pooled use of the specifications to be “competitive,” with “very aggressive pricing,” although precise figures were not provided (NGECE, 2014, 11). Pooled acquisitions have been used by Amtrak and several states for locomotives and passenger coaches. Longer term, pooling and standardization may allow for follow on maintenance and lifecycle cost savings with common agreements.

Additionally, NGECE claims that the standards may contribute to a more healthy and diverse domestic passenger rail manufacturing market. With fewer passenger rail procurements than freight or international passenger markets, the overall market for passenger equipment in the U.S. is less robust. NGECE found that by increasing the size of orders through joint procurements, “the benefit of combined acquisitions across multiple states or other entities is that there is greater scale to make the programs attractive to prospective bidders” (NGECE, 2014, 11). NGECE claims the standardized specifications add predictability and stable demand, “connecting passenger railcar builders and U.S. suppliers” (NGECE, 2010, 2).

### *Federal Policy Barriers to Innovative Practices*

Federal policy was essential in the creation of NGECE, but otherwise did not alter any regulations preventing any innovative practice. Procurement strategies such as the pooling of orders were made easier through the new collaboration between the broad membership of the committee and the existence of a standard specification. Federal policy, however, encourages the further adoption of the specifications, most directly through grant opportunities for rail equipment purchases where applicants are “encouraged” to use the NGECE standards (NGECE, 2010, 2).

### *Adoption of New Technologies*

With multiple parties pooling their acquisitions, volume purchases of equipment may encourage the adoption of newer technologies. NGECE has a defined process for the review and modification of the six equipment types. As new technologies are developed and deployed, the NGECE “document control procedures enable a review of the use of specifications and requests for modifications in order to continuously improve the specs as new developments are conceived” (NGECE,

2010, 2). Such a process to keep the standards up-to-date and relevant may encourage the development of new technologies if larger, pooled acquisitions enable their broader adoption.

### *Cost Considerations*

NGEC estimates that each specification is worth \$2.5 million (NGEC, 2010, 2), which represents the potential for cost savings that may be realized during the vehicle engineering stage of a procurement process. In 2014, the NGEC chairperson claimed that after development of the standards and the standardization efforts, “costs have been lowered for intercity passenger rail; the bi-level car procurement resulted in a 36% savings from what the anticipated costs were” (NGEC, 2019, 47).

The cost to develop the standard, however, is less clear. NGEC was authorized \$5 million for its operations but that total may mask the full cost of developing, using, and maintaining the specifications, as in-kind contributions of labor time by Amtrak, FRA, states, and other industry member exceeded the authorized total. With over 200 members participating in the development of the standards over several years, the full cost to develop the specifications is not known.

### *Potential Application to Transit*

It is inconclusive whether lessons from NGEC can inform innovative practices in transit procurements. Although APTA has a standards program, they appear to be based on vehicle components, systems, and best practices of transit systems rather than standards for vehicles themselves (APTA, 2020a). However, the standards program may provide an existing forum for development of such vehicle specifications.

### *Interoperability of Intercity Passenger Rail*

With only six specifications required to operate the bulk of route miles on the national rail network, the homogeneity of intercity passenger rail equipment may make the standardized approach more viable for intercity rail than for rail transit vehicles. Excluding the electrified Northeast Corridor, most intercity rail service operates on diesel-powered locomotives. The resulting operating environment is largely consistent nationwide with some differences in boarding height and amenities that can be accommodated by design options within a standardized specification. This allows pooling of equipment across the network, as Amtrak-owned equipment operates nationwide.

Creating an equipment pool facilitates not just operations but also allows for consolidation of maintenance, as facilities can specialize in a common equipment type. Amtrak has three primary facilities for its equipment maintenance, and equipment pooling by states may result in common maintenance as well.

Interoperability of rail equipment allows for a combination of ownership strategies in the intercity passenger market. Amtrak currently operates a combination of owned or leased assets (locomotives and railcars), including some wholly-owned by states. Interoperable equipment can also be overhauled and sold to new operators, allowing for equipment to cascade to other operators.

### *Variety in Transit Vehicles*

The sheer variety of transit vehicles hampers any development of standard specifications for vehicles and potential benefits from pooling for orders, ownership, maintenance, and equipment cascading. However, that may depend on the type of transit vehicle. Light rail transit operates on a variety of power sources and rail gauges with unique designs used by various transit agencies. Depending on the variety of operating requirements and physical characteristics across transit agencies, developing standard light rail transit vehicles may not be possible unless they are grouped in a way that reduces variation. Absent such a standard, the resulting unique designs for each agency do not lend to pooling and the associated benefits. On the other hand, heavy commuter rail uses equipment falls under FRA safety regulations and may benefit from the standardizations. The North County Transit District in San Diego has purchased several locomotives using the NGEC standard, and Metro North is working with Amtrak on a third-rail locomotive procurement. There is no commuter specification for passenger cars, but NGEC and APTA have discussed a commuter equivalent of passenger car specifications (NGEC, 2019, 210).

Bus transit may benefit from the adoption of specifications, such as used by NGEC, as it is easier to envision a bus standard adoptable by a variety of transit agencies given the relative operational flexibility of buses over rail transit. The potential volume of bus purchases may encourage rapid adoption of new technologies given the potential size of the market. APTA Bus Transit Systems Standards include standards for operations, facilities, safety, maintenance training, and some vehicle components such as brake systems, but they are performance-based and not as prescriptive as NGEC specifications (APTA, 2020b).

## Conclusions

This project focused on two main areas of analysis: (1) the extent to which federal policy barriers limit the use of innovative practices in federally-assisted procurements and (2) the influence of procurement practices on transit agency ability to adopt new technologies and rolling stock.

“Innovative” or “creative” procurement does not have a formal definition in the transit industry. For the purposes of this project, creative or innovative procurements include a broad range of approaches that deviate in some way from the typical RFP process, including joint procurements, leasing, performance-based procurement, and public-private partnerships, among others. The intent of the project was to examine procurement methods that yield real improvements in cost-effectiveness rather than techniques aimed at exploiting small loopholes in regulatory policies. This report summarizes the current state of transit procurement, determines transit agency use of innovative practices in relation to the adoption of new technologies and procurement of rolling stock, determines how (and to what degree) FTA procurement rules are impeding the procurement of newer vehicles and new technologies, and identifies other issues or barriers that may be present.

Key topics within the research scope include several types of innovative procurement methods for rolling stock, transit automation technology, CV technology for transit vehicles, and other transit investments. Procurement of EVs and associated battery/charging systems are an area of particular relevance to the transit industry and are highlighted in the research, as are automation technologies and ITS onboard technology.

Analysis consists of a literature review and six case studies. The literature review was conducted through a search of FTA regulations and guidance, press releases and news articles, and previously-completed studies on FTA procurement practices. Case studies were conducted for several transit agencies pursuing innovative procurement methods; NGECE equipment standards were reviewed to shed light on standardization as a procurement strategy in intercity passenger rail.

## Summary of Findings

Cross-cutting themes exist between the literature and case studies that summarize the federal policy barriers to innovative procurement methods and the influence of procurement practices on a transit agency’s ability to adopt new technologies.

When a transit agency conducts a procurement for transit asset or other products, such as ITS technology, the most common methods of conventional procurement include an RFP or IFB. More recently, several agencies began pursuing innovative procurement practices such as joint procurements, State cooperative procurement schedules, performance-based procurement, capital leasing, public-private partnerships, and unsolicited proposals. Additionally, FTA enacted new legislation in the FAST Act to further encourage the use of these innovative methods.

Innovative procurement methods such as State cooperative purchasing schedules and joint procurements introduce new benefits of reduced administrative burden and increased purchasing power. Capital leasing provides a new business model for transit agencies but presents additional administrative challenges, especially for smaller agencies. UPs and P3s enable transit agencies to take advantage of private sector innovation but present challenges due to the complexity of fulfilling open competition. Performance-based procurements are efficient and highly beneficial for CV and ITS procurements. NGEC found that a coordinated program of vehicle standardization resulted in reduced acquisition timelines and cost savings; pooled acquisitions by states and rail operators increase order size and realize economies of scale that reduce unit price. A review of the specifications allows new technologies to be incorporated as they come to market. This approach may warrant additional research for its applicability to different types of transit vehicles.

### Barriers to Conventional Procurement

Many agencies are currently dealing with barriers and challenges to conventional procurements. Staffing and resource limitations at many smaller and mid-size transit agencies are often more of a barrier to innovative procurement methods than specific FTA regulations. These agencies infrequently conduct procurements, may not have dedicated procurement staff, have difficulty retaining their specialized procurement officers, and often find it challenging to stay up-to-date with federal requirements. As such, they are typically more focused on getting the basics of procurement correct rather than being innovators in the field. For example, Everett Transit noted that it considered leasing its electric bus fleet but had to decide against it largely due to the administrative burden that this more complex option would impose on its limited staff. Iowa DOT staff in charge of the State purchasing schedule for transit vehicles have not pursued a cooperative agreement with other states (even though FTA allows it) because it would create additional complexity for staff and liability for the agency with little perceived direct benefit. Complex federal regulations and numerous contract clauses necessary to conduct a procurement with federal funding prove difficult to small and mid-size transit agencies.

Many transit agencies also have their own formal and informal institutional barriers, outside of FTA regulations, that can influence innovative procurements. At Metro Transit, for example, internal processes and business rules typically envision vehicle acquisition or construction projects, not advanced technology. LA Metro stated that many of the barriers to working with unsolicited proposals came from its own internal agency culture issues and administrative barriers and that it had to work hard to foster cross-department collaboration. Metro Transit, Everett Transit, and Virginia DRPT all cited their reliance on other agencies (MPO, host city, Department of General Services, respectively) to manage their procurement, making them subject to those other agencies' regulations and processes in addition to federal practices.

### Barriers to Advanced Technology Procurement

New technologies such as EVs, autonomous vehicles, and ITS onboard technology introduce procurement complexities and associated risks from factors such as incomplete information, rapidly-changing markets, evolving technology standards, vehicles types, and different business models. Multiple case studies and the literature noted this challenge with respect to electric buses and ITS. State procurement schedules reduce this risk by providing additional buying power, reducing information costs, and providing other non-price benefits (e.g., production schedule, delivery time, warranties).

New technologies also create new considerations and challenges of data management and proprietary information. As such, data availability, ownership, and propriety technology are areas that agencies need to carefully manage. Everett Transit found that the data it needed from its electric buses was proprietary to the vendor in its contract. Virginia DRPT worked hard to ensure that data from its DAS technology procured through the State purchasing schedule would be available to third-party researchers. Generally, however, these limitations were described as technical issues rather than challenges from federal procurement regulation or policy.

### Federal Policy Issues Affecting Innovative Procurements

Federal policy barriers to innovative procurement were noted with respect to partnerships with the private sector. LA Metro observed that FTA's standard practices for due-diligence envision the standard procurement model and have not translated well to P3s or UPs in its experience. Additionally, standard federal contracting clauses cover a wide variety of minor issues (e.g., recycled products, cargo preference). These contract clauses are well-known within the industry and are not a significant barrier in typical procurement settings. However, Everett Transit noted that these clauses can add numerous pages to its contracts and can be daunting for potential private sector partners who are less familiar with them.

FTA's minimum useful life policy is not a barrier to conventional procurements; indeed, agencies typically do not have funds available to replace buses more frequently than the minimum useful life. However, this regulation discourages investment in emerging technology where the lifespan and durability are unknown or where capabilities change quickly. LA Metro described the 12-year requirement for buses as constraining innovation when advanced technology is still emerging and changing rapidly. In these cases, a shorter minimum might allow for a shift in the industry toward shorter lifespans with more frequent product update cycles to incorporate new technology. LA Metro also noted that midlife overhauls for rail vehicles can cost almost as much as new vehicles and that maintaining long vehicle lifespans is difficult due to broken supply chains and defunct vendors. Metro Transit noted that lifespan requirements could be a limitation for hardware and software projects where full lifespans are largely unknown.

Additionally, FTA's local preference policy can go against a State's processes for preference of in-state vendors. LA Metro notes that this limitation in federal policy makes it more difficult to build community support for large projects, as they cannot cite the benefits of local job creation. MBTA and NYC Transit chose to use non-federal funds in their procurements for the additional flexibility related to local preferences.

Increased guidance and timely updates to FTA's circulars and the *Best Practices Procurement & Lessons Learned Manual* could ensure better compliance with federal requirements. Many agencies are continuously looking to FTA for increased clarification and guidance; as changes have taken place due to the FAST Act and other legislation, it can be challenging for agencies to keep pace. Even among procurement experts interviewed in the case studies, there were still a few misconceptions or outdated understandings of federal requirements. Guidance documents, best practices manuals, and circulars are helpful, but some of these materials are in need of updates to include the newest legislation. Also, although it is useful to maintain an archive, outdated interpretation letters and other materials might need to be removed from the FTA website (or clearly annotated) to avoid confusion with current policies.

This research found that whereas the FAST Act provides additional flexibilities, it could take time for non-lead adopter agencies to adjust to the new rules and overcome impressions from previous FTA rulings. Even as they pursue innovation, transit agencies typically are cautious with regard to federal policy compliance, so any instance of unclear guidance or regulation can reduce the willingness to try innovative procurement methods, and regulatory complexity and legislative changes may amplify this impact. Agencies also noted that FTA Regional Offices provide helpful answers and guidance to agencies but that it can sometimes be difficult to get a clear answer. Thus, one promising approach would be to



provide more detailed, step-by-step guidance on innovative procurement and procurements of advanced technologies, addressing any continued uncertainties or perceived barriers. However, at least one agency expressed a belief that direct incentives to promote innovative procurement would be more effective than simply removing barriers.

## Next Steps

Findings suggest that innovative transit procurement has been constrained, in general, by unclear guidance, regulatory complexities, limited training opportunities, and lack of easily-accessible data on innovative approaches. Some efforts to address these limitations are already underway, such as the Joint Procurement Clearinghouse and an FTA-sponsored four-part technical assistance course on transit procurement through NTI. Other suggested next steps include the following:

- Greater awareness and use of the Joint Procurement Clearinghouse as a resource for information on successful joint procurements, their pricing advantages, and other outcomes; the Clearinghouse could also be expanded to include data on how staff time and other internal costs vary for joint procurements or qualitative information about risks and lessons learned.
- Objective information and data in an accessible format at the federal level for agencies to analyze tradeoffs, such as the benefits of all innovative procurement methods in terms of lower unit costs, faster timetables, or other advantages relative to their costs in terms of additional procurement risk and complexity. Data on capital leasing could be mined from FTA's reporting requirement under the FAST Act, such that transit agencies can learn from peer use of innovative approaches without each having to experiment with each approach.
- National guidance for transit and State agencies summarizing the tradeoffs associated with innovative methods; this could include step-by-step guidance on several innovative procurement methods addressing continued uncertainties, perceived barriers, and suggestions for when their uses are most appropriate.
- Increased training opportunities for the development of specialized procurement officers at the local and State levels, with specific training courses developed for large agencies vs. small and mid-size agencies. Along with the NTI courses, it may be possible to leverage the relationship transit agencies have with their FTA Regional Offices to provide more in-person trainings and webinars that would address the limitations to innovative procurement that stem from limited staff resources and expertise.
- Best practices documents specifically for the procurement of advanced technologies experiencing rapid change (e.g., connected vehicles, transit automation technologies, ITS onboarding technologies), including procurement flexibilities for the least-cost or lowest-risk way to enable



adoption of advanced technologies. This is especially applicable to advanced technologies supporting new public health initiatives in transit (e.g., retrofitting buses or rail cars with UV systems).

- Clear and timely updates to guidance, best practices, and circulars after new regulation and standards are in place, including removal of outdated interpretation letters and other materials from the FTA website (or clearly annotated) to avoid confusion with current policies.

## ACRONYMS AND ABBREVIATIONS

APTA	American Public Transportation Association
CNG	Compressed Natural Gas
CV	Connected Vehicle
DAS	Driver Assistance Technology
DB	Design-Build
DBB	Design-Bid-Build
DRPT	Department of Rail and Public Transportation
DSRC	Dedicated Short Range Communication
EV	Electric Vehicles
FAR	Federal Acquisition Regulation
FAST	Fixing America's Surface Transportation
FCC	Federal Communication Commission
FDOT	Florida Department of Transportation
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
IFB	Invitation for Bid
ITS	Intelligent Transportation Systems
MBTA	Massachusetts Bay Transit Authority
MDOT	Mississippi Department of Transportation
MPO	Metropolitan Planning Organization
MTA	Metropolitan Transit Authority
NGEC	Next Generation Equipment Committee
NTI	National Transit Institute
OA	Operating Administration
OEI	Office of Extraordinary Innovation
OST-R	Office of the Assistant Secretary for Research and Technology
P3	Public-private partnership
PRIIA	Passenger Rail Investment and Improvement Act
RFP	Request for Proposal
RRIF	Railroad Rehabilitation and Improvement Financing
SEPTA	Southeastern Pennsylvania Transportation Authority
TCRP	Transit Cooperative Research Program
TIGGER	Transit Investments for Greenhouse Gas and Energy Reduction
TRID	Transport Research International Documentation

UDOT	Utah Department of Transportation
UP	Unsolicited Proposal
USDOT	United States Department of Transportation
VE	Value Engineering

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