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Passenger Rail Investment and Improvement Act 2008
Title III, Intercity Rail Policy, Section 305

Next Generation Equipment Committee (NGEC)

NGEC Executive Board

Pilot Program-Standardization

Independent Review of NGEC Standardization Process

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1. Introduction

The U.S. passenger rail rolling stock market can somewhat be described as a historical series of industry contracts to "custom-build" passenger railcars for individual transit authorities, commuter agencies, State DOTs, and Amtrak. This is a design to order build to order industry. This results in the designer/manufacturer constantly" re-inventing the wheel" where a small portion of a design work performed on previous contracts is re-used. The constant re-design effort results in a significant amount of non-recurring costs with each new procurement; paid for by public customers. These new designs can result in operations and maintenance inefficiencies for the owners and/or third party contractors responsible for the maintenance and operation of the equipment. Also, it creates procurement project schedule risk due to new car body designs that must be verified and tested. New designs for systems/components have to be continually re-integrated into the design to meet custom vehicle design, performance and acceptance test criteria.

In summary, this lack of vehicle design/equipment standardization results in significantly increased initial vehicle cost for both the car builder, suppliers, and translates into higher vehicle price to the public owner.

The Passenger Rail Investment and Improvement Act of 2008 recognize the advantages of Standardization of equipment specifications. In May 2011, the Next Generation Equipment Committee's Standardization Working Group developed a Standardization Pilot Program to implement standardization for all NGEC procurements. The objective of this Report is to provide the NGEC Executive Board with an independent assessment of the Standardization Pilot Program and recommend modifications as appropriate for the Executive Board's consideration.

PASSENGER RAIL INVESTMENT AND IMPROVEMENT ACT 2008 AND TITLE III, INTERCITY RAIL POLICY, SECTION 305 – STANDARDIZED NEXT GENERATION EQUIPMENT COMMITTEE

On January 3, 2008 the US Congress passed H.R. 2095. Division A –The Rail Safety Improvement Act amended Title 49, US Code, to prevent railroad fatalities, injuries, and hazardous materials releases, and other safety improvements, including Positive Train Control (PTC). Division B-Passenger Rail Investment and Improvement Act of 2008 (PRIIA), Title III, Intercity Passenger Rail Policy, Section 305 established the Next Generation Corridor Train Equipment Pool. The requirements of Section 305 are summarized as follows:

(a) **In General**-Within 180 days after the date of enactment of this Act, Amtrak shall establish a Next Generation Corridor Equipment Pool Committee, comprised of representatives of Amtrak, the Federal Railroad Administration, host freight railroad companies, passenger railroad equipment manufacturers, interested States, and, as appropriate, other passenger railroad operators. The purpose of the Committee shall be to design, develop specifications for, and procure ***standardized*** next generation corridor equipment.

(b) **Functions-the Committee may-**

a. Determine the number of different types of equipment required, taking into account variations in operational needs and corridor infrastructure;
b. Establish a pool of equipment to be used on corridor routes funded by participating States; and
c. Subject to agreements between Amtrak and States, utilize services provided by Amtrak to design, maintain, and remanufacture equipment.

(c) **Cooperative Agreements**-Amtrak and States participating in the Committee may enter into agreements for the funding, procurement, remanufacture, ownership, and management of corridor equipment, including equipment currently owned or leased by Amtrak and next-generation corridor acquired as a result of the Committee's actions, and may establish a corporation, which may be owned or jointly-owned by Amtrak, participating States, or other entities, to perform these functions.

In January 2010 the Next Generation Equipment Pool Committee was formed and organized by a establishing an Executive Board, which created standing committees; a Technical Subcommittee, Finance Committee, and Administrative Committee. More recently, it has established a Structures and Funding Committee to address item (c) above.

The Technical Subcommittee, with representation from Amtrak, FRA, States and over 100 industry participants, including designers and manufactures of passenger railcars, major Tier I equipment suppliers, suppliers of subcomponents and materials, and industry consultants, have participated in the development and approval of several new Next-Generation Equipment Technical Specifications with the general requirement that they meet the requirements of being qualified to operate at speeds of up to 125 mph in accordance with 49 CFR Part 238 FRA Safety Standards. These NGEC technical specifications were developed for NGEC designs for a bi-level coach, single level coach, single level trainset, and a diesel-electric locomotive. In process are designs for a Diesel-Multiple Unit (DMU) vehicle and a Dual Mode (electric) locomotive forecast to be completed in 2012.

The NGEC objective is to produce "standardized" technical specifications to the extent practical and economical. The term standardized should not be confused with the 49 CFR Part 238 Equipment Standards required by FRA. The purpose and scope of these regulations and requirements are to prevent collisions, derailments, and other occurrences involving railroad passenger equipment that cause injury or death to railroad employees, railroad passengers, or the general public; and to mitigate the consequences of such occurrences to the extent they can be mitigated. These safety and technical specification design standards must be met and are incorporated by reference in all NGEC technical specifications.

The intent of the NGEC standardized equipment objective is to identify and implement standardized technical specifications that capture the benefits to rolling stock owners, operators, and suppliers to the passenger rail industry. An independent analysis of the equipment standardization process, as part of the technical specification development and procurement process is the focus of this report.

2. Executive Summary

The NGEC Executive Board created a Standardization Working Group (SWG) in January 2011 consisting of Amtrak, the States (Caltrans), the Federal Railroad Administration, a consultant facilitator and periodically needed assistance from Subject Matter Experts from the core group of the NGEC.

The SWG, developed a detailed Work Plan that detailed the Plan objectives, approach, process, and staffing. In May 2011 the SWG developed a Standardization Pilot Program to provide verification of the process steps identified for achieving standardization of vehicle systems and components. The process included identification of standardization candidates, technical suitability, financial/economic evaluation, documentation of analysis for SWG review, and final approval by the Executive Board.

Development of Standards embraced the same process used to develop technical specifications, namely the use of Technical Subgroups that are the Technical Subcommittee Subject Matter Experts (SME). They were referenced by the SWG as the Technical Working Group (TWG) in process description (Mechanical, Electrical, Structural, Interiors, and VTI). The TWG, under direction of Team Leaders were utilized to identify candidates for standardization and perform the technical and financial/economic analysis. The TWGs are comprised of members of the core group, but largely consist of industry car builders and system and component suppliers. Although the industry members were very active in the development of the technical specifications process, their interest and participation in the standards development process was noticeably lacking.

The Pilot Program identified 7 standardization candidate systems and components, at least one for each of the TWGs. In September, it became apparent the Pilot Program was encountering issues that inhibited progress. These issues were lack of member participation, urgency, and interest, and inability of TWGs to come to full agreement on candidate evaluation items. At the recommendation of the SWG, the NGEC Executive Board determined that there was potential bias introduced by having the TWGs composed of industry members make a determination as to whether a component or system should be standardized.

The NGEC Executive Board concluded that the standardization process, as conceived, should be reviewed by an impartial third party assessor. A contract was awarded to Larry Salci, an independent passenger railcar consultant. That is the focus of this Report.

The statement of work requested independent review and assessment of specific Standardization Process issues and questions defined as Tasks. The detailed analysis of these Tasks is contained in Section 6 of this Report, however, a brief Executive Summary is provided below.

Task 1 – Review the SWG process, performance, and results and recommend changes to the SWG Work Plan and Work Plan Flow Chart.

The TWGs industry members' commercial bias does limit the ability of the TWG to propose systems and components as candidates for standardization, let alone perform the technical suitability or cost-benefit financial/economic analysis. The TWG efforts should be limited to technical specification development.

Recommendation:

- **Car Builder Standardization Plan** -The SWG request the NGEC to include a standardization process in the vehicle procurement phase (starting with the bi-level procurement) by requesting interested and qualified car builders to develop and submit a detailed (conceptual design) Standardization Plan for major system and components as candidates for standardization.
- **Standardization Plan Part of RFP Evaluation Process** - The car builder Standardization Plan should be part of the RFP submittal requirement and part of the evaluation of both technical and financial criteria. Evaluation criteria should be weighted in relation to the importance of standardization to the NGEC program
- **Utilize SWG to Assist in Evaluation Process and Design Phase** -The NGEC SWG should be considered as support as Subject Matter Experts (SME) in assisting in the RFP evaluation phase and the Program Management design phases.
- **Standardization Plan CDRL** - The owner should require the selected car builder Standardization Plan be included in the contract deliverable requirements (CDRL) in the form of inclusion in the Design Submittal Plan. The CDRL should reference and integrate the Standardization Plan for design review and approval as part of the Preliminary Engineering Phase (30%) and the Intermediate Design Phase (60%) including provisions for system (s) mock-ups.

Task 2A – How can perceive barriers to standards development be overcome, while maintaining involvement of the NGEC Technical Subcommittee in the standardization process?

There are both perceived and "real" barriers to standards development in the U.S. passenger railcar industry. Some of these barriers apply to the NGEC Standardization process. The barriers are the historical infrastructure limitations of legacy transit systems, customer demand for custom built railcars, federal, state and local funding issues, Federal, State and local procurement requirements, low bid vs. negotiated procurements, and car builder market/bid strategies.

Recommendations:

- **Large Systems/High Usage Components** - Standardization should focus on both high dollar systems and high usage components over life of the vehicle
- **Modular Design** - Standardization of systems should be designed utilizing a "modular" approach or top down approach by the car builder through the design phase, and cross reference opportunities for vehicle platforms for all NGEC vehicles, bi-level, single level, trainsets, and DMUs
- **Key Interface Definition** - Define standardization as key interface, form, fit, function, and interchangeability, not design of an identical component
- **Two Step Procurements** – A procurement process that provides for two separate evaluation processes, technical and financial/price criteria utilizing weighted criteria method (Brooks Method) vs. low bid will enhance standardization objective. Low bid process runs counter to Total Cost of Ownership analysis (initial price plus life cycle cost analysis) and will negatively impact standardization efforts
- **Industry Funding** - Sufficient Federal/State funding creates order volume, will attract competition, provide for economies of scale, and create permanent jobs

Task 2B – How should the concept of standardization be defined? Should standardization include components comprised of several subcomponents? Should standardization be focused on systems or components or both?

Recommendations:

- **Modular Design** - Standardization should be defined as a modular approach, top down approach, starting with platform architecture, precisely define space envelope and weight limits, detail design interface requirements (form, fit, and function) and interchangeability. This approach will still protect suppliers intellectual property rights
- **Top Down Approach** - Standardization utilizing a top down approach should be defined starting at the highest system level and defined to the lowest component level possible
- **Both Systems and Components** - The vehicle platform should be used to guide the customer/owner and a listing of key systems/components should be defined jointly with all involved disciplines, including key system/component suppliers

Task 2C – How can the question of when to standardize be resolved? Will standardizing of components which exist now impede technological innovation? Is it more practical to base standards on the components chosen for incorporation in the first NGEC equipment order?

Recommendations:

- **RFP Starts Standardization Process** -Ideally, standardization should start with the design of a new vehicle, a new vehicle being defined as starting with a "clean sheet of paper" concept. If an existing design or technical specification already exists e.g., NGEC bi-level, single-level, trainset, or DMU specifications, then design RFP to contain requirement for car builders to develop a Standardization Plan to be submitted with their technical proposals for evaluation
- **Technological Innovation** – Utilizing both the modular approach and the key interface definition, standardization should enhance technological innovation as suppliers of components and systems will be able in theory, and practice, to allocate scarce engineering resources to R&D, manufacturing and assembly process improvements to improve product reliability, reduce costs, and improve their competitive position in the market. This will allow them to protect their intellectual property rights, key to their participation in standardization. The modular design process avoids the perception that the car builder/suppliers who win the first order in effect become the standard for all future NGEC similar orders.

Task 2D – How can/should the potential benefits of standardization be determined? In its current form, should the standardization process consider a cost/benefit like analysis? Would other metrics be more reflective of the potential gains achievable by standardizing components?

- **Integrate into RFP Process -** standardization benefits can only be determined by integrating Standardization into the RFP procurement process and using car builder Standardization Plans as a measure of benefit against a do nothing baseline. A best case evaluation will utilize both a technical suitability analysis and a financial/economic cost-benefit analysis that utilizes Total Cost of Ownership (initial cost plus life cycle costs) resulting in a "Best Value Approach"

- **Best Value-Total Cost of Ownership Approach** - TCO analysis requires technical and financial management resources beginning with the car builder evaluation phase, through the design approval phase. It also requires the verification of operational and maintenance cost over the life of the vehicle systems and components.

- **Other Metrics-** If TCO is not utilized; benefits can still be measure by the systems/component measurement against reliability metrics, Mean Distance Between Failure (MDBF) and maintenance metrics, Mean Time To Repair (MTTR) specification requirements. Other common metrics are warranty repair experience and cost of spare parts over time. However, these activities also require management analysis and verification of data.

Task 2E – If an item is rejected for standardization, what should the process for reviewing the reasons given and potentially re-evaluating the decision?

Recommendation:

Car Builder Standardization Plan Requirement - It is recommended that the responsibility to develop a Standardization Program be shifted from the SWG to the prospective car builders for bidding on NGEC procurements. This issue should be revisited and examined during the RFP evaluation phase and the car builder Standardization Plan should include a provision or process for re-evaluating candidate components previously rejected, and the rationale or criteria for re-evaluation (technical or economic) should be articulated.

3. Consultant Professional Background

Mr. Salci has 40 years' experience in the transportation industry, 32 as the CEO of both passenger railcar manufacturers and passenger rail system operators. He has 22 years' experience as the President/CEO of four passenger railcar manufacturers, The Budd Company Transit Group, Bombardier Corporation (US), Morrison Knudsen Rail Group/Amerail, and Colorado Rail Car Manufacturing (as consultant to secured creditor group). Mr. Salci has 12 years Transit System CEO Experience, with six years each in Detroit (SEMTA) and St. Louis (St. Louis Metro) responsible for urban bus, commuter rail, light rail system construction, equipment procurement, and operations and maintenance of equipment.

During his tenure as CEO at St. Louis Metro, in 2007 St. Louis Metro received an international award as the best maintained transit system in its peer group (mid -size bus/rail) and its maintenance practices were recognized by the Federal Transit Administration as industry best practices. The achievement of the outstanding performance was a direct result of the 2003 Metro Plan for fleet/equipment evaluation of rolling stock replacement, overhaul and maintenance based on Total Cost of Ownership (TCO) which included life cycle cost analysis. This management initiative reduced the average vehicle cost per mile to operate substantially below industry averages and reduced spare parts usage by over 30%. The St. Louis Metro Vehicle Maintenance Organization has provided industry leadership on TCO and life-cycle cost analysis and maintains an ongoing continuous improvement program to gain further efficiencies.

Mr. Salci has the unique experience and perspective of being both a private and public sector CEO responsible for both the development of passenger railcar bids, and contractual responsibility for the design, manufacture, and warranty of over 3,000 passenger railcars of all types and technology. He was the CEO of two major transit systems responsible for the procurement, maintenance and operation of passenger railcars and locomotives. He has administered several federal US DOT- Federal Transit Administration grants for rolling stock acquisition (www.salciconsult.com).

Within his passenger railcar experience portfolio, Mr. Salci has extensive experience and responsibility for the design and manufacture of earlier generation stainless steel bi-level coaches such as the Amtrak Superliner II, Caltrans California Car, and Chicago Metra Gallery Car and Bombardier's Bi-level aluminum coach. Mr. Salci has similar industry experience with single level cars of both stainless steel and aluminum design and technology including Amtrak's stainless steel Amfleet II coaches, Amtrak's Viewliner, and the Amtrak Horizon aluminum coach.

Since 2008, Mr. Salci has been an independent transportation management consultant serving surface transportation industry clients responsible for the design and manufacture of passenger railcars, the operation and maintenance of passenger railcars, and large financial institutions involved in the capital financing of passenger railcars and locomotives. Mr. Salci has served as both expert consultant and expert witness for financial institutions in tax liability litigation of leveraged lease transactions involving passenger railcars and locomotives. He has served clients in the commuter rail industry providing contract and claims analysis for the design and delivery of bi-level commuter coaches.

Since 2010 Mr. Salci has served as an independent consultant for the NGEC Executive Board's Review Panel for the NGEC Section 305 vehicle/locomotive technical specifications development. He has performed independent review and provided written reports for the NGEC's bi-level, single level, trainset, and diesel-electric locomotive technical specifications. He has also provided counsel on other matters including PRIIA Buy America provisions, Configuration Management/Document Control, and the Procurement Process for the NGEC Program.

4. Next Generation Equipment Committee Standardization Working Group

In early 2011, the Executive Board created a Standardization Working Group (SWG) with the objective to develop a Report that documented a proposed approach to technical specification/procurement that included standardization of equipment. The SWG was comprised of a facilitator and three voting members. The voting members came from the core groups of the FRA, Amtrak and the states. They were:

Kevin Kesler	-	Federal Railroad Administration
Dale Englehardt	-	Amtrak
Stan Hunter	-	Caltrans (representing the States)
Rob Edgcumbe	-	Consultant Facilitator

Additional input was provided at various points by individuals brought in by the core members, including Jeff Gordon (Volpe Center), Anand Prabhakaran (Sharma & Associates, Inc.) and Michael Burshtin (Amtrak).

A summary of the SWG Report, dated January 19, 2011, is summarized below, including the SWG recommendations. As a result of the efforts of the SWG, a Standardization Pilot Program was initiated in May 2011, utilizing the procedures defined by the SWG to determine its efficacy. Seven candidate components for standardization were conceived to which the SWG procedures were applied. A subsequent SWG Report identified lessons learned from the pilot program which will be described below. In, September 2011 the Executive Board, after a SWG presentation, concluded the standardization process, as conceived, should be reviewed by an independent third party assessor. The scope of this report is to provide an independent review and analysis of the SWG Standardization Pilot Program, Lessons Learned, and to provide recommendations for modifications as appropriate.

The SWG developed a detailed Work Plan that identified Work Plan Objectives, Approach, Process, Staff, and a Pilot Program (60 day). A brief review of the Work Plan is appropriate and is summarized as information to assist the reader of this Report with familiarity with the SWG work that has been completed that led to the SWG Questions that are the scope of this Report.

4 A. Work Plan Objectives - The SWG Work Plan Objectives were defined as follows:

1) To embrace a long-range effort to achieve commonality of systems or components across a spectrum of vehicle platforms specified for acquisition under the NGEC process
2) To encourage the vitality of the US domestic railcar supply industry
3) To identify potential candidates for standardization, as well as establish a process for the recommendation of candidates
4) To develop and refine a common process for the evaluation of each system/component that identifies both the technical suitability, and the likely range of costs and benefits of implementing a standard, through the life cycle costs of the system/component
5) To emphasize the use of open and industry standards where possible
6) To determine the process by which potential revisions to existing standards would be proposed, their benefits and costs evaluated, and recommendations made for revisions.
7) To establish a schedule for the periodic revalidation (and updating, as necessary) of issued standards

4 B. Work Plan Approach - The SWG Work Plan also identified, in detail, the approach to be used. In summary, it required the NGEC Standardization process shall be under the general direction of a Standardization Working Group (SWG), with the details of the process managed by a designated Coordinator.

The approach required the various Technical Working Groups (TWGs) shall perform the technical and financial evaluation of each submission. The TWGs shall normally be based upon the five NGEC Technical Subgroups (Mechanical, Structural, Electrical, Interiors, and VTI), and shall each be managed by their Subgroup Team Leader. The Coordinator may also designate additional Subject Matter Experts (SME) as required on an individual standardization candidate basis for proper analysis to assist the TWG in their evaluation.

The Team Leaders shall have their TWG perform both a technical analysis and a financial benefit analysis of the submission. They shall work with a Financial Analyst to verify the economic aspects of the proposal.

4 C. Work Plan Process – In summary the Work Plan Process detailed the process to identify standardization candidates, provided a process for the Coordinator to assign standardization candidates to respective TWGs and identify and assign, as needed, additional Subject Matter Experts. Under the Team Leader, the TWG shall perform an analysis of the benefits and drawbacks, and define clear reasons for rejection.

The process required the use of existing third party technical standards where possible, such as APTA, AAR, ASTM, SAE, etc. It required the technical analysis to be coordinated with a financial analyst to verify the economic benefits of the standardization candidate and to measure this benefit against a baseline cost comparison using a non-standard approach.

The process required a documented analysis presentation to the Executive Board and upon approval, coordination with the Document Management System for incorporation into the appropriate vehicle technical specification.

4 D. Work Plan Staff – The Standardization Work Plan Staffing needs were identified as follows:

- Coordinator – coordinate and facilitate the activities of the standardization process, a technical staff member who is appointed by the Technical Subcommittee
- Standardization Working Group – Group will consist of representatives from Amtrak, the States, Federal Railroad Administration, and appropriate supporting members.
- Technical Working Groups – comprised of the team leaders for the Technical Subcommittee's Subgroups to provide technical suitability and analysis.
- Financial Analyst – a representative from the Finance Subcommittee provides validation of the economic aspects and guidance on evaluation approach taken.
- Subject Matter Experts - Assigned by the TWG Team leader as needed for specialized technical data on operating characteristics, maintenance needs, operating constraints.

4 E. Pilot Program (30-60 days) – In May 2011, a Pilot Program was initiated that utilized the process identified above on seven nominated candidates for standardization. The purpose of the Pilot Program was to provide a verification of each step of the process. In September 2011 the Pilot Program was reviewed and a presentation made to the NGEC Executive Board. The candidates nominated for plan process verification their evaluation status are:

1 Wheel set – in process
2 Brake Discs – Standard developed
3 Brake Shoes – Standard developed
4 Brake Valves - Rejected
5 Seats - Rejected
6 Windows – in process

7 HVAC – rejected, no interface baseline or carbody design

4 F. SWG Identified Benefits, Aspects and Levels of Standardization, and SWG Recommendations

The SWG was to define, develop, and recommend a standardization process in a manner that would maximize its benefits while minimizing any potential downsides. The potential benefits of the standardization effort identified include:

- Reduction in life cycle cost
- Reduction in parts inventories
- Reduction in training needs with respect to maintenance practices
- Reduction in risk of human error during service and maintenance operations
- Reduction in tools and tooling requirements for both maintenance and manufacturing perspectives
- Improved reliability
- Improved sustainability of the passenger rail supply industry in the United States
- Consistency in the design, manufacture, operation, and maintenance criteria of intercity rail equipment

The SWG considered, discussed, and evaluated several aspects of the standardization process, such as:

- The Potential Benefits of Standardization
- What can Standardization cover (scope)?
- How does Standardization Relate to Different Rail Operations?
- Acquisition vs. Life Cycle Cost (Evaluation of OEM Supplier bids)
- Maintenance Commonality and Practices
- Manufacturers'/Suppliers' Perspectives
- Commuter Rail and Intercity Rail Synergies
- Impact on Competitiveness of Policies
- How does one select a Standard?

The SWG discussed several levels of standardization with regard to components/systems in relation to:

- Performance standards
- Interface standards
- Interoperability standards
- Interchangeability standards
- Design standards

The SWG distilled the above into three levels of standardization:

- Standardization of the specific layout and language of the technical specification
- Standardization of key interfaces so that components are interchangeable with common performance requirements, while the components' internals are left up to individual suppliers' designs.
- Standardization of the design of a particular component or system, resulting in identical and interchangeable components/systems for all fleets of the same car type.

The SWG's Recommendations:

1. Standardization of specification characteristics
2. Process/protocol for evaluating whether a nominated component is a good candidate for standardization
3. Defining the process for developing or acquiring a standard
4. List of initial nominees (both components & systems) to be considered for standardization

Lessons Learned from the Pilot Program:

- Major Issues:
    a. Lack of Technical Subgroup member interest in participation;
    b. No current baseline vehicle yet designed to use as a basis for subsystem interface standards

- Minor Issues:
    a. Improvements in process steps need examination;
    b. some candidates were too complex and Subgroups could not agree on all items of a candidate

- Economic Analysis - Technical Subgroups and their Financial Advisor were not clear as to how to perform the economic analysis of the potential benefits of standardization, since formal economic analysis was not practiced in Technical Subgroup preparation of vehicle specification development

- Time/Efficiency - Standardization evaluation process took much longer than expected.

5. SCOPE OF REPORT

Based on the information provided by the SWG in the Report on the Standardization Pilot Program, the NGEC Executive Board determined that one reason for the lack of participation encountered during the Standardization Pilot Program was the potential bias introduced by having Technical Subcommittee Subgroups (composed primarily of volunteer industry members – rail equipment manufacturers and suppliers) make the determination as to whether a component or system should be standardized. The Executive Board concluded that the standardization process as conceived should be reviewed and revised by an impartial third part assessor. Mr. Larry Salci was contracted with by AASHTO, on behalf of the NGEC Executive Board, to perform an independent analysis of the standardization process.

The specific tasks requested in the contract with Mr. Salci are as follows:

Task 1. – Review the SWG process, performance and results and recommend changes to the SWG Work Plan and Work Plan flowchart (Attachment 1), indicating how and where the proposed process could be revised and/or simplified, including issues regarding funding, independence, and productivity of the Subgroups, which has largely been comprised of volunteers for the car builders and suppliers.

Task 2. – Address standards development in the context of the current activities of the NGEC by considering the following questions:

A. How can perceived barriers to standards development be overcome, while maintaining involvement of the NGEC Technical Subcommittee in the standardization process? Active and continued participation of industry representatives (manufacturers and suppliers) is critical to the success of the NGEC.
B. How should the concept of standardized components be defined? Can/should components which are comprised of several subcomponents (possibly produced by different suppliers) be standardized? Should standardization be focused on components, or on major subsystems interfaces with a car, or both?
C. How can the question of when to standardize be resolve? For example, will standardizing on components which exist now impede technological innovation? Is it more practical to base standards on the components chosen for incorporation in the first NGEC equipment order?
D. How can/should the potential benefits of standardization be determined? In its current form the standardization process considers cost/benefit-like analysis. Is this appropriate? Would other metrics be

more reflective of the potential gains achievable by standardizing components?

E. If an item is rejected for standardization, what should be the process for reviewing the reasons given and potentially re-evaluating the decision?

Task 3. – Prepare a letter Report for presentation to the NGEC Executive Board describing findings from Task 1 and Task 2. This Report fulfills such requirement.

6. INDEPENDENT ANALYSIS OF SWG STANDARDIZATION PILOT PROGRAM

Task 1. – Review the SWG process, performance and results and recommend changes to the SWG Work Plan flowchart (Attachment 1), indicating how and where the proposed process could be revised and/or simplified, including issues regarding the funding, independence, and productivity of the Subgroups, which has been largely been comprised of volunteers from the car builders and suppliers.

The SWG Work Plan identified and defined the benefits and aspects of a standardization process. It also defined three levels of standardization:

1. standardization of technical specification layout;
2. Standardization of key system and component interfaces so components are interchangeable with common performance requirements;
3. Standardization of the design of a particular component or system resulting in identical and interchangeable components/systems

In summary, the SWG developed a Flow Chart (Attachment 1) that detailed the Work Plan Process to identify standardization candidates and provide for a process for a Coordinator to assign standardization candidates to respective Technical Working Groups (TWGs) and identify and assign, as needed, additional Subject Matter Experts. Under the leadership of the Team Leader of the TWGs, both a technical suitability and financial/economic analysis, was to be performed and measured against a non-standardized baseline approach. The results of the technical and financial benefits, if positive, are documented and reported to the SWG, and if approved by the SWG, recommended to the NGEC Executive Board for approval. Once approved by the NGEC EB, the Coordinator submits a Document Control Request to incorporate the standard into the respective vehicle Technical Specification.

In general, industry car builders believe the standardization of key systems and component interfaces that are interchangeable with common performance requirements is the preferred definition and approach to standardization. They support standardization as a desirable objective. However, most car builders believe the standardization process ideally should have begun concurrent with the development of the technical specification, not after. In effect, many car builders believe the "standardization horse is out of the barn" for NGEC technical specifications already approved, like the bi-level specification that is in its procurement phase. While under ideal circumstances this may be true, the current process described above still provides for achievement of a meaningful standardization process if incorporated into the RFP process.

In addition, the industry participants are volunteers, their cost of participation, time and travel, is an opportunity business development cost for their business. Many have supported the NGEC technical specification development, to varying degrees, as they hope it will lead to potential contract opportunities. But discussions at the first NGEC Technical Subcommittee meeting in April 2010 regarding the required market size (orders) necessary to sustain or attract significant car builder interest for "standardized" NGEC equipment should not be forgotten. Several car builders/suppliers expressed opinions that at least 200-300 vehicles per year order volume would be required to sustain a NGEC market. This market segment currently represents only 7% of all U.S passenger railcars (see Table 1 page 43). Car builders and suppliers are constantly re-assessing all U.S. railcar market segments and where they have opportunities and competitive advantage to allocate their resources. The uncertain predictability of federal, state, and local financial resources for capital continues to be a challenge for the industry impacting both order timing and order volume.

Also, the competitive and commercial aspects of multiple car builders and suppliers jointly participating in the discussions of identifying candidate systems and components for standardization, which they respectively design and manufacture, is at best challenging.

These are the primary reasons for the industry's lack of both participation and timely response to the TWGs standardization efforts.

STANDARDIZATION PILOT PROGRAM

A 60 day Pilot Program was implemented to test and verify the Standardization Plan Process. Initially, 27 systems/components were identified and from that list 7 candidates, at least one for each Technical Subgroup, were selected for the Pilot Program. The Pilot Program encountered problems:

- Process took much longer than expected
- Lack of subgroup member interest and urgency in participation, less than 25%
- No vehicle design to use as a basis for system/component interface standards
- Subgroups could not come to full agreement on all issues of a candidate system/component

The results from the Pilot Program Candidates are as follows:

1 Wheel set – still in progress
2 Brake Discs – Standard developed
3 Brake Shoes – Standard developed
4 Brake Valves - Rejected
5 Seats – Rejected
6 Windows – Still in progress

7 HVAC – Rejected, no interface (car design) for baseline

The lack of Subgroup member interest was a contrast to the much higher industry member interest and responsiveness during the drafting of the Technical Specifications. This lack of interest resulted in lengthy delays in developing the Pilot Program Standards and in some cases resulted in incomplete work. The obvious question is why the lack of interest and participation by the car builders/suppliers in their respective Subgroup?

The current SWG Work Plan to develop a Standardization Process for implementation will have limited impact due to one primary reason, the lack of a baseline design from which to develop interface requirements. System standardization can only be accomplished by the car builder selected to design and manufacture the vehicle who is responsible for the integration of all systems and components with the vehicle design.

Examples of successful standardization in other transportation industries include automotive, aerospace, and rail freight. There are several common factors in these industries that encourage standardization. They are all profitable (generally) private sector industries, in which product designs to serve customers are driven by economics of improving their cost structures and competitive position. All utilize the architectural platform approach to developing vehicle or aircraft designs. In autos, there are small car, mid-size car and large car platforms that use common and interchangeable engine/transmission components, electrical components, seat components, HVAC systems, wheels, etc. In the aerospace industry, Boeing by example has platforms for 737, 747, 757, 767, and 777 models, that all utilize common components for avionics, toilet systems, interior lighting, seat designs, jet engines, brake systems, and interior doors and panels. The Class I freight railroads utilize (through stock ownership)Trailer Train (TTX) for platform designs for high volume freight cars, e.g. low-level double stack flat cars, box cars, and high cube hopper cars. They all have common components, couplers, brakes, wheels, and axles. All these industries designs are driven by private sector customer demand; the manufactures control the product design process, have the advantage of predictable financing from capital markets, generate large volume orders on an annual basis, and compete in global markets.

In contrast, the passenger railcar market is characterized by public ownership, unpredictable public finance of capital order needs, the design process is historically controlled by owner technical specifications due to historical infrastructure or owner preferences, and U.S. vehicle safety design standards differ from Europe and Asia standards limiting global design applications to U.S. markets.

Therefore, the ability to achieve elements or levels of standardization in the U.S. public sector railcar industry is more challenging as compared to the other private sector transportation industries. However, like the industries above, only the manufacturer can achieve the objectives of standardization and the process recommended to the NGEC is to achieve standardization through the RFP process of requiring car builders to develop Standardization Plans.

Standardization efforts should be focused on the major high dollar systems and high usage components. The two high dollar systems above, seats and HVAC were both rejected as Pilot Program Candidates due to no baseline design. The SWG was absolutely correct in selecting these items. However, the standardization of candidate major systems can only be accomplished by the selected car builder.

By example, standardization of the HVAC system, a high dollar system, should be a high priority item. Car builders all support what can be defined as a “modular” or top down design approach. Car builders would have preferred starting with a “clean sheet of paper” design approach based on vehicle architecture, but meaningful standardization can still be accomplished within existing NGEC designs. From this vehicle platform the car builder would define the space/weight requirements for the HVAC system, define the electrical, mechanical, pneumatic interface requirements and communicate these design parameters to all HVAC suppliers who can then design their respective HVAC systems to meet the space/location envelope, weight limits, and all interface requirements. The same comment applies to seats, doors, and other high dollar systems that can be standardized via the modular approach.

The two primary functions of the car builder in the design of a passenger rail car is to perform or create the design of the carshell structure (including CEM) and integrate all systems and components within the vehicle dimensions. Design all space requirements, weight requirements, which accomplishes form, fit and function or integration into the vehicle and with all other systems and components. The end product or design must meet all design, manufacture, test, and acceptance performance requirements.

To date, the success of the SWG has been limited to stand alone components, like brake discs or brake shoes. Components that meet industry standards can be defined for performance and dimensional requirements (fit and function) and procured as a commodity. They do not require detailed design integration with the vehicle carbody by the car builder like seat systems or HVAC systems.

Therefore, the SWG Standardization Process is handicapped because the TWGs rely on industry participants to both identify candidate systems and components and perform evaluation of both the technical suitability and financial/economic benefits of major systems for standardization.

Given the TWGs challenges noted above and reasons for lack of industry participation, it serves no useful purpose to comment on the process Flow Chart or make recommendations for process improvements. A recommendation for a different approach is stated below.

RECOMMENDATIONS:

- **Car Builder Standardization Plan** - Request all NGEC procurement RFP processes include the requirement that all qualified and interested car builders submit a Standardization Plan as part of their technical proposal and price proposal. The car builder Standardization Plan should be part of the technical and economic evaluations and be weighted according to importance of the "Standardization Objective" of NGEC equipment.

- **Standardization Plan Part of Technical and Economic Evaluation -** It should be noted that the economic/financial analysis evaluation component relies on Total Cost of Ownership analysis (initial cost plus life cycle cost analysis) which requires substantial commitment by the purchaser/owner/operator to perform both the bidder evaluation and monitor the performance and report data for systems and components.

- **SWG Utilized to Assist RFP Evaluation and Design Processes** - The role of the SWG should be expanded to include defining/reviewing the RFP criteria to evaluate the prospective car builder Standardization Plan proposals. The SWG should be involved in the design review process as it relates to the car builder standardization plan development, with emphasis in the approval of systems and components for standardization both the Conceptual Design Phase (10%) and at the Preliminary Engineering (30%) design phase.

- **Standardization Plan CDRL** – The owner should require the car builder Standardization Plan be included in the contract deliverable requirements (CDRL) in the form of inclusion in the Design Submittal Plan. The CDRL should reference and integrate the Standardization Plan for design review and approval as part of Preliminary Engineering Design Review (30%) and Intermediate Design Review (60%) and related mock-up review requirements.

Task 2. Address standards development in the context of the current activities of the NGEC by considering the following question:

A. *How can perceived barriers to standards development be overcome, while maintaining involvement of the NGEC Technical Subcommittee in the standardization process? Active and continued participation of industry* *representatives (manufacturers and suppliers) is critical to the success of the NGEC.*

The NGEC Technical Subcommittee is made up of volunteer industry car builders and system/component suppliers. Their lack of participation in the development of a vehicle standardization program is problematic for several reasons. *Therefore, it is important to first understand the issues that have contributed to the lack of industry participation before making a recommendation on industry involvement.*

For the impending bi-level procurement, the best time for including standardization as part of the technical specification has passed, i.e., standardization ideally would have occurred during the development of the technical specification, not after. However, there remains significant opportunity for standardization during the RFP process which will be explained in detail below. It is recognized the NGEC's quest for standardization is real, especially for the first NGEC procurement. The timing to engage the industry is now critical, and without clear definition to the industry the equipment standardization objective opportunity will marginalize. This Report will provide recommendations below for inclusion of standardization implementation in the current bi-level procurement and all future NGEC procurements.

The PRIIA Section 305 NGEC has succeeded in developing, in cooperation with the industry participant car builders and suppliers, technical specifications for a bi-level vehicle, single level vehicle, single level trainset, and diesel-electric locomotive. The coaches have different configuration design requirements, coach, business class, café/lounge, and cab/baggage. The design effort will also include carbody and coupler crash energy management requirements. The non-recurring engineering design cost for a car builder will be significant, and could significantly impact the vehicle prices if fully allocated to the 130 car order size. The industry does not yet know the form of the procurement bid award process; will it be a low bid process or will it provide for a two- step negotiated bid process (Brooks Method)? Competitive industry dynamics, bid award process, intellectual property rights, and future NGEC funding uncertainty are all issues of great concern to the car builder industry and without clarity may be reasons for their lack of participation in the standardization process to date.

While the NGEC's Technical Subcommittee and Standardization Working Group should be congratulated for the extensive hard work and effort for the above achievements, a defined commercial strategy for the NGEC program has lagged the technical specification development process. The definition of how NGEC stakeholder participants that will manage the funding, procurement, and ownership of the vehicles through cooperative agreements are an ongoing discussion (NGEC Structures and Funding Subcommittee). The NGEC has not yet been able to articulate a coherent commercial strategy that will foster a competitive market while capturing the benefits of standardization. However, as noted above, the NGEC's quest for standardization is real and the timing is critical to engage this subset of the passenger railcar market.

It is first important to understand the reasons car builders and suppliers believe there are both perceived and real barriers to equipment standardization. This is due to the both historical industry and public agency standardization impediments, which to some extent, also apply to the NGEC standardization efforts and procurement process, even though standardization is a stated NGEC objective.

As stated above, industry participation in the NGEC /SWG standardization process has been lacking, and the question is why and how can this situation be overcome as industry participation is critical to the success of the NGEC. Listed below are some of the industry characteristics, competitive dynamics, market profile, and public agency procurement process issues that collectively contribute to this lack of participation. There needs to be recognition of these issues and they need to be avoided, or mitigated to the extent possible, by the NGEC, if standardization implementation is to become a reality.

U.S. PASSENGER RAILCAR INDUSTRY CHARACTERISTICS, COMPETITIVE DYNAMICS, AND MARKET PROFILE THAT HAVE IMPACTED THE LACK OF STANDARDIZATION

- Railcar manufactures that participate in the U.S. market are all multinational corporations with varying degrees of U.S design/manufacturing operations. U.S. owned companies have all exited the industry during the past 30 years, but many of their assets sold remain in productive use in the U.S., including manufacturing facilities, engineering resources, and skilled workforces. The U.S. market makes up approximately 5% of the worldwide fleet; the industry is global (see page 48 Table 2).
- The U.S. passenger railcar fleet or installed base is approximately 22,000 vehicles of which the intercity/state corridor fleets are approximately 1,600 or 7% of the U.S. fleet. The size of markets, technology specific tenders and public funding for those markets often determines the engineering and commercial resources multinational car builders allocate to U.S. opportunities.
- Car builder technical risk and commercial competitiveness for a contract opportunity is often a function of ownership of past designs vs. new or custom designs, the form of bid process (low bid vs. negotiated tenders) and order size.
- Worldwide, there is far more car builder capacity than there is demand for the manufacture of passenger railcars, which exerts tremendous pressure on price levels in an industry that already suffers from low margins.
- The U.S. market has witnessed large turnover in car builders participating in the U.S. market in the past 30 years; exit of U.S owned car builders and the

entrance of several new multinational car builders. There are virtually no barriers to entry to the U.S. market. There are currently 10 multinational car builders active in various segments of the U.S. market, but not all have participated in the NGEC Subcommittee process, or participated with the same level of resource commitments.

- Multinational car builders that participate in the U.S. market have had to adjust their business model operations to meet U.S. federal regulatory requirements, specifically, Buy America requirements (FTA 60%-Amtrak 50.1%, NGEC 100%), which require final assembly in the U.S. There is no strict definition of U.S. assembly. Some manufacturers have decided to build or purchase permanent manufacturing and assembly facilities and are fully integrated car builders, including car shell manufacturing, in the U.S. Other car builders have leased temporary facilities, import car shells, and assemble in the location where the order is filled; then leave after order completion. This later strategy has been successful with local transit authorities that have made "local" assembly a bid evaluation criteria or even a contract requirement. These different car builder business strategies create different profiles for the type of skilled workforce and permanent jobs created in the U.S.
- Historically, the U.S. market for passenger railcars is limited and erratic and tends to be for customized cars. The large urban transit and commuter systems of New York and Chicago often create spikes in the volume of cars manufactured on an annual basis which create huge peaks and valleys distorting annual market averages.
- Since railcar procurements are infrequent, with railcars having a federal (FTA) defined useful life of at least 25 years (actual is 35-40), many transit agencies/State DOTs officials may participate in only one or two procurements in their careers. They often lack experience and resource and must rely on engineering design consultants for technical specification development, procurement management assistance, and project management for railcar contracts. To date, there has been no effort by the owners or consultants to move toward standardization of vehicles by type; bias is towards owner custom designs which generate more business for consultants.
- Transit agency/State DOT procurement requirements may create difficulties (impediments) due to state and local requirements. Some state laws require full disclosure of all procurement information, including potential proprietary information. This may make the procurement evaluation process and car builder bid negotiation/selection process difficult and often results in limiting the number of proposals received when purchasing railcars; many companies will not divulge their proprietary information.
- Transit agencies, State DOTs, and Amtrak rely on public funding to purchase railcars but must weigh these purchases against other capital and operating needs. Often, the sources for both capital and operating funding for railcars is a combination of federal, state, and local funding sources, and annual levels of

funding are uncertain. The amount of design reuse (standardization) that will be possible during procurement is defined during the capital expenditure (Capex) phase (initial vehicle price). Unfortunately, many of the benefits of standardization (life cycle cost analysis) are obtained and verified during the operating phase of the vehicle life and there often exists a lack of coordination between the priorities of both sources of funds within

- The type of procurement process may have an impact on the number of bidders. The industry went through a period of selecting winning bids on the basis of "best value", where many factors, including Total Cost of Ownership (TCO) was evaluated (initial capital cost plus life cycle cost of vehicle/components). However, because worldwide capacity exceeds demand, competition is fierce, which exerts downward pressure on price levels and resulted in many of the negotiated procurements incurring protests from one or more losing bidders over price evaluation weighting. Protests are costly to resolve and can significantly delay contract award. Attribution on the basis of lowest price is the method least subject to protest, but can also reduce competition.
- The trend over the past 10 years has been to return to the low bid process due to increased oversight of public funds and the ability of purchasers to obtain "extremely" low prices due to the car builder overcapacity issue and multinational car builder U.S business strategy for market penetration.
- There has been much consolidation in the worldwide capacity of railcar manufacturers, but capacity still is greater than demand, and there have been new international entrants. These new entrants, some from emerging economies, have an abundance of qualified, low cost engineering and manufacturing talent, and often have strong national government support through (subsidies) export financing, bonding and insurance, government financing, and currency fluctuations. It is therefore, relatively easy for them to minimize the cost and schedule impacts of "custom" designs due to the lack of standardization. Low price always seems to outweigh potential contract performance problems or past poor performance with owners.
- Recent low price examples are the recent bi-level coach orders in both the commuter industry and intercity markets. In the case of the Southern California Regional Rail Authority (SCRRA) the price differential between the winning bid and the second low bid for 130 coaches was $81 million or approximately 25% of total contract price. The recent Amtrak Viewliner II award for 130 coaches the price differential between the winning bid and second lowest was $91 million, also about 25% of total contract value. For an industry that in general has margins of 5%-6%, these winning bids often distort market price levels, but for public agencies competing for scarce capital funding these bids are attractive and politically desirable. If the low bid process trend continues in the U.S., car builder price competitiveness can only be achieved through margin erosion in a business that is already a low-margin

business. This situation is not sustainable for profit oriented companies in a strictly low bid procurement environment impacted by erratic bidding behavior of some car builders.

- Funding for the NGEC has been provided by the ARRA (one time source) and annual appropriations by Congress for the bi-level and diesel electric locomotives. Funding beyond these scheduled procurements is undefined at this time. The benefits of standardization are achieved by volume of vehicle orders. The industry questions whether the bi-level order will be followed by more bi-level orders or is this a "one and done" procurement for the near future?
- Amtrak represents about 95% of the Intercity/Corridor fleet and it has the oldest average fleet age of all railcar modes in the U.S. (see page 43, Table 1). Amtrak inherited a heritage fleet at its creation of many different designs and age. Amtrak historically has long been undercapitalized as it relates to the funding appropriations made by the U.S. Congress for fleet replacement. The car builder/supplier industry continues to monitor the funding debate in the U.S. Congress over the levels authorized and annually appropriated for Amtrak. Funding for Amtrak will have significant impact on the NGEC long-term program.

To date, the NGEC is discussing the appropriate structure and funding arrangements for NGEC procurements. In the interim Caltrans and Illinois DOT are jointly managing the bi-level procurement, with Caltrans and its engineering consultant responsible for procurement administration. The industry is waiting to learn what procurement evaluation process will be utilized by Caltrans/Illinois DOT and will standardization requirements be a part of the procurement evaluation criteria?

From my years of experience and professional relations with many car builders and suppliers in the U.S., there is a consensus that standardization would be good for the passenger railcar industry, for both owners and car builders/suppliers. Car builders see benefits in lower technical risk, lower project risk in meeting delivery schedule, lower risk with system suppliers, which translate into lower operations and maintenance cost to the owner/operator. Several car builders have expended extensive financial and technical resources on their own in recent years to develop a standardized approach to designs of passenger railcars, but without much success with public agencies.

SWG STANDARDIZATION DEFINITION

The SWG identified three levels of standardization definitions that were contained in its report to the NGEC Executive Board:

1. Standardization of the technical specification layout, format and language. This has been accomplished by the Technical Subcommittee with the development of the bi-level, single level, trainset, and diesel-electric locomotive. This was a major achievement by the Technical Subcommittee.
2. Standardization of key interfaces so that components are interchangeable with common performance requirements, while the components internals, including intellectual property rights, are left up to individual suppliers' designs. *This is clearly the preference of the industry and will be used below as the preferred definition of standardization development and is in both the NGEC and industry best interest.*
3. Standardization of the design of a particular component or system, resulting in identical and interchangeable components/systems for all fleets of the same car type. *This is generally not supported by the industry for major systems and components.*

The car manufacturers, the prime contractor with the customer as the designer and manufacturer of passenger railcars, perform two major functions, design of the car body and design integration of all the systems and components into the car body in accordance with the technical specification dimensions and performance criteria. Therefore, the only significant way for standardization to occur, is if the car builder is provided the opportunity to achieve standardization utilizing the commercial concept of the platform/architecture and modular design approach. This requires trust and credibility between the owner/customer and car builder/suppliers.

This approach will potentially generate the greatest standardization opportunities across the entire vehicle platform value chain, from vehicle platform definition through engineering, procurement, assembly, parts logistics, to vehicle commissioning.

I believe it may be helpful to describe how car builders and system suppliers view the best way to achieve standardization and then compare that to both the industry impediments and the SWG/NGEC perceived barriers identified in the Pilot Standardization effort.

INDUSTRY SUPPORTS STANDARDIZATION

The industry supports the concept of standardization as defined by the SWG definition of both technical specification layout (already achieved) and for standardization of key interfaces with common performance requirements while components internals, including intellectual property rights, are retained by the supplier's designs. The car builder and suppliers are not prone to give up intellectual property rights, which include not only patents and copyrights, but proprietary business process and methods that control engineering, manufacturing, and tooling processes.

The general industry concept of designing a passenger railcar with standardized components is ideally accomplished when the following sequential activities are allowed to occur:

- Customer provides Car builder with the infrastructure outline, operating conditions, and clearance envelope for the vehicle.
- Car builder starts with a clean design, i.e., a "platform" from which all vehicle architecture is developed. This is a top down approach.
- Car builder designs the form, fit, and function of all systems and components by utilizing a "modular" approach. Specifically, the car builder defines the modular or space requirements for all major subsystems and components that allows for multiple suppliers of the same system and/or components to design their equipment to specific capacity or space requirements, requirements for electrical, mechanical, and pneumatic interfaces, and meet technical specification performance criteria, including reliability (MDBF) and maintainability (MTTR) requirements. These supplier systems and components are then interchangeable, i.e., suppliers A, B, or C can all provide the system or component. Selection evaluation can then be made on price/cost, performance criteria, reliability, warranty support, etc. by the car builder (best value approach) and subsequent spare parts decisions by the customer based on life cycle cost-benefits.

The issue of incorporating standardization into the PRIIA designs should have occurred at the beginning or the inception of the development of the vehicle technical specification process. This did not happen. By example, the development of the bi-level specification began with the use of the Caltrans C-21 technical specification as a benchmark starting point, a very mature specification itself nearly ready for bidding. This was not the "clean platform" approach discussed above. There were modifications made to the specification during development, but there was little attempt to incorporate the standardization "modular" design philosophy as the technical specification was already significantly advanced. And since the C-21 technical specification was a derivative of both the California Car developed for Caltrans and Pacific Surfliner designed for Amtrak/Caltrans many car builders and suppliers have the perception, rightly or wrongly, that the designer/manufacture of the California Car/Surfliner designs and equipment suppliers for these two designs have a competitive advantage in bidding the PRIIA bi-level procurement. This may be why some car builders and suppliers decided not to participate in Technical

Subcommittee, or only to a limited degree, believing they were at a competitive disadvantage.

RECOMMENDATIONS:

- **High Dollar Systems and High Usage Components** - Standardization should focus on two major cost drivers, major systems and subsystems that are large high dollar cost elements for vehicle procurements and high usage components procured over the life cycle of a of a passenger coach.

  Specific high dollar system candidates recommended for standardization are:
  a. HVAC System
  b. Door Systems
  c. Seat Frames – a maximum space envelop would be defined and there could be two standards means of attachment: fixed (location and type of fixation) and adjustable (seat tracks)
  d. Coupler Systems (CEM design)
  e. Truck Systems (component assemblies and carbody interface)
  f. Toilet systems
  g. Toilet modules
  h. Lighting systems
  i. LVPS and battery system
  j. Floors (subfloor design/assembly)

  High usage components, procured independent of a system, can be readily identified that comply with industry standards and regulations, such as APTA, SAE, ANSI, ASHRAE, ASTM, AWS, IEEE, ISO, etc. These components are in the category of consumables or items with high usage, maintenance due to normal wear and damage. These items are generally readily procured in the open market as spare parts. Many of these items were already identified by the SWG as follows:
  a. Wheel sets
  b. Axles
  c. Bearings
  d. Brake discs
  e. Brake shoes
  f. Trainline power connections
  g. Trainline electrical signal connections
  h. Windows

  b. **Modular Design Approach** - Standardization of systems needs to be designed from a "modular" approach described above and can only be achieved in cooperation with the car builder through the design phase via a top down approach. Once the vehicle architecture is determined (bi-level technical specification) then the car builder can provide "conceptual design" for space and weight requirements, for form, fit, function, and for electrical, mechanical, pneumatic interface requirements of major systems. All industry standards must be met. The car builder will be required to coordinate this effort with major system suppliers during the RFP process as this is when technical proposals and price quotations are obtained from suppliers and are part of car builder's technical and price proposal. This will incentivize car builders to be creative. Car builders should be required to provide a "Standardization Plan" as part of their technical submittal to the Request for Proposals and at a minimum the Standardization Plan should include, but not be limited to, their design response to the major systems and components requested for consideration noted above.

c. **Key Interface Definition** - Define standardization as defined space requirements, weight limits, and key interface requirements to meet form, fit and function, and interchangeability not design an identical component.

d. **Two Step Procurements Preferred** – A procurement process that provides for two separate evaluation steps, technical suitability for responsiveness to technical specification and compliance with all financial requirements (bonding, LC, insurance, financial ability to perform) and price proposal that have separate weighted criteria is preferred (Brooks Method) vs. low bid process will enhance standardization effort. Low bid process runs counter to Total Cost of Ownership (TCO) analysis which relies on initial price plus life cycle cost-benefit analysis.

e. **Industry Funding** - Sufficient federal/state/local capital funding needs to be provided to ensure market volumes will provide for economy of scale to attract completion and investment in U.S. plants and create new jobs.

Task 2, B. – How should the concept of standardized component be defined? Can/should components which are comprised of several subcomponents (possibly produced by different suppliers) be standardized? Should standardization be focused on components, or major subsystem interfaces with a car, or both?

RECOMMENDATIONS:

- **Modular Design Approach** - As explained in the previous section standardization should be defined using a modular approach and the approach should be from the top down, i.e., starting with the vehicle architecture definition and then analysis of the highest level of systems and related components. Once systems are identified, then identification of the lowest level of components can be standardized and procured in the open market. This assumes the definition of key interface definition for form, fit, function, and interchangeability of systems/components.

- **Top Down Approach** - Using a modular top down approach, both system large dollar items and components with high volume usage should be standardized. This can be accomplished on systems where different suppliers may supply different components that comprise the system.

- **Both Systems and Components** - The vehicle truck is a major system and consists of both sub-systems and components. The design of various sub-systems and components when assembled comprise a truck that is required to accommodate longitudinal, swiveling, and vertical forces encountered during operation and provide the ride quality and performance required by the specification. Each of these components impacts some aspect of the performance requirements of the truck. The design requires integration of all these components to meet truck performance requirements. There are several high cost components, produced by different suppliers that have relatively high usage over the life of the truck and vehicle.

The truck design is a prime example of why the standardization process for identification of components needs to be a top down approach. By example, a truck for a vehicle is comprised of many components: a truck frame, primary and secondary suspensions systems, shock absorbers, wheels and axels, journal box (bearings) and other truck assembly components. These components all have different useful lives and maintenance service requirements.

The current bi-level specification allows for either a cast or fabricated truck frame design with a required design life of 40 years, same as the carbody. However, the major components of the truck have a much shorter useful life. By example, the primary suspension system must be of proven arrangement and have a minimum functional service life of 8 years. The secondary suspension system allows for either coil springs or air springs, and has a service life generally less than the primary suspension system. Therefore, it would be through the design phase (PE) when the car builder and truck designer would develop a truck design to meet the technical specification performance requirements and could then identify candidate truck components for standardization, such as coil springs or air springs. This would be approved by the NGEC's SWG through the design review process (30% PE design level) by contract management.

Truck components, such as wheels, axles, and tread breaks already must meet various industry standards and regulations and once dimensional, performance and functional interface requirements are identified as part of the truck design, these components should be relatively easy to procure competitively in the open market.

Task 2, C. - How can the question of when to standardize be resolved? For example, will standardizing on components which exist now impede technological innovation? Is it more practical to base standards on the components chosen for incorporation in the first NGEC equipment order?

RECOMMENDATIONS:

- **RFP Starts the Standardization Process** - The time of when to standardize ideally should occur concurrent with technical specification development if a new design is being developed. If a technical specification is already developed, the car builder should be required to develop a Standardization Plan within the architecture of the existing vehicle design. The Standardization Plan will be developed and verified during the preliminary engineering design phase of the railcar contract. *The standardization potential will be identified during the design phase of the first NGEC vehicle order (and each successive vehicle platform type) and documented by the as-built drawings which become the property of the NGEC.*

- **Technological Innovation** – Key to the modular design and key interface definition is both the ability of suppliers to retain their intellectual property rights and use those rights to focus on technological innovation that may provide the supplier with a competitive advantage. At the same time the modular approach does not inhibit other suppliers of the same system or component for pursuing the same strategy and objectives, thereby creating the best competitive situation for all parties.

Once a system or component is standardized, the assumption is suppliers can avoid the non-recurring cost of engineering and production tooling requirements for custom order components. In theory, and practical application, suppliers competing to supply such compon*ents will then orient engineering resources to research and* development for technological innovation to develop possible competitive advantage. This R&D process is done in coordination with supplier manufacturing process improvements, methods, production tooling, all resulting in either improved product reliability or improved production cost benefits, or both.

The supplier technological innovation investment efforts will be based on market share improvement potential, based on market volumes relative to the opportunity costs of other components or products that comprise the suppliers business. If cost reductions can be achieved, the supplier will then decide how much of the economic benefit to retain (margin improvement) and how much to pass on to the customer for cost reduction to improve the supplier's competitive position by reduction of component cost to the owner/operator.

Task 2, D. – How can/should the potential benefits of standardization be determined? In its current form the standardization process considers a cost/benefit-like analysis. Is this appropriate? Would other metrics be more reflective of the potential gains achievable by standardizing components?

One of the seven major objectives of standardization identified by the SWG was goal number 4:

> "To develop and refine a common process for the evaluation of each system/component that identifies both the technical suitability, and the likely range of costs and benefits of implementing a standard, through the probable range of the life of the standard in accordance with the life cycle costs of the system/component".

RECOMMENDATION:

Mr. Salci concurs with the SWG identification of the potential benefits of standardization and specifically with the recommendation to utilize life cycle cost/benefit analysis as a key element of the standardization analysis utilizing Total Cost of Ownership (TCO) economics. However, Mr. Salci has two major concerns that may negatively impact standardization implementation:

- **Integration of Standardization into the Procurement Process -** How does, or will, the current bi-level (and future PRIIA procurements) incorporate/integrate standardization, and life cycle cost benefit analysis, into the evaluation criteria and criteria weighting process for assessing the car builder bids? The current bi-level procurement process to date is under development and it will be determined if and how standardization will be incorporated and evaluated. If utilized, will the standardization process be limited to the technical suitability evaluation or will it also include TCO economics in the car builder evaluation process? Will the SWG have the ability to input into the car builder evaluation criteria development and weighting process on standardization? If so, who will actually perform the standardization analysis, both technical suitability and financial/economic analysis? The SWG could act as the independent car builder evaluators or Subject Matter Experts limited to standardization evaluation.

- **Best Value or Total Cost of Ownership Approach -** If a life cycle cost/benefit analysis is utilized, there are two serious questions: 1) how will the life cycle cost/benefits represented by the car builder and their suppliers be evaluated and are resources available to perform such analysis?; and 2) how will car builder/supplier life cycle cost representations be verified over time and will resources be available to collect, analyze and verify data.

TCO LIFE CYCLE COST BENEFIT VERIFICATION

A vehicle contract with a car builder, the prime contractor, represents a series of contracts with virtually hundreds of suppliers, of which approximately 20 make up 80% of the vehicle's bill of material. These 20 major vendors will likely offer the greatest opportunity for standardization of their systems and high usage components. The car builder has a contractual relationship with the suppliers for the initial car order, and therefore the ability to negotiate standardization into the design for select systems/components and enforce representations made by suppliers on the basis of TCO.

To properly verify the supplier performance/financial representations the owner will be required to monitor the vehicle performance (reliability and maintainability) and provide financial accounting of the costs related specifically to systems, subsystems, and components. Owners/operators will be required to have their daily reporting and accounting of operations and maintenance activities "customized" to collect and segregate data (bill of labor, bill of material, materials management, warranty claims, and applied overhead costs) for those specific systems and components data. To date, the management /verification of life cycle cost analysis remains a challenge for the industry owners/operator. At this stage of the NGEC standardization process, the cooperative agreements between the NGEC participants have not been defined. To make TCO a part of standardization will require a commitment of resources noted above.

The only other metrics, other than TCO, that could be used to reflect potential gains from standardization would be to rely on the Technical Specification requirements for system/component reliability (MDBF) and maintenance (MTTR). However, these metrics would require the same monitoring, reporting and verification and the same problems noted above would apply.

If the NGEC SWG determines it wants to use TCO and the life cycle cost element the following model is provided for consideration.

LIFE CYCLE COST ANALYSIS MODEL FOR CONSIDERATION

The term **Cost Benefit analysis** is used frequently in business planning and decision making support. The term has no universally agreed spelling, it is written as cost benefit, cost/benefit, cost-benefit, or benefit/cost. The term covers several varieties of business case analysis, including:

- Return on investment (ROI analysis)
- Financial justification (used for investment analysis)
- Total Cost of Ownership analysis (TCO)

All of these approaches to cost benefit analysis attempt to predict the financial impacts and other business consequences of an action. All these approaches have the same structural and procedural requirements for building a strong business case. They differ primarily in terms of:

- How they define "cost" and "benefit" in practical terms
- Which costs and benefits are included in the analysis
- Which financial metrics are important for decision makers and planners?

As noted above, it is recommended that **Total Cost of Ownership (TCO)** be used for the purpose of decision making support of the financial analysis element of equipment standardization for passenger railcars. TCO is designed to assist decision makers in defining positive and negative consequences of a proposed action, which are summarized and then weighed against each other. To be useful, the cost/benefit analysis requires strictness and methodological coherence in its application. This will only be of benefit if the owner/operator has the management resources and discipline to measure, monitor and verify performance and costs of systems/components.

For a passenger railcar, the concept of TCO must include both the initial capital cost and the annual operating and maintenance cost associated with the vehicle and all of its systems and components. Listed below are major key assumptions and data required to perform a life cycle cost analysis of a passenger railcar that can be considered in building a life cycle cost model:

1. Useful life of vehicles must be specified, technical specification minimum 40 years for carbody, systems and components have shorter minimum useful lives as defined by technical specification. Supplier input is required for each system/component identified by car builder for life cycle analysis.
2. Depreciation Rate: Straight line depreciation-FTA Circular C5010.1D
3. Annual vehicle operating miles (estimated by duty cycle)
4. Discount Rate (of interest): e.g. 3% to 6% used to calculate or discount cash flows to a net present value. The higher rate adjusts for risk factors.
5. Annual escalation (inflation) rates for operating costs:
    a. Maintenance materials
    b. Energy consumption
    c. Labor rates
6. Average fleet energy consumption at AW2 (seated) loading - diesel fuel cost (key assumption that may also require sensitivity analysis)
7. Initial Capital Cost of Vehicle
8. Maintenance Cost (should include skilled burdened labor and supervision, parts)
    a. OEM recommended inspection and maintenance program to be performed by owner/third party
    b. OEM recommended periodic preventive maintenance program to be performed by owner/third party
    c. Intermediate vehicle subsystems periodic overhauls, to be executed by owner/third party
    d. Estimate of all running repairs and corrective maintenance costs base on proposers reliability and maintainability program-meet Technical Specification requirements:
        i. Friction brake system – 300,000 miles
        ii. Side and End doors - 300,000 miles
        iii. HVAC System - 380,000 miles
        iv. Couplers - 300,000 miles
        v. Trucks & Suspension - 435,000 miles
        vi. PA System - 460,000 miles

   vii. Aux Power System - 255,000 miles
   viii. Food Svc components - 300,000 miles
   ix. Cab control systems - 450,000 miles
9. Cost of in-kind Mid-life Overhaul (MLOH) –requires specific definition of work
10. Definition of Management and Production personnel or MLOH or third party contractor
11. Residual cost of disposal-due to depreciation or obsolescence

If TCO is not utilized, benefits can still be measured by the systems/components measurement against the reliability MDBF metrics noted above. The same can be said of the metrics for the MTTR metrics requirements. Other common metrics are warranty repair experience, cost of spare parts over time. These measurements will still require the use of data collection and analysis, just not at the level of commitment as the TCO analysis.

The SWG recommended the use of life cycle cost analysis as a key element of the standardization financial/economic evaluation process. TCO has many benefits, but requires a top management resources commitment.

Task 2, E – If an item is rejected for standardization, what should be the process for reviewing the reasons given and potentially re-evaluating the decision?

In responding to other Tasks previously discussed, it is recommended that the Standardization process be modified to shift responsibility form the SWG to develop a Standardization Plan for each NGEC design to require the prospective car builders to develop a Standardization Plan as part of the RFP procurement process. If this process is adopted, a careful analysis of the car builder Standardization Plans will provide great insight as to what is possible regarding standardization of systems and components. The benefit will be enhanced as a function of how many car builders respond to the RFP which will provide the owner/operator with valuable information on commonality of systems and components identified as well as the level of standardization on systems with multiple components.

It should also provide insight on the rationale or reasons for rejection of candidates by car builders, especially if there are differences of professional opinion between car builders on what is achievable.

The SWG standardization process Flow Chart identifies the various processes and sequence for standardization candidate evaluation, both technical and financial/economic. These principles still apply to sound evaluation techniques for making a business case decision on standardization. These evaluation techniques should be compared to the evaluation techniques utilized by car builders in their respective Standardization Plans.

RECOMMENDATION:

- **Car builder Standardization Plan Requirement** – It is recommended that the responsibility to develop a Standardization Plan be shifted from the SWG to the prospective car builders for bidding on NGEC procurements. This issue should be re-visited and examined during the RFP evaluation phase and the car builders should be provided RFP instructions to include a provision or process for re-evaluating candidate systems or components previously rejected, and the rationale or criteria for re-evaluation (technical or economic) should be articulated.

7. SUPPLEMENTAL INFORMATION ON THE PASSENGER RAILCAR INDUSTRY

The scope of this independent analysis was to focus on the NGEC Standardization Pilot Program; however, to properly provide an independent analysis of the recommended Standardization Process, it is essential to understand the historical bias or natural tendencies against standardization from public agencies procuring equipment, i.e., transit agencies, commuter agencies, State DOTs, and Amtrak. The passenger rail industry, as a group, must understand the inter-relationships of these issues if equipment standardization progress is to become reality. These issues will be discussed in response to the Tasks required in the scope of this report.

Also, it is important to understand the structure of the US passenger equipment market, its installed base, historical development, both from an infrastructure/equipment and funding perspective. These issues all contributed to the decisions that impacted the historical development of passenger rail equipment technical specifications, and why standardization has not occurred to any significant degree. This information will help explain the perceived and real impediments to standardization, what needs to be done to change past industry practices that will positively impact the NGEC's standardization objectives for intercity/state corridor PRIIA/NGEC Section 305 funded equipment.

The evolution of passenger rail transportation systems and the lack of any formal standardization of vehicles and equipment have occurred for several reasons, including the historical private sector development of transit systems infrastructure, evolution of surface transportation systems from private to public ownership, vehicle design limitations due to infrastructure, and federal, state, regional, and local funding for

U.S. Passenger Railcar Installed Base

The U.S. passenger rail car market installed base is comprised of different types of vehicles: heavy rail, light rail, and commuter rail (both coach and EMU) vehicles for urban and suburban services, locomotive hauled coach vehicles for State DOT corridor services, and intercity services (Amtrak). The fleet is made up of the following vehicles by mode:

Table 1

Vehicles by Mode	Quantity of Vehicles	Fleet Average Age in Years	% of total Passenger Rail Vehicles
Heavy Rail (Urbanized Area transit systems	11,461	21.9	51.9%
Light Rail (Urbanized Area transit systems)	2,068	15.8	9.4%
Commuter Rail (Urbanized Area commuter systems)	6,941	17.1	31.5%
Intercity-Amtrak	1,510	26.0	6.8%
State DOTs Corridor Services-Caltrans/NC DOT	108	20	0.4%
Totals	22,068		100.0%

Source: APTA 2011 Fact Book (based on 2009 data)
Amtrak Fleet Plan, Version 2, February 2011

The total percent of the combined Amtrak/State corridor fleets is slightly more than 7% of the total passenger rail car installed base in the U.S. This IC/Corridor mode and its percentage of the U.S. market is the focus of the NGEC Standardization Program. The percent of the US fleet that may be impacted by standardization can be slightly larger if synergies can be found with the Commuter Rail coach market/fleet, although this has limitations. There is virtually no standardization synergy with the heavy rail, light rail or EMU technologies as they are self- propelled vehicles, consisting of multiple designs due to infrastructure and operate in different markets, urban transit and regional commuter rail. This will be discussed below in the report.

- The **heavy rail market** (11,461 vehicles) or urban rapid transit systems were developed by the private sector in our older cities, like New York, Boston, Philadelphia, and Chicago. By example, the first two New York lines were initially constructed and owned by the private sector, influenced by the technology revolution that swept surface transportation at the turn of the century, the use of electricity for propulsion. The Interborough Rapid Transit Company (IRT) opened in 1904 financed by NYC merchants and stimulated vast residential construction. In 1913 the privately owned and operated Brooklyn-Manhattan Transit Corporation (BMT) opened. The third and final leg of the New York system opened in segments during the 1932-1940 time periods, the Independent Subway System (IND), but it was publicly owned and operated. There was no coordination or standardization of infrastructure or vehicles, which is why the cars that operate today on all three major systems are of different lengths and capacity due to infrastructure specifications. The NYCTA was not organized until 1953, combining all three rapid transit systems, all constructed without any federal financial assistance. Today's Chicago Transit Authority (CTA) was created in 1947, a municipal corporation, to purchase the assets of the Chicago Rapid Transit Company. Like New York, the CTA's lines were constructed in the early 1900's, and the length of its cars is determined by the "loop" in downtown Chicago, which is why all cars are small; 48' in length. The newer heavy rail systems built beginning in the 1970's with federal funding, such as WMATA, MARTA, Maryland MTA, Miami-Dade, generally have higher capacity vehicles, 70 plus feet in length, but still have different infrastructure, and interoperability compatibility issues, e.g. electrical voltage, vehicle truck wheel diameters, platform boarding heights, etc. These large legacy systems, and newer systems will continue to purchase passenger railcars of custom design to meet their specific system infrastructure and operational requirements, with little, if any industry standardization.

- The **light rail market** (2,068 vehicles), for medium density urban areas developed in the 1970's-1990's in response to energy and urban/suburban growth strategies has taken on more of a standardized approach, as light rail vehicle manufactures from Europe, Japan, and Canada have provided vehicles of similar lengths (generally articulated designs), capacities, and operating performance requirements. While it is difficult to document, there was an attempt by the FTA to generate a standardized light rail vehicle for North American applications, with limited success.

- The **Commuter rail market** (6,941 vehicles) is of two basic vehicle types, locomotive hauled coaches and electrical multiple units (EMUs). The largest urban areas, New York, New Jersey, Philadelphia, and to lesser extent Chicago agencies utilize EMU vehicle technology, which represents about 50% of the commuter rail vehicle installed base. The newer commuter rail systems rely on locomotive hauled coaches. There have been two designs that have dominated the locomotive hauled coaches, the “Gallery coach” design, a bi-level gallery design developed for Chicago area private railroads, now Chicago Metra, and also used in a few other U.S. locations, and the Bi-level coach developed for the Toronto Go Transit Commuter System and now used by over a dozen U.S. commuter properties. These two designs became the defacto “standard designs” for the commuter rail industry from the 1950’s to 1990’s, and in total are approximately 2,000 vehicles or about 65% of the non-EMU commuter fleet. In later years, newer bi-level designs have been developed and purchased by other U.S. commuter rail owners, like New Jersey Transit’s new bi-level coach built specifically for its service needs (accommodates both high and low platform boarding). It is this later locomotive hauled coach market segment that may have some standardization synergy with the Intercity/state corridor market, although it is limited.

- The **Intercity/State Corridor market** (1,598 vehicles) is Amtrak and States. Amtrak has several rail car designs in its fleet, both single level and bi-level that operates in both corridor services and national intercity services. The Amtrak business model is basically three service types, national services, the Northeast Corridor, and State supported corridor services. California developed the “California Bi-level Car” design for Caltrans corridor services. The Amtrak/State(s) Corridor fleet of vehicles is the focus of the PRIIA Section 305 NGEC Vehicle specification and procurement program. It should also be noted that the average age of the Amtrak fleet is the oldest in the entire U.S. railcar industry.

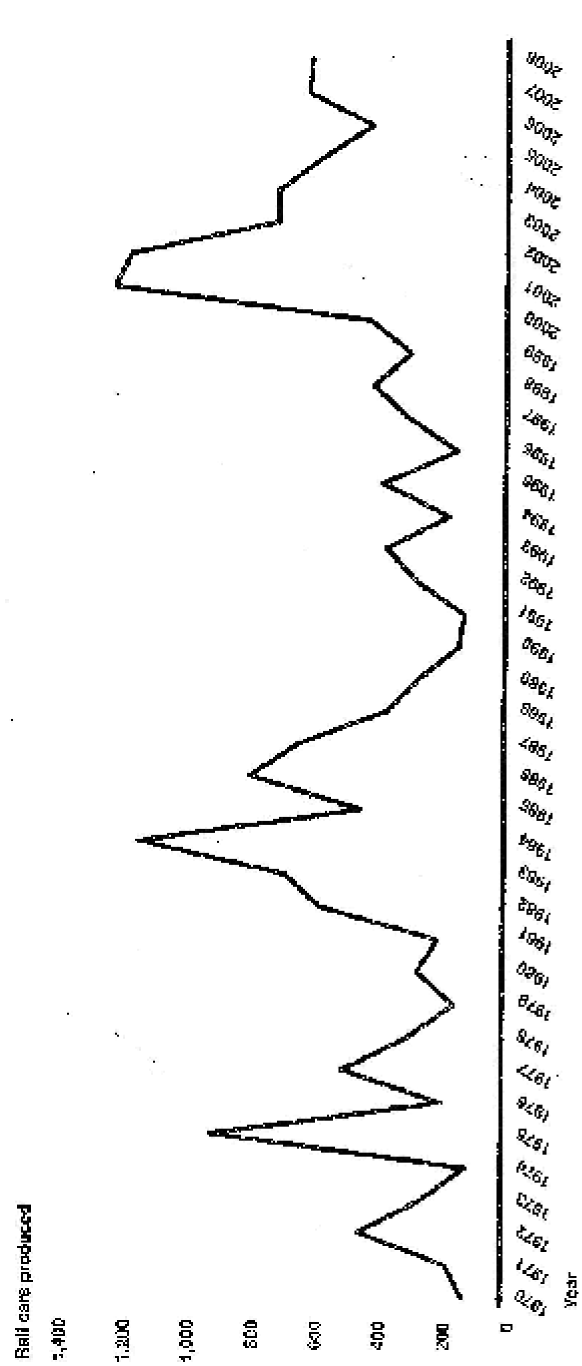


Figure 6: Rail Cars Produced for the U.S. Transit Agencies, 1970 through 2008

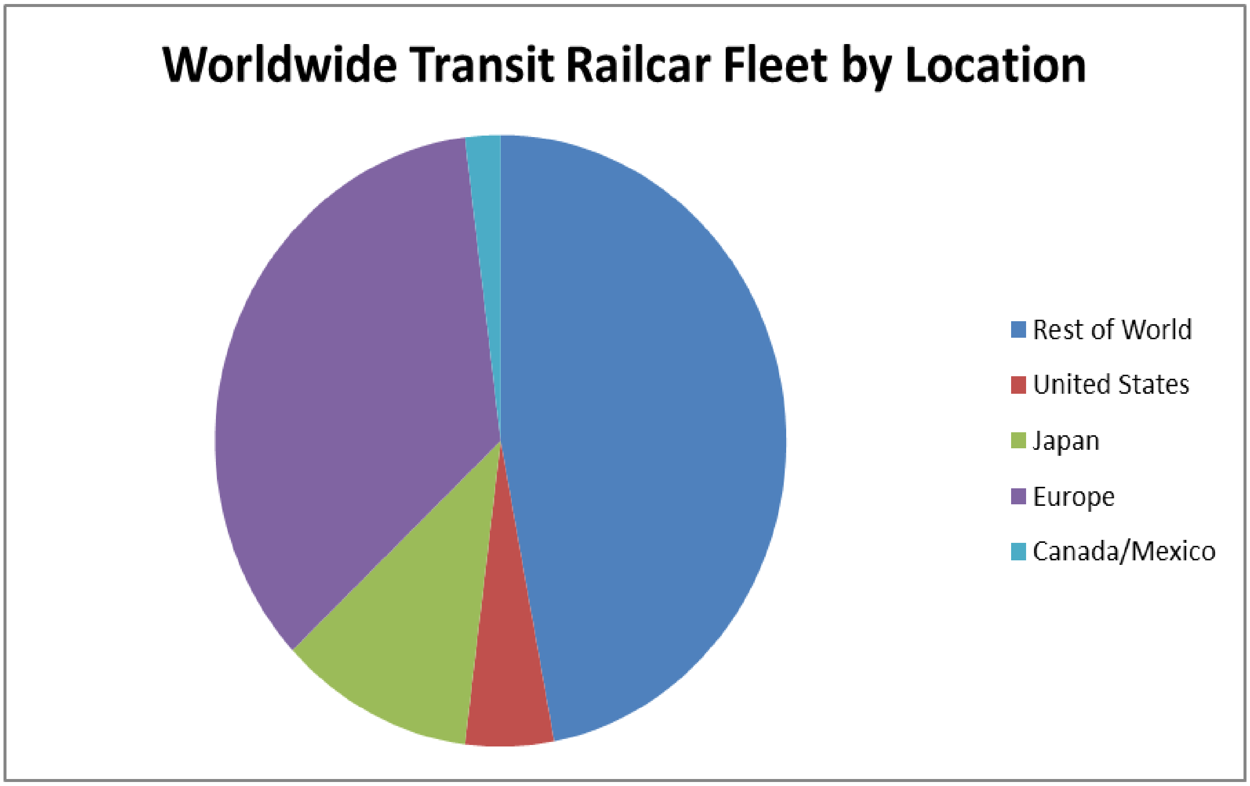


Table 2

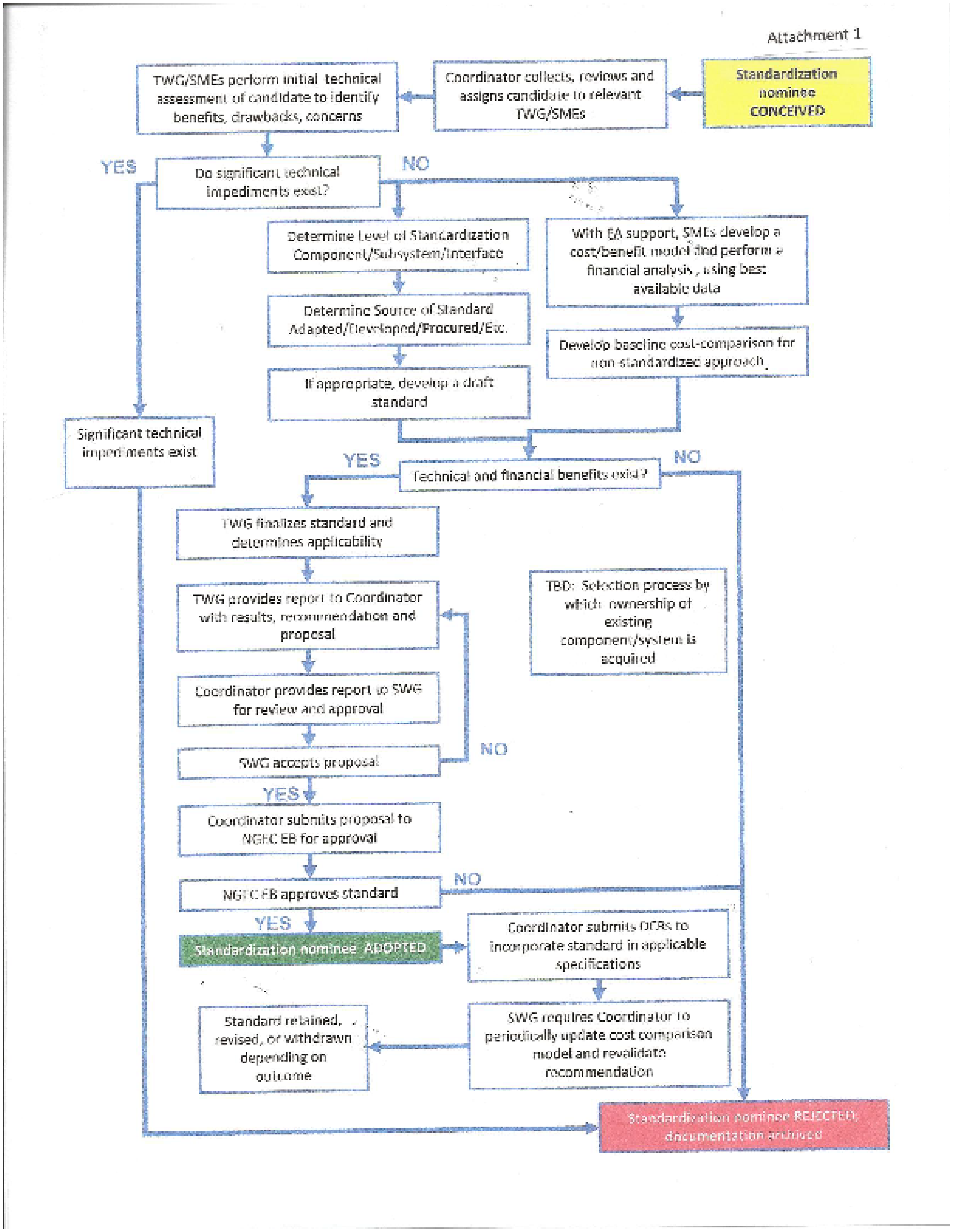
Country/Region	% of Worldwide Fleet
Rest of World	47%
United States	5%
Japan	11%
Europe	35%
Canada/Mexico	2%

Source: GAO, Transit Rail, Potential Rail Car Cost-Saving Strategies Exist, June 2010

Evolution of Federal and State Funding for Transit, Amtrak and State DOTs and Impact on Standardization

The purpose of this brief discussion is to understand the impact the historical federal funding for both capital and operating for transit, State DOTs and Amtrak have had on equipment procurements. This is a brief summary of federal agency funding legislation.

- 1964 Urban Mass Transit Administration created by Congress, funding provided on a 50/50 basis for operating subsidy and capital, with annual operating funds provided on a formula basis, capital funding was discretionary. Local match was 20% for capital, similar to Federal Highway. All funds from U.S. General Fund, appropriated by Congress.
- 1971 Amtrak was created from the bankruptcy reorganization of major eastern U.S. freight railroads (provided transfer of passenger rail from private to public ownership), Amtrak became entity for providing all intercity and NEC services, inherited legacy rolling stock fleets from bankrupt private freight railroads and significant overhead/personnel costs. Amtrak budgets are subject to annual appropriations from Congress.
- 1991 Congress passed ISTEA, created Mass Transit Account in Federal Highway Gas Tax Fund, and dedicated 2.6 cents of federal gas tax to Mass Transit Account, which provided transit with dedicated source of funding. Also eliminated operating subsidy by allocating same annual formula funds to formula capital grants. ISTEA maintained discretionary capital account. Mass Transit Account now 50 % formula capital and 50% discretionary capital. This had major impact on funding capital programs, including new equipment purchases, transit agencies and State DOTs could now plan on levels of capital expenditures. However, burden of operating subsidy became total local responsibility, with exception that formula capital may be used for vehicle maintenance, which provided relief to some agencies with inadequate operating subsidy funds.
- Subsequent 5 year period authorizations have been passed by Congress, including TEA-21 in 1998, and SAFETEA-LU in 2005. Currently, the Congress is operating on continuing resolutions to extend provisions of SAFETEA-LU as a new authorization bill has not been passed by Congress. Amtrak has also received several multi-year authorizations from Congress, including the PRIIA of 2008 which authorized Amtrak through 2013. Authorization legislation bills are subject to annual appropriations from Congress.
- 2008 Passenger Rail Investment and Improvement Act (PRIIA) were passed by congress the established Division A-Rail Safety that included Positive Train Control requirements and Division B- Passenger Rail Investment and Improvement Act (PRIIA) Title III, Intercity Passenger Rail Policy, Section 305, Next Generation Corridor Train Equipment Pool.


Attachment 1
Standardization nominee CONCEIVED
Coordinator collects, reviews and assigns candidate to relevant TWG/SMEs
TWG/SMEs perform initial technical assessment of candidate to identify benefits, drawbacks, concerns
Do significant technical impediments exist?
YES
NO
Determine Level of Standardization Component/Subsystem/Interface
Determine Source of Standard Adapted/Developed/Procured/Etc.
If appropriate, develop a draft standard
With EA support, SMEs develop a cost/benefit model and perform a financial analysis, using best available data
Develop baseline cost-comparison for non-standardized approach
Significant technical impediments exist
Technical and financial benefits exist?
YES
NO
TWG finalizes standard and determines applicability
TWG provides report to Coordinator with results, recommendation and proposal
TBD: Selection process by which ownership of existing component/system is acquired
Coordinator provides report to SWG for review and approval
SWG accepts proposal
NO
YES
Coordinator submits proposal to NGEC EB for approval
NGEC EB approves standard
NO
YES
Standardization nominee ADOPTED
Coordinator submits DCRs to incorporate standard in applicable specifications
SWG requires Coordinator to periodically update cost comparison model and revalidate recommendation
Standard retained, revised, or withdrawn depending on outcome
Standardization nominee REJECTED; documentation archived