NCHRP Project 20-7/Task 309

Challenges And Opportunities: A Strategic Plan For Equipment Management Research

June 24-28, 2012

EMTSP/TRB National Equipment Management Meeting

Mobile, Alabama

TRB TRANSPORTATION RESEARCH BOARD OF THE NATIONAL ACADEMIES

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Purpose of Presentation

To provide an overview of the recent 2011 AASHTO-sponsored and NCHRP-conducted study titled: “Challenges and Opportunities: A Strategic Plan For Equipment Management Research.”

Sequence:

- Study Purpose
- Background
- Methodology
- Participants
- Grand Challenges
- Ballot

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Purpose of Study

To **identify, define and prioritize research needs** to assist equipment managers in dealing with both external and internal challenges that confront them today … and tomorrow … with an emphasis **on improving performance and controlling costs** of equipment fleets .

Background

- Well documented challenges face the Nation's "public infrastructure."
- Fiscal pressures, predating even the 2008 economic downturn, have resulted in deferred maintenance and construction projects across the country.
- The current political climate, at all levels of government, shows little appetite for significant increases in infrastructure spending any time soon.
- The result is an environment where transportation agencies are faced with serious challenges on how to proceed.

Background (Continued)

- While the infrastructure situation can be described as dire, **challenges facing the equipment managers are even less well understood** (or documented).
- Organizations responsible for **providing the equipment and equipment services** essential for maintaining this infrastructure may be in **even worse shape**.
- Arguably, many in transportation leadership positions **do not fully appreciate the complexity of managing equipment fleets**.
- It is critical, therefore, that the **equipment community develop a unified front on how to maximize its approach** to a future of continually constrained resources.

Background (Continued)

- With this background, the AASHTO SCOM Equipment TWG developed and submitted a research problem statement to address these needs.
- The AASHTO Subcommittee on Maintenance (SCOM) voted to support the research.
- The AASHTO Standing Committee on Highways (SCOH) approved a project to study, define and recommend prioritized research needs to assist the equipment management community in meeting the awesome challenges it faces in the future.

Study Methodology

- With the aim of conducting a **low-dollar, quick-response study**, planners started with a literary search to see what relevant work had gone before.
- From a considerable body of work, the consensus was that most prior, published research focused on safety and replacement issues.
- In preparation for a group effort, a special report was prepared that captured salient information from a variety of sources (text books, conference papers, professional journal articles, etc.).

Study Methodology (Continued)

- Because time was limited, the decision was made to conduct a 2-day meeting with selected and available SMEs from around the country.
- That "workshop" was scheduled and conducted at the TRB facilities in Irvine, CA on June 28-29, 2011.
- **Two categories of equipment management** focus areas were used to facilitate the deliberations (containing a combined 50 activities/tasks):
  - **Asset management activities** (acquisition, operation, utilization, upkeep, disposal and replacement).
  - **Program management activities** (responsibilities, authority, resources, expertise and decision-making).

Study Methodology (Continued)

- 50 activities were identified and defined.
- Participants rated all 50 as “high” or “low” priority based on potential benefits for research (with a standard definition for “research”).
- When complete, 17 of the 50 activities were identified as candidate areas for further investigation.

Study Methodology (Continued)

- Workshop participants were divided into two groups and assigned the task of **distilling the 17 candidate** areas into manageable numbers and formats, subsequently entitled "**GRAND CHALLENGES**." Each group was required to:
  - **Identify and describe the challenge.**
  - **List important areas of research needs within each challenge.**
  - **Describe anticipated outcomes and benchmarks for success.**
  - **List barriers that would prevent success.**
  - **Assess the relative importance and readiness of research in the challenge area**.

Study Participants

- Amir N. Hanna, NCHRP (PM)
- Frank Lisle, TRB
- Rick Bradbury, FHWA
- Tim Cunningham, Kansas DOT
- Bruce Erickson Oregon DOT
- Dennis Halachoff, Arizona DOT
- Drew Harbinson, NC DOT
- Erle Potter, Virginia DOT
- Aaron Weatherholt, IL DOT
- Sonja Scheurer, Michigan DOT
- Jim Smith, Pennsylvania DOT
- Janie Vrtiska, Nebraska DOT
- John E. Dolce, Consultant
- John Wiegmann, Booz-Allen-Hamilton
- John Brewington, Brewington & Co.
- Paul Lauria, Mercury (facilitator)
- Len Bammer, Mercury (facilitator)

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Grand Challenges

- When the workshop was completed, participants had agreed upon **five most-pressing areas** as a focus for future equipment management research needs.
- Titled "**Grand Challenges**," those areas were:
  - **Fleet performance measurement;**
  - **Equipment cost and financial management **;**
  - **Equipment utilization measurement;**
  - **Equipment replacement management **; and**
  - **Equipment disposal and remarketing**.

    (** indicates multiple, related areas included)

- The remainder of this presentation discusses each.

GRAND CHALLENGE 1

Fleet Performance Measurement

Challenge: Identify opportunities to **improve fleet performance and fleet management cost effectiveness using quantitative measures of performance** and appropriate internal and/or external benchmarks.

Description:

- Quantitative performance measures and benchmarking are common tools used by many equipment managers today.
- Metrics, or key performance indicators (KPIs), have been designed to measure a wide range of important operational and fiscal benchmarks.
- Most managers use a MIS to facilitate capturing and reporting performance data.

GRAND CHALLENGE 1

Fleet Performance Measurement (Continued)

Description (Cont'd):

- While fleet performance measures have advanced over the past decades, many managers are unable to effectively master capturing, reporting, analyzing and actually making decisions on more than a handful of KPIs.
- More troubling is an **inability to effectively benchmark** (compare) **individual metrics with sister DOTs**, because of data are not easily available, and there is no certainty regarding how other states measure specific items.
- In short, **research is needed to develop industry-recognized measurements**, focusing on both ***what*** to measure and ***how*** to measure it.

GRAND CHALLENGE 1

Fleet Performance Measurement (Continued)

Area(s) of Research:

- **Develop a methodology for measuring performance** in quantitative terms that include a mix of input (e.g., resource availability), output (e.g., resource utilization, service quality), and cost measures. Methodology should specify for each KPI:
  - Attribute of performance to measure.
  - Relationship between the area being measured and organizational success.
  - Metric computation, including content, data and calculation.
  - Types and sources of benchmarks .
  - How individual measurements should be disseminated and acted upon.
- Provide documentation suitable for endorsement and distribution as an AASHTO guide.

GRAND CHALLENGE 1

Fleet Performance Measurement (Continued)

Anticipated Outcomes and Benchmarks:

- A methodology for calculating and using “industry standard” KPI.
- Metrics that could be used to determine the effectiveness of the recommended research include the following:
  - Number of DOTs using the methodology to compute and manage performance in their organizations.
  - Number of equipment managers who find the methodology useful.
  - Improvements in performance in the areas recommended by the methodology, as reflected in trend analyses.

GRAND CHALLENGE 2

Equipment Cost and Financial Management

GRAND CHALLENGE 2A – Cost of Service Analysis

Challenge: Develop a complete **understanding of fleet resource and service delivery costs to educate customers** (internal and external), services providers, and decision makers; and to **identify opportunities to minimize these costs**.

Description:

- Most government fleets face fiscal challenges, aging fleets, reduced staffs, increased service demands, and threats from the private sector performing traditional in-house work.
- It is critical that fleet mangers **understand the full costs of their assets, operations and services, and how to determine if they are competitive or not**.

GRAND CHALLENGE 2
Equipment Cost and Financial Management (Cont'd)
GRAND CHALLENGE 2A – Cost of Service Analysis (Cont'd)

Description (Cont'd):

- An accurate **understanding all costs facilitates such decisions as replacement cycles, replacement spending (as a means to reduce total operational costs), repair/rebuild versus replacement, and measuring performance**, among others.
- Periodic (at least annual) cost of service or activity-based analyses are key to determining total and avoidable costs of specific fleet goods and services.
- Total costs are necessary for calculating annual charge-back rates, life-cycle costs and benchmarks; avoidable costs identify opportunities for potential cost savings, such as with selected outsourcing.

GRAND CHALLENGE 2

Equipment Cost and Financial Management (Cont'd)

GRAND CHALLENGE 2A – Cost of Service Analysis

Area(s) of Research:

- Develop an **activity-based methodology for determining standardized total and avoidable costs** of furnishing specific fleet-related products and services, and for assessing the reasonableness of these costs using appropriate benchmarks.
- Provide documentation suitable for endorsement and distribution as an AASHTO guide.

GRAND CHALLENGE 2

Equipment Cost and Financial Management (Cont'd)

GRAND CHALLENGE 2A – Cost of Service Analysis (Cont'd)

Anticipated Outcomes and Benchmarks:

- A methodology that provides equipment management organizations with a tool for quantifying the costs of furnishing fleet-related goods and services in an accurate, standardized manner.
- Possible metrics could include:
  - Number of DOTs using the methodology to compute their fleet management service delivery costs.
  - Number of equipment managers who find the methodology useful.
  - Reductions in unit costs of services without corresponding reductions in service level and/or quality.

GRAND CHALLENGE 2

Equipment Cost and Financial Management (Cont'd)

GRAND CHALLENGE 2A – Cost of Service Analysis (Cont'd)

Importance and Readiness:

- Optimizing performance and costs in understandable and transparent formats for upper management, elected officials and customers is one of the most important challenges facing the fleet manager.
- **Managers cannot manage costs they cannot see**, and therefore cannot be held accountable for them.
- The conduct of a cost of service analysis is part of a larger, strategic approach to managing the costs of a fleet operation.
- There is no other performance measure that is likely to have a greater impact on fleet and fleet management performance than this one.

GRAND CHALLENGE 2

Equipment Cost and Financial Management (Cont'd)

GRAND CHALLENGE 2B – Charge-Back System

Challenge: **Develop full-cost charge-back rates** that 1) support the allocation of costs to programs/projects; and 2) promote the efficient use of resources to produce transparency and create accountability.

Description:

- Many DOTs use charge-back systems to distribute costs of owning and operating fleet assets. Many also allocate these costs to specific projects or activities, in part to comply with FHWA and FEMA reimbursement requirements.
- These types of systems are typically “usage-based,” “time-based,” or a combination of both.

GRAND CHALLENGE 2

Equipment Cost and Financial Management (Cont'd)

GRAND CHALLENGE 2B – Charge-Back System (Cont'd)

Description (Cont'd):

- While these systems are effective in allocating costs, they do not necessarily promote the most efficient means of managing or controlling ownership/operating costs.
- Charge-back systems employing “service-based rates” or “transaction-based charges” tend to be more accurate models for capturing actual costs of fleet goods and services. They are more transparent.
- Some DOTs have used a combination of usage-and-service-based systems to good effect.

GRAND CHALLENGE 2

Equipment Cost and Financial Management (Cont'd)

GRAND CHALLENGE 2B – Charge-Back System (Cont'd)

Area(s) of Research:

- Survey state DOTs to **identify current fleet cost charge-back practices**.
- Determine the extent to which service-based rates and transaction-based charges would require additional DOT resources or capabilities, and identify strategies for fleet managers to acquire them.
- **Develop methodologies to support the development and use of a standard model** that supports the use of service-based and usage-based and/or other appropriate charge-back rate models, and that comply with all applicable FHWA and FEMA cost-claiming requirements.

GRAND CHALLENGE 2

Equipment Cost and Financial Management (Cont'd)

GRAND CHALLENGE 2B – Charge-Back System (Cont'd)

Area(s) of Research (Cont'd):

- Develop case studies applying recommended methodologies to confirm the appropriateness of all components.
- Provide documentation suitable for endorsement and distribution as an AASHTO guide.

Anticipated Outcomes and Benchmarks:

- A **toolkit** (software or algorithm) **for use in developing, implementing and using** a service-based or other appropriate, standardized charge-back system.

GRAND CHALLENGE 2

Equipment Cost and Financial Management (Cont'd)

GRAND CHALLENGE 2B – Charge-Back System (Cont'd)

Anticipated Outcomes and Benchmarks (Cont'd):

- Possible metrics could include:
  - Number of DOTs using the methodology.
  - Number of equipment managers who find the methodology useful.
  - Reductions in unit costs of services without corresponding reductions in service level and/or quality.

Importance and Readiness:

- **Both of the "Cost and Financial Management" challenges could be pursued as a single research project, but development of a charge-back system would be more complex, but likely yield greater benefit.**

GRAND CHALLENGE 2
Equipment Cost and Financial Management (Cont'd)
GRAND CHALLENGE 2B – Charge-Back System (Cont'd)

Importance and Readiness (Cont'd):

- Given sufficient time and resources, most managers could implement a cost of service analysis today. **Charge-back development, however, requires participation of many stakeholders.** In the end, this participation means users have to share responsibility for managing equipment costs.

GRAND CHALLENGE 3

Equipment Utilization Measurement

Challenge: **Facilitate the management of the size and composition of a fleet** and its suitability to an organization's business needs by measuring, monitoring, and reporting on asset utilization levels.

Description:

- There are three approaches to determine an appropriate fleet size and, thereby control related costs:
  - Justifications prior to purchasing new equipment.
  - Periodic, ad hoc, right-sizing studies.
  - Ongoing equipment utilization measurements and reports.

GRAND CHALLENGE 3

Equipment Utilization Measurement (Cont'd)

Description (Cont'd):

- Effective utilization programs must be flexible and accommodate differences in such factors as equipment types, urban-vs-rural, business applications, seasonal work, etc.

Area(s) of Research:

- **Develop a methodology for establishing an organizational-specific equipment utilization program** that:
  - Is continuous.
  - Assesses specific asset utilization levels for benchmarks.
  - Investigates instances of apparent underutilization.
  - Takes or recommends action, where appropriate.

GRAND CHALLENGE 3

Equipment Utilization Management (Cont'd)

Area(s) of Research (Cont'd):

- Provide documentation suitable for endorsement and distribution as an AASHTO guide.

Anticipated Outcomes and Benchmarks:

- A methodology that systematically identifies and facilitates the removal/reassignment of underutilized assets.
- Possible metrics could include:
  - Number of DOTs using the methodology.
  - Increases in average annual asset usage levels.
  - Reductions in fleet size and associated capital/operating costs.
  - Improvements in age-related fleet performance metrics, such as equipment availability and breakdown rates, return-to-service times, and asset residual values.

GRAND CHALLENGE 3

Equipment Utilization Management (Cont'd)

Importance and Readiness:

- During periods of economic downturns, managers are often required to downsize their fleets, reduce staffs, outsource more, or defer new equipment purchases.
- Effective utilization programs are useful in presenting the case to avoid these actions by eliminating under-utilized assets.
- Technologies such as GPS and automatic fuel dispensing systems have been proven to enhance utilization data capture and accuracy.

GRAND CHALLENGE 4

Equipment Replacement Management

GRAND CHALLENGE 4A – Replacement Cycle Guidelines

Challenge: **Determine when specific types of assets should be replaced.**

Description:

- Replacement cycle guidelines are critical for long-term replacement planning and near-term replacement budgeting.
- Guidelines identify when specific assets should be replaced in terms of age and/or accumulated usage so as to minimize total costs of ownership.
- Guidelines should reflect differences between classes of vehicles and operational usages; e.g., urban-vs-rural, mountainous-vs-flat, etc.

GRAND CHALLENGE 4

Equipment Replacement Management (Cont'd)

GRAND CHALLENGE 4A – Replacement Cycle Guidelines

Area(s) of Research:

- **Develop a methodology for determining validated and optimal replacement cycle guidelines** based on the unique needs, practices, and operating environments of specific state DOTs.
- . Provide documentation suitable for endorsement and distribution as an AASHTO guide

NOTE: The Equipment TWG submitted a problem statement on this challenge last year. It made its way through several levels of approval but was not selected at the final stage.

GRAND CHALLENGE 4

Equipment Replacement Management (Cont'd)

GRAND CHALLENGE 4A – Replacement Cycle Guidelines

Anticipated Outcomes and Benchmarks:

- A methodology and/or software programs **that provide equipment managers with a tool for determining optimal replacement cycles** for specific types of assets in their fleets.
- Possible metrics could include:
  - Number of DOTs adopting replacement cycle guidelines.
  - Increases in replacement spending levels.
  - Reductions in average asset age by asset type.
  - Improvements in asset age-related fleet performance metrics such as equipment availability and breakdown rates, average return-to-service times, and asset residual values.

GRAND CHALLENGE 4

Equipment Replacement Management (Cont'd)

GRAND CHALLENGE 4A – Replacement Cycle Guidelines

Importance and Readiness:

- In and of themselves, replacement cycle guidelines will not significantly improve equipment profiles. They are, however, critical to other replacement activities, and for explaining the economic rationale for timely replacements to upper management.
- Because of inconsistencies among DOTs in how M&R costs are calculated (especially technician labor rates), there needs to be a corresponding effort to develop a uniform approach for calculating fully-burdened M&R costs as part of this research.

GRAND CHALLENGE 4

Equipment Replacement Management (Cont'd)

GRAND CHALLENGE 4B – Repair/Rebuild vs Replace

Challenge: **Determine the circumstances under which major repairs and service life extensions are more cost effective than replacement** (when established replacement criteria exist).

Description:

- Because of fiscal pressures, repair/rebuild in lieu of replacement is becoming an increasingly common practice among many DOTs.
- When using cash purchases, repair/rebuild will always be cheaper in the short run.
- DOTs need a structured method to demonstrate the long-termed advantages of replacement over repair/rebuild.

GRAND CHALLENGE 4
Equipment Replacement Management (Cont'd)

GRAND CHALLENGE 4B – Repair/Rebuild vs Replace

Area(s) of Research:

- Develop a methodology for **making empirically validated repair/rebuild decisions** for individual fleet assets on a case-by-case basis.
- Provide documentation suitable for endorsement and distribution as an AASHTO guide.

GRAND CHALLENGE 4

Equipment Replacement Management (Cont'd)

GRAND CHALLENGE 4B – Repair/Rebuild vs Replace

Anticipated Outcomes and Benchmarks:

- A set of algorithms and/or a software program that provide equipment managers **a tool to determine where and when repair/rebuild is a viable option**.
- Possible metrics could include:
  - Number of DOTs using the methodology.
  - Number of equipment managers who find the tool to be useful.
  - Increases in replacement funding/spending levels.
  - Reductions in repair/rebuild costs.

GRAND CHALLENGE 4

Equipment Replacement Management (Cont'd)

GRAND CHALLENGE 4B – Repair/Rebuild vs Replace

Importance and Readiness:

- **Because of widespread fiscal concerns, an effective tool in this area may have more immediate benefit than other research areas, especially in the near-term**.
- Again, the chief impediment to a standardized approach is the variance in how M&R costs are calculated among the DOTs (especially technician labor rates).
- It is not uncommon for an organization to use artificially low (i.e., not fully burdened) technician labor rates to erroneously conclude that repair/rebuild is more cost effective, when actually this is not the case.
- DOTs need uniform methods to determine fully-loaded costs.

GRAND CHALLENGE 4
Equipment Replacement Management (Cont'd)
GRAND CHALLENGE 4C – Equipment Replacement Planning

Challenge: **Quantify long-term fleet replacement costs** to show past performance, future needs, year-to-year acquisition and disposal demands, alternative financial approaches, and development of replacement using a sinking fund model.

Description:

- Most DOTs experience volatile replacement cycles due to varying capital costs, asset life expectancies, and available funds from year-to-year.
- One challenge is an inability to quantify long-term replacement costs both from an aggregate and specific out-year basis.

GRAND CHALLENGE 4

Equipment Replacement Management (Cont'd)

GRAND CHALLENGE 4C – Equipment Replacement Planning

Description (Cont'd):

- Long-termed planning is also critical for identifying backlogs due to deferments, educating decision makers, making specific asset “accelerate or delay” purchases to even out annual outlays, and managing logistical and resource challenges from year-to-year.
- Effective long-range replacement plans also facilitate comparison shopping using a variety of financing options, including sinking fund models, and others.

GRAND CHALLENGE 4

Equipment Replacement Management (Cont'd)

GRAND CHALLENGE 4C – Equipment Replacement Planning

Area(s) of Research:

- **Develop a methodology for determining future replacement costs based on class-specific purchase prices, inflation rates, replacement cycle guidelines, and specific asset needs over multiple fiscal periods**.
- Provide documentation suitable for endorsement and distribution as an AASHTO guide.

GRAND CHALLENGE 4

Equipment Replacement Management (Cont'd)

GRAND CHALLENGE 4C – Equipment Replacement Planning

Anticipated Outcomes and Benchmarks:

- An algorithm and/or software programs that provide equipment managers with **a tool to develop multi-year replacement plans and near-term replacement budgets**.
- Possible metrics could include:
  - Number of DOTs using the methodology.
  - Increases in replacement funding/spending levels.
  - Reductions in average asset age, by class.
  - Improvements in asset age performance metrics.

GRAND CHALLENGE 4
Equipment Replacement Management (Cont'd)
GRAND CHALLENGE 4C – Equipment Replacement Planning

Importance and Readiness:

- This is the most important topic in this research area because it provides:
  - An ability to "snapshot" replacement effectiveness.
  - Decisions makers with a quantified justification of needs.
  - An array of other fleet-specific performance indicators like fleet size, composition and age.
- While replacement cycle guidelines are an ideal component of replacement planning, they are not an absolute.
- There no major limits in terms of data or systems within most DOTs that would prohibit the development of effective, long-range replacement plans.

GRAND CHALLENGE 4

Equipment Replacement Management (Cont'd)

GRAND CHALLENGE 4D – Equipment Replacement Financing

Challenge: **Ensure the availability of funds to replace equipment** through sound plans and guidelines, and by using capital financing methods that minimize year-to-year volatility.

Description:

- The method DOTs use to finance their replacement programs has a greater impact on effectiveness than any other factor:
  - DOTs that employ "pay before you go" (cash) almost always have old fleets. (Marginal short-term replacement costs are always higher than repair/defer costs,)
  - Defer/repair decisions also decrease residual values of the retained asset, a factor rarely considered during the decision making process.

GRAND CHALLENGE 4

Equipment Replacement Management (Cont'd)

GRAND CHALLENGE 4D – Equipment Replacement Financing

Description (Cont'd):

- Some “pay before you go” methods, such as sinking funds, loans and leases, permit these costs to be paid as assets are used up.
- These approaches encourage organizations to replace assets in a more timely and consistent manner.

Area(s) of Research:

- Develop one or more methodologies for varying types of equipment that **examine alternative financing approaches and which identify the most economically viable approach for meeting future replacement needs**.

GRAND CHALLENGE 4

Equipment Replacement Management (Cont'd)

GRAND CHALLENGE 4D – Equipment Replacement Financing

Area(s) of Research (Cont'd):

- Provide documentation suitable for endorsement and distribution as an AASHTO guide.

Anticipated Outcomes and Benchmarks:

- A set of algorithms and/or software programs that provide **a tool to forecast and compare the long-term impacts of financing equipment replacement costs under a variety of approaches.**
- The tool would require a variety of options that include sinking fund, loans and leases, and buy-back provisions for selected types of equipment.

Equipment Replacement Management (Cont'd)

GRAND CHALLENGE 4D – Equipment Replacement Financing

Anticipated Outcomes and Benchmarks (Cont'd):

- Possible metrics could include:
  - Number of DOTs using the methodology to investigate alternative financing approaches.
  - Number of DOTs actually changing their methods of financing.
  - Increases in replacement funding/spending levels.
  - Reductions in average asset age, by class.

GRAND CHALLENGE 4

Equipment Replacement Management (Cont'd)

GRAND CHALLENGE 4D – Equipment Replacement Financing

Importance and Readiness:

- If financial planning is the most important component of an effective replacement program, then a toolkit to facilitate comparing alternative financing approached is essential.
- It must be recognized with this research item, a number of issues may impact pure economic considerations; e.g., statutory, constraints of existing contracts/arrangements, political willingness to consider options, etc.
- The ability to quantify cost savings associated with alternative financing approaches is, nevertheless, a very important area requiring research.

GRAND CHALLENGE 5

Used Equipment Remarketing

Challenge: **Promote used asset remarketing methods that maximize used asset residual values**.

Description:

- Effective disposal of used equipment can have a significant impact on fleet capital costs, especially with a solid replacement program where equipment has not "been run into the ground."
- Determining the most cost effective decommissioning and remarketing methods is another important aspect of replacement.

GRAND CHALLENGE 5

Used Equipment Remarketing

Description (Cont'd):

- Managers must determine the best time and most productive means of remarketing for their individual situations (local and regional auctions, sealed bids, private party transactions, or on-line auctions, etc).

Area(s) of Research:

- Survey private and public fleet organizations to catalog information on the effectiveness of the specific equipment decommissioning and disposal methods currently being used.
- Use results to **develop a tool to assist managers in determining the best method for their particular organization**.

GRAND CHALLENGE 5

Used Equipment Remarketing

Anticipated Outcomes and Benchmarks:

- A comprehensive survey of used equipment remarketing practices and guidelines for use by DOTs in disposing of their used fleet assets.
- Possible metrics could include:
  - Number of DOTs using the guidelines to modify their remarketing approaches.
  - Number of managers who find the guidelines helpful.
  - Increases in used equipment residual values.
  - Reductions in used marketing costs and average days of sales.

GRAND CHALLENGE 5

Used Equipment Remarketing

Importance and Readiness:

- Replacement and disposal are interrelated; if one is not optimized, it affects the other.
- Disposal is also interrelated with capital financing. Cash-only purchases do not provide incentives to maximize remarketing efforts.
- Research in this area will be most beneficial to DOTs who will simultaneously benefit from improvements in equipment replacement, utilization and cost management.

Resources

- All of the foregoing information can be found in the final research report on our EMTSP website at: http://www.emtsp.org/

Conclusion and Survey

- **QUESTIONS?**

- Ballot to rank the five “Grand Challenges” in terms of most pressing research needs **from your unique perspective**.

  (Handout)