massDOT
Massachusetts Department of Transportation
Rail & Transit Division

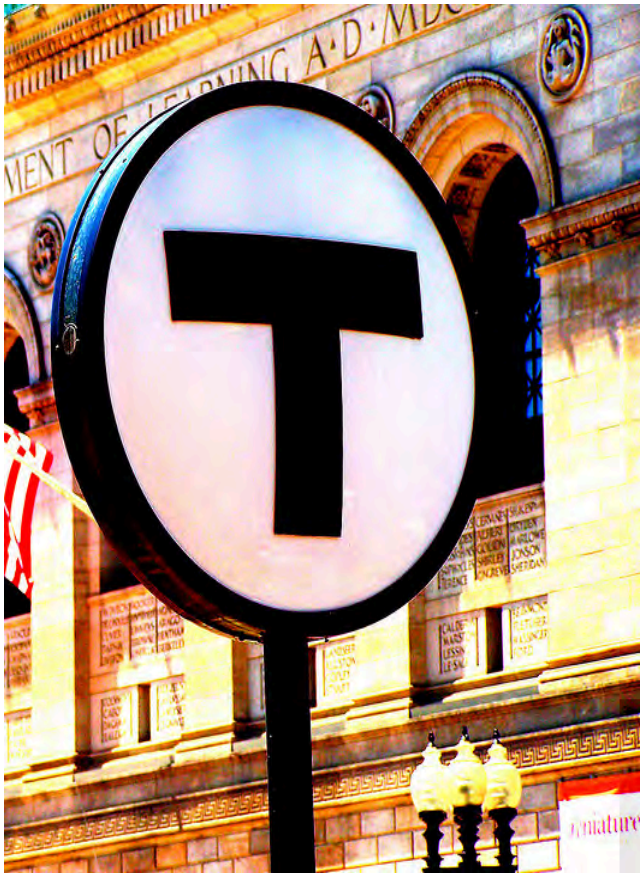
Transit Asset Management
Pilot Projects
MBTA Initiatives & Lessons Learned

Federal Transit Administration Presentation

March 5, 2014

MBTA introductions

- Robert Guptill
  Manager of Systems Integration
  617-222-5755
  rguptill@mbta.com
  - PM - SGR Database Enhancements
  - PM - Decision Support Tool
- Eric Waaramaa
  Deputy Director, Financial Planning
  617-222-1950
  ewaaramaa@mbta.com
  - PM – Asset Management Plan



Agenda

- Importance of TAM for the MBTA
- Overview of our TAM program
- Use of TAM Pilot Program grant funds:
  - Asset Management Plan
  - Decision Support Tool
  - State of Good Repair Database
- Lessons learned

A little bit about us

- **Large** - 5th largest transit system, based on ridership
- **Mature** - oldest subway system (opened in 1897)
- **Multimodal** - 4 rapid transit lines, 182 bus routes, 5 BRT lines, 14 commuter rail lines, 3 ferry routes, paratransit
- **Widespread** -175 communities served
- **Important to Region** - daily ridership of 1.3 million trips; 55% of work trips to Boston are made on the MBTA

Good news and bad news

- **The good news:**
  - Transit ridership, and the public's reliance on the system, is greater than ever
- **The bad news:**
  - At the same time, capital needs of an aging system are growing faster than revenues
  - Prior system expansion has placed a strain on limited capital and operating revenues
  - High debt burden limits pay-go financing
  - There's just not enough funding to address all capital needs

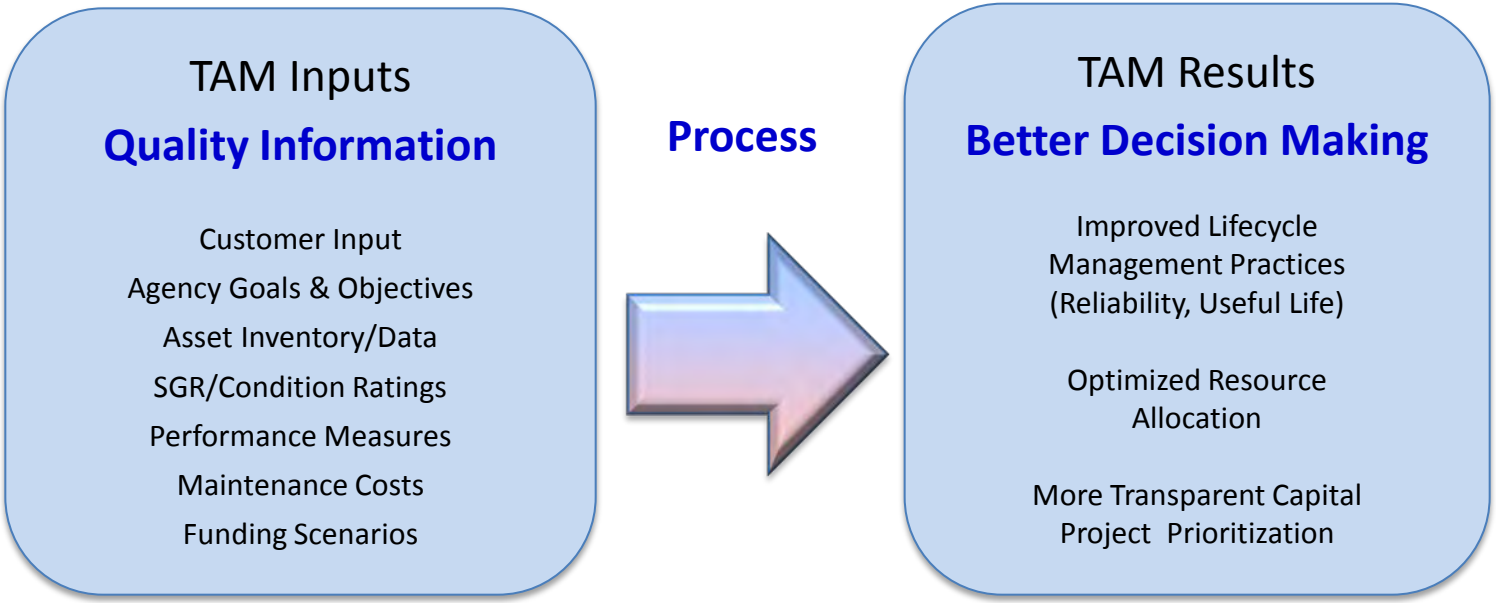
As a result…

- Maintenance of the existing system needs to be a top priority
- Limited resources must be directed to where they can most cost-effectively provide continued safe and reliable service
- Transit asset management (TAM) strategies and processes are more important than ever in helping to make this happen
  - Extending the useful life of existing assets
  - Optimizing investment in new assets
  - Proving to the public that every dollar is well-spent

Our view of TAM

"A strategic and systematic **process** of operating, maintaining, upgrading, and expanding physical assets throughout their lifecycle. It focuses on business and engineering practices for resource allocation and utilization, with the objective of **better decision making** based on **quality information** and well defined objectives"

(Source: AASHTO – "Transportation Asset Management Guide")

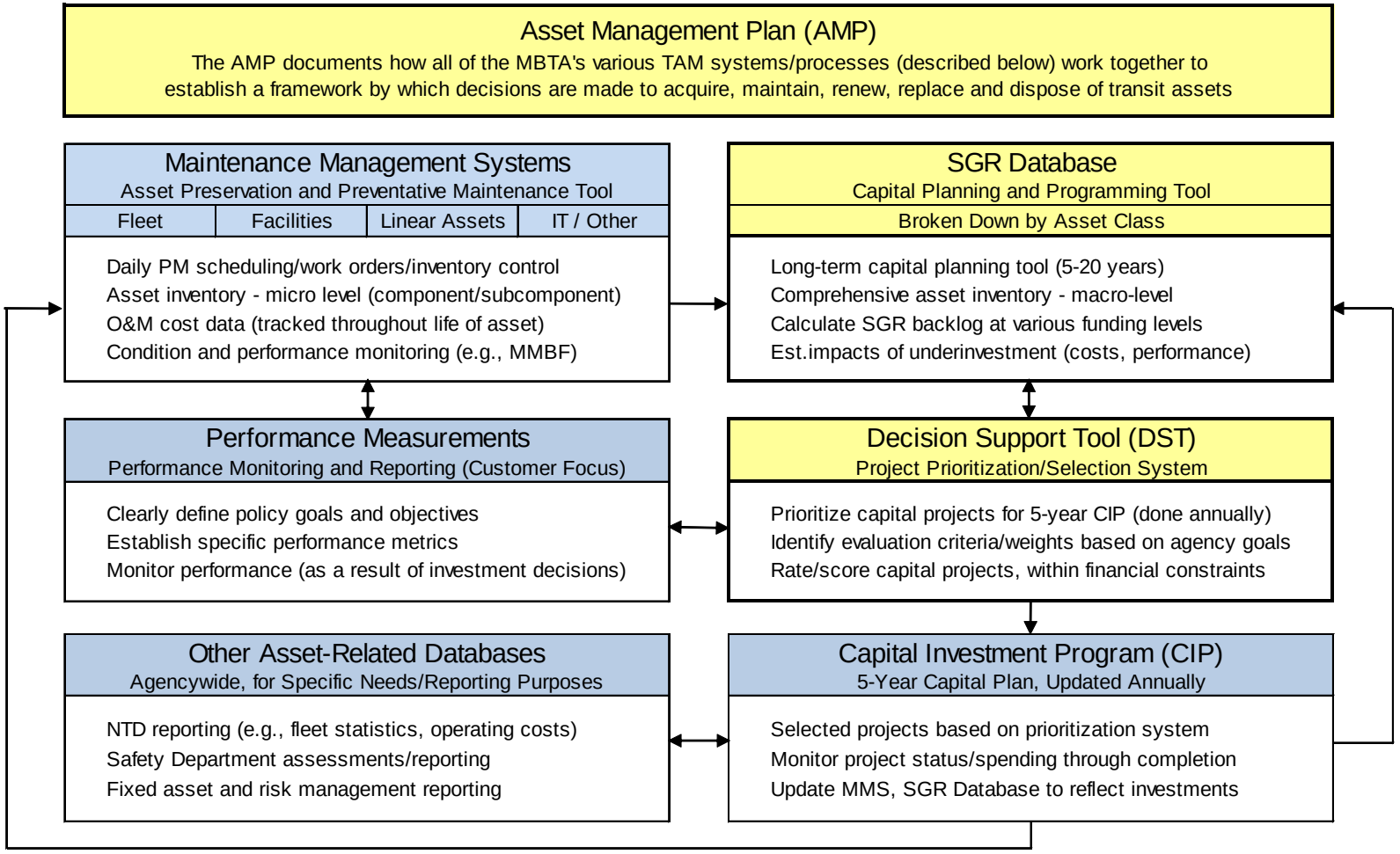


Putting TAM into practice

- **Quality information**: Collecting and reporting useful, accurate and timely data on our transit assets (e.g., age, condition, performance, maintenance costs, replacement value)
- **Process**: Processing that data in a way that it helps us to make better decisions on how we manage our assets throughout their life cycle, and how we should prioritize our capital spending
- **Better decision making**: Getting the right information, in the right format, to the right decision makers, at the right time for them to use it

Information overload, or poor quality data (i.e., not useful, not accurate, not timely), can be worse than none at all

The MBTA's TAM program



Projects funded by TAM Pilot Program grant include: AMP, SGR Database and Decision Support Tool

Asset Management Plan

We'll try to answer 6 questions for you today:

- What is it?
- Why did we do it?
- Who participated?
- How did we prepare it?
- What's included within it?
- Now what do we do?

AMP – what is it?

The AMP is not…	The AMP is…
A one-and-done exercise, so we can "check off" that we have developed a Plan and met a federal requirement	Just a first step toward improving our asset management practices over the long term; a foundation that we will build upon in the future
A static document, that sits on the shelf	Our plan as of today only; it needs to be regularly updated to reflect progress made, lessons learned, and changing priorities and resources
A list of all the good asset management practices we have in place today	A list of the steps we plan to take in the future to improve our asset management practices
A comprehensive document (e.g., lifecycle management plan) that explains precisely how we will manage each of our assets going forward	A document that provides the framework by which decisions will be made to acquire, maintain, renew, replace and dispose of transit assets over their lifecycle
A reference book, to open up whenever we have a tough decision to make on asset maintenance or capital project prioritization	A roadmap that shows how we plan to improve our asset management practices over time - through better training, accountability, systems and data collection
Going to improve anything on it's own	A commitment by MBTA management to dedicate resources and create a culture for improved asset management at all levels of the organization

AMP – what is it?

For our initial AMP, we decided to adopt the approach laid out in the FTA Asset Management Guide (October 2012):

- The AMP "outlines how **people**, **processes**, and **tools** come together to address the asset management **policy** and **goals**" of the transit agency. It also "outlines the **activities** that will be implemented and **resources** applied" to meeting those goals.

Our AMP addresses 3 key questions…

- Goals – Where do we hope to be in the future?
- Activities – What needs to be done to get there?
- Resources – What will it take to accomplish this?

and 4 success factors:

- Policy,
- People,
- Tools, and
- Processes/ business practices

AMP – why did we do it?

1. To address MAP-21 requirements:

- All transit agencies receiving federal funds must develop an AMP (e.g., asset inventory, SGR/condition assessment, investment prioritization)
- Agencies also need to address the link between SGR and safety

2. Because it makes good business sense:

- To better understand where the MBTA stands today compared to industry “best practice” (Where are we strong? Where are we weak?)
- To better understand how asset management can help the MBTA to improve service reliability and safety, while optimizing the use of limited funds
- To develop a realistic plan for improving asset management practices over the next five years

AMP – who participated?

Over the past year, about 40 MBTA employees (the “TAM Team”) participated in the development of the AMP

- Leadership Team – policy guidance and strategy
  - Includes the following executives: General Manager, Chief of Staff, Chief Financial Officer, Chief Operating Officer, Chief Information Officer, Chief Safety Officer, AGM-Design & Construction, AGM-Supplier Diversity, AGM-Systemwide Accessibility
- AM Improvement Team – interdepartmental coordination
  - Includes managers representing the following enterprise-level functions: Operating Budget, Capital Budget, Design & Construction, Engineering & Maintenance, Operations, Fleet Engineering, Railroad/Boat Operations, Information Technology, Planning & Development
- Asset Class Leaders - subject matter experts
  - Includes managers representing the following asset classes: Bridges, Tunnels, Communications, Commuter Rail, Elevators & Escalators, Facilities, Fare Equipment, Operations, Parking, Power, Bus and Rail Fleet, Signals, Stations, Technology, Track and ROW
  - Where applicable, both D&C (design/construction) and E&M (engineering/maintenance) were represented

AMP – how did we prepare it?

1. **Perform baseline assessment –** Where does the MBTA stand today in terms of industry "best practice" in asset management?
2. **Develop goals and objectives –** In what areas do we hope to improve over the next 2-5 years? What do we expect to accomplish from this?
3. **Identify implementing actions –** What steps are needed to get there?
4. **Develop AMP –** Our "roadmap" for making it happen over the next 2-5 years (resource-constrained)

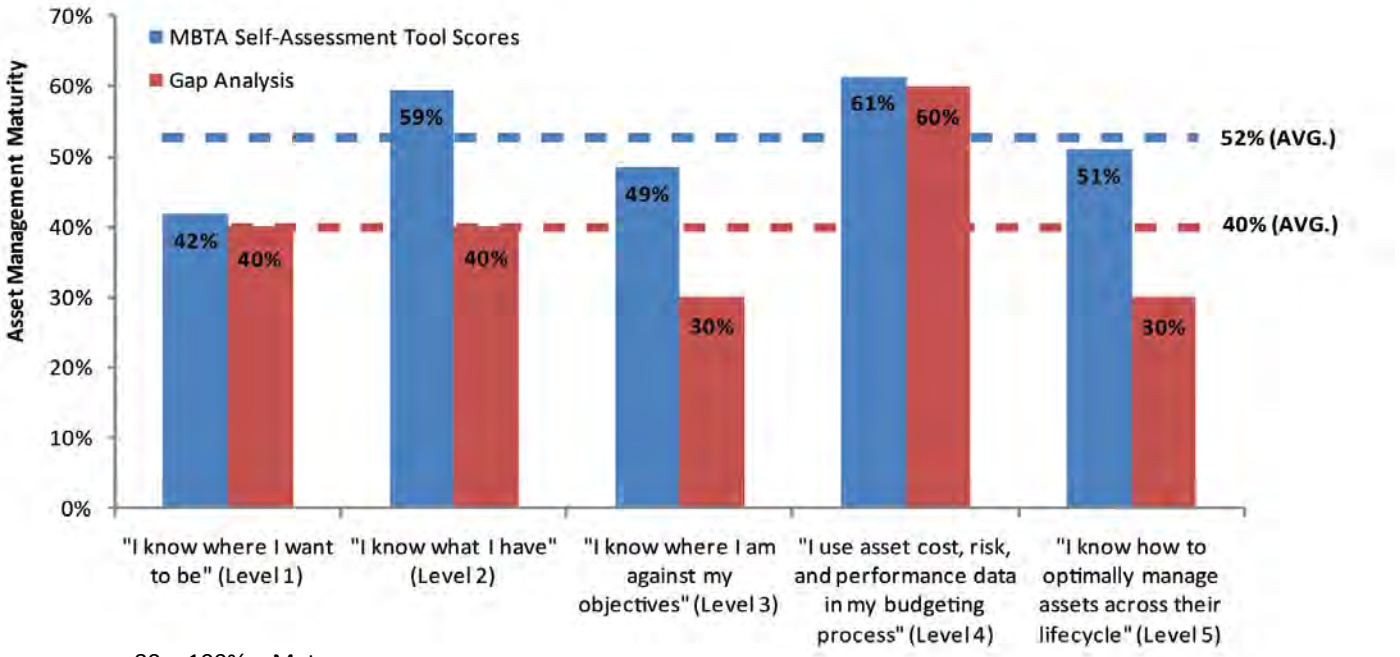
AMP – how did we prepare it?

AMP – what's included within it?

- Asset Management Plan:
  - Executive Summary
  - Introduction
  - AM Baseline Assessment
  - AM Policy, Goals and Objectives
  - AM Improvement Program
- Appendix A:
  - Implementing Actions – detailed plan for 19 specific action items
- Supplemental Materials:
  - MBTA Baseline Assessment Report
  - Lifecycle Mgmt. Gap Analysis

AMP – baseline assessment

Step 1: Where are we now? -- Using the assessment tool in the FTA Asset Management Guide, MBTA's asset management maturity was measured against industry best practice



80 – 100% = Mature process
60 – 80% = Substantial progress towards maturity
40 – 60% = Process occurring effectively, but inconsistently
20 – 40% = Potential for process to be effective
0 – 20% = Process ineffective

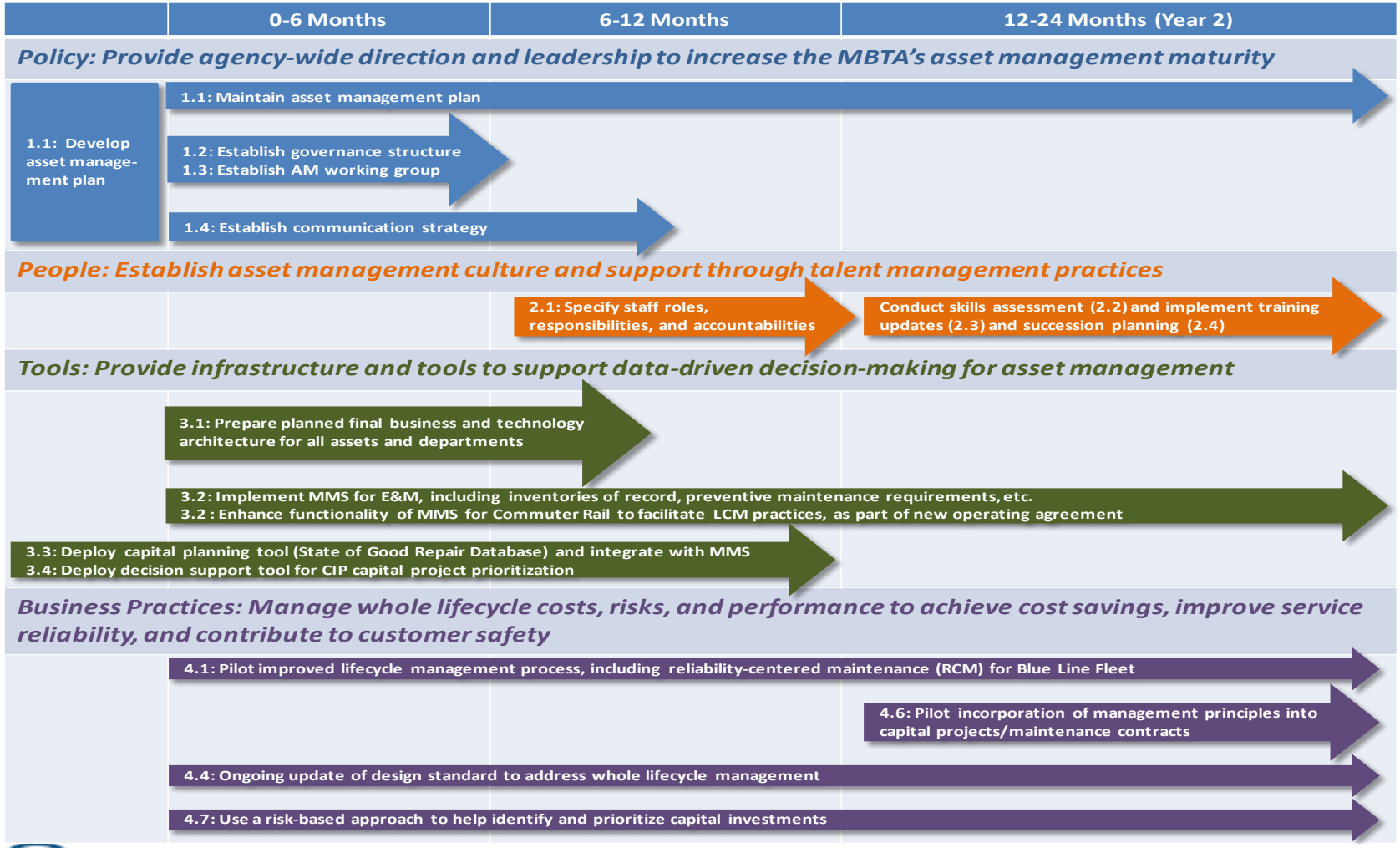
AMP – goals and objectives

Step 2: Where do we want to be in the future? -- Based on interviews, workshops and breakout sessions, 4 asset management goals were identified.

Goals	Objectives
Policy: Provide agency-wide direction and leadership to increase the MBTA's asset management maturity	Provide clear leadership and direction regarding the agency's asset management strategy and expected outcomes Establish vision of and provide support for an asset management culture Increase the agency's overall asset management maturity
People: Establish asset management culture and support through talent management practices	Improve asset management knowledge sharing within the agency Improve asset management documentation practices
Tools: Provide infrastructure and tools to support data-driven decision-making for asset management	Implement the business processes, supporting systems, and data integration to provide the data and information required to inform decision-making
Business Practices: Manage whole lifecycle costs, risks, and performance to achieve cost savings, improve service reliability, and contribute to customer safety	Reduce/eliminate corrective maintenance actions by asset type Minimize asset-related service disruptions Maximize asset availability

AMP – roadmap (years 1-2)

Step 3: How do we get there? – Specific actions during first 24 months



AMP – roadmap (years 3-5)

AMP – policy statement

The AMP includes the following policy statement, expressing management's commitment to asset management and how it supports the agency's mission and objectives

MBTA Asset Management Policy

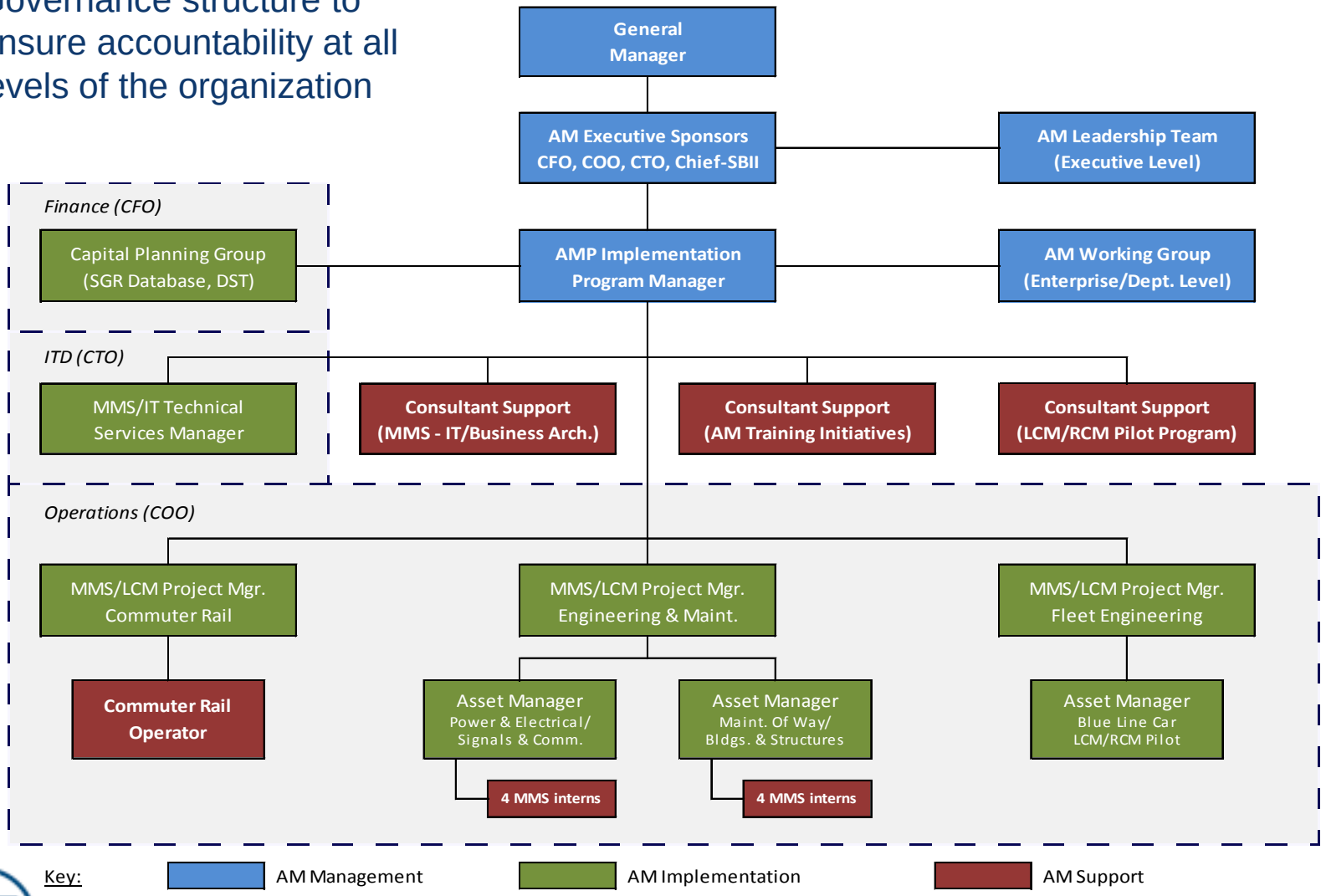
The MBTA is committed to implementing a strategic process for acquiring, operating, maintaining, upgrading, and replacing its transit assets to directly support the agency's mission of providing the nation's safest and most reliable public transportation services.

Our policy is to promote a culture that supports asset management at all levels of the organization, to employ effective asset management business practices and tools, to ensure optimal asset performance and useful life, and to use timely, quality data to support transparent and cost-effective decision-making for resource allocation and asset preservation.

We shall emphasize people. Through coaching, training, the application of state-of-the-art technology, and improved processes, we shall ensure our workforce's ability to identify and meet the MBTA's asset management needs, incorporate sustainability and accessibility into our business practices, and to deliver to our customers the best service and value for every fare and tax dollar spent.

AMP – organizational structure

Governance structure to ensure accountability at all levels of the organization

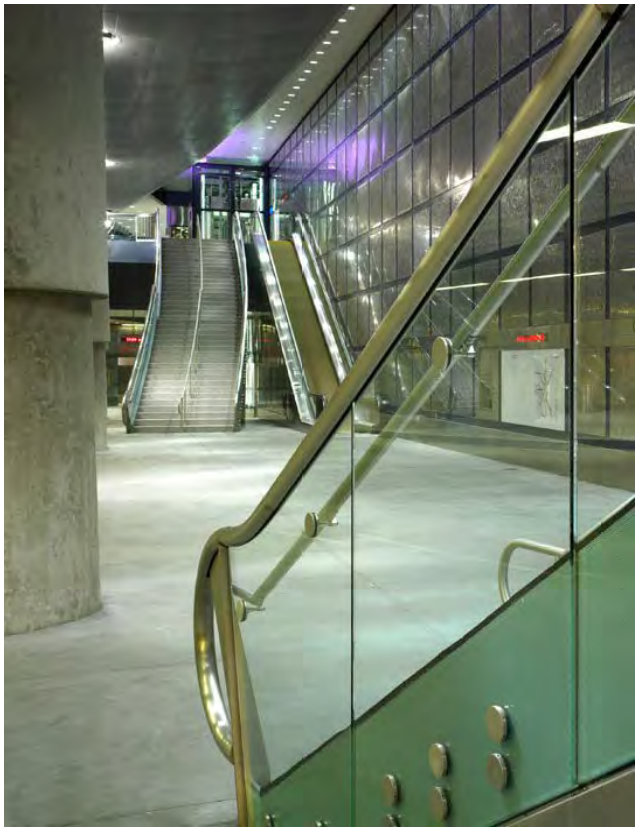


AMP – resource requirements

- Proposed AM staffing, starting in FY15:
  - AMP implementation program manager
  - ITD – MMS technical services manager
  - E&M – Asset managers to support new MMS for facilities/linear assets
  - Commuter Rail – Positions to oversee enhanced MMS and new LCM program
  - Fleet Engineering – Positions to support MMS and LCM initiatives
- Proposed capital funding/third party support:
  - 5-year funding for implementation of new MMS for facilities and linear assets
  - Annual funding for consultant support, including MMS, LCM initiatives, and AM training curriculum
  - Year 1 funding for enterprise level MMS business and technology architecture
  - Year 1 funding for Blue Line Car LCM/RCM pilot feasibility study

AMP – now what do we do?

- AMP document just recently finalized
- Developing strategy for communicating the AMP to staff and other stakeholders
  - Final workshop, including AMIT, Asset Leaders
  - MBTA internal communications (e.g., email, newsletter)
  - Brief Board of Directors
- Implementation
  - Establish governance structure (e.g., Executive Sponsors, Working Group)
  - Commit resources within FY15 budget for Year 1 implementation
  - Develop plan for accountability (e.g., quarterly reports/briefings)
  - Develop process for annual update to AMP (e.g., revised roadmap, as priorities/resources change)



Drafting the AMP is just the first step in the process

Decision support tool

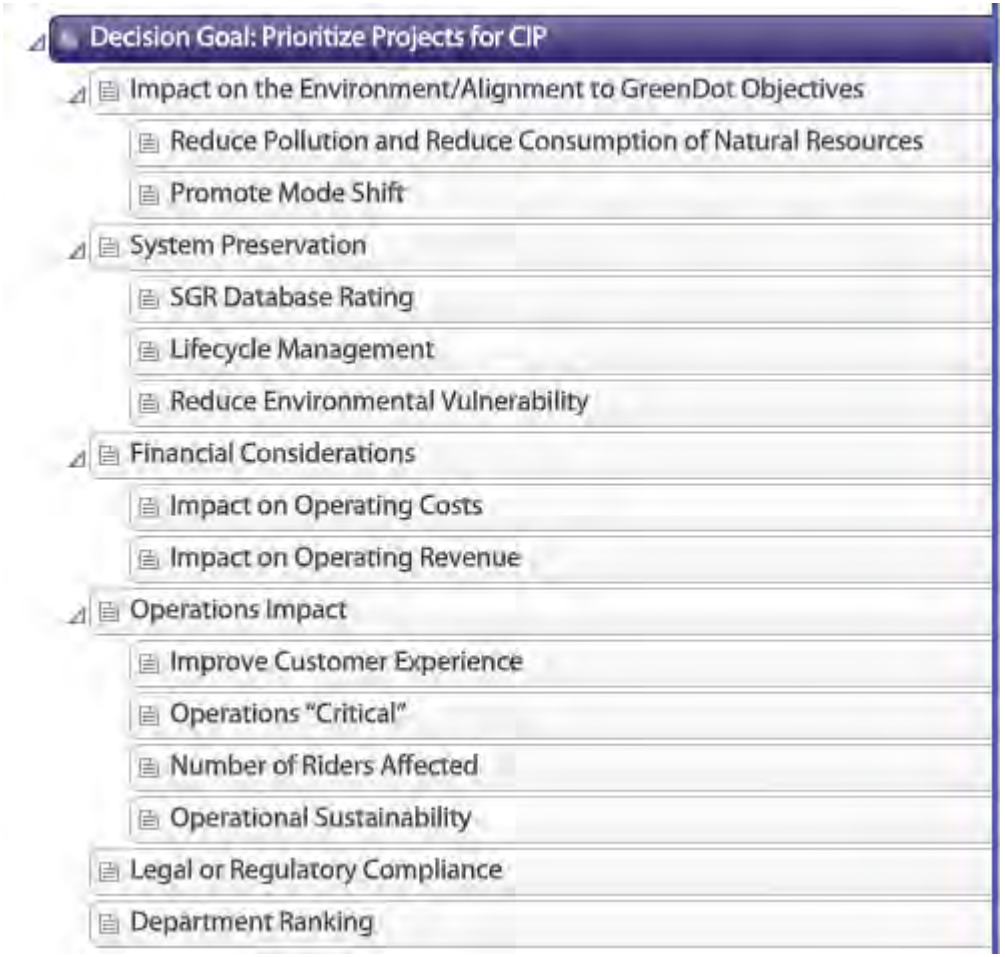
- **Goal**: To optimize the allocation of limited resources and the prioritization of proposed capital investment projects to best achieve the Authority's objectives and customer expectations
  - A collaborative, consensus-based approach to identifying and weighting evaluation criteria – so everyone feels part of the process
  - A more structured, systematic approach to project prioritization – so stakeholders will believe in the results
  - An ability to support decision making at different levels of the organization – agency as a whole, and for individual departments (e.g., IT, accessibility)

Decision support tool

- 5-step process:
  - Identify project evaluation criteria
  - Determine criteria weights
  - Establish rating scales
  - Score capital funding requests
  - Prioritize projects within fiscally constrained scenarios
- Other functionality:
  - Sensitivity analysis
  - Reporting

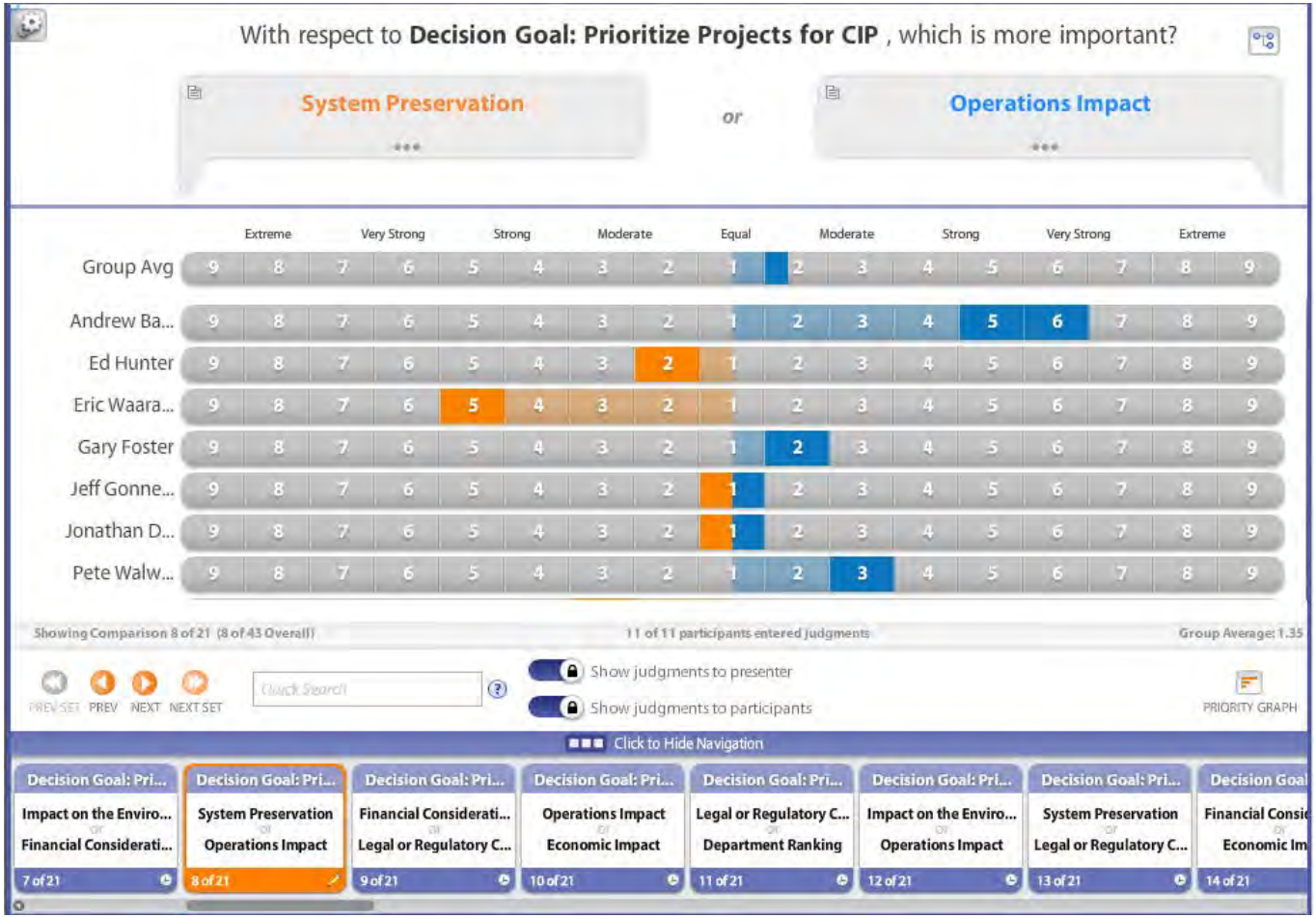
Decision support tool:

Identify project evaluation criteria



Decision support tool:

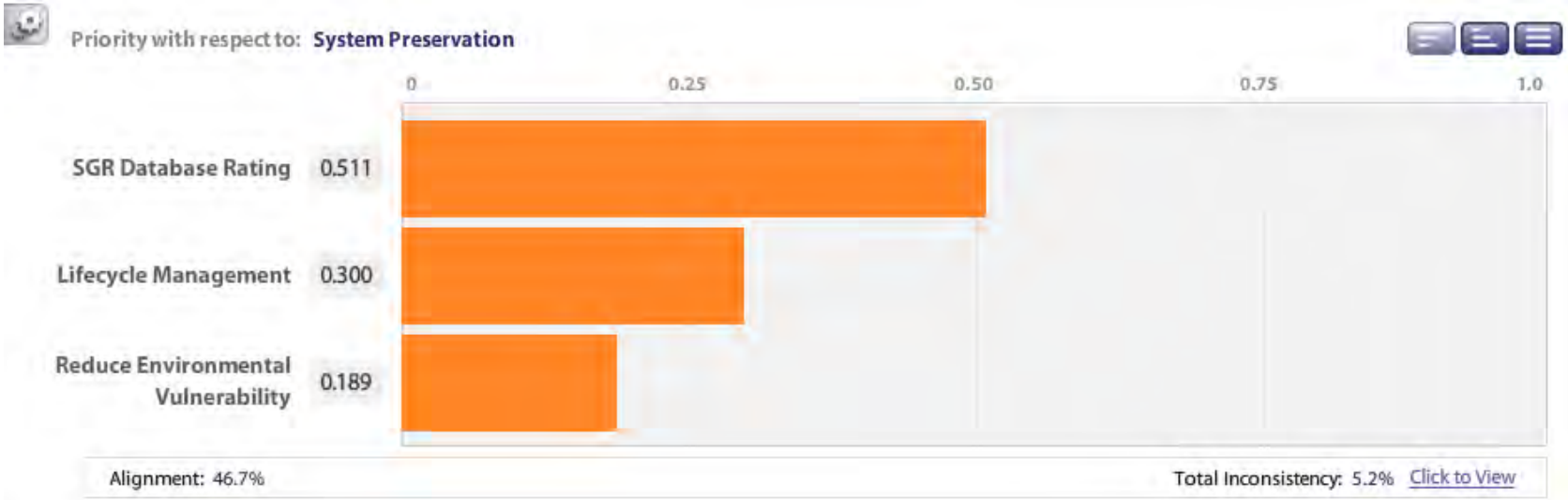
Pairwise comparison to determine weights



Decision support tool:

Determine criteria weights

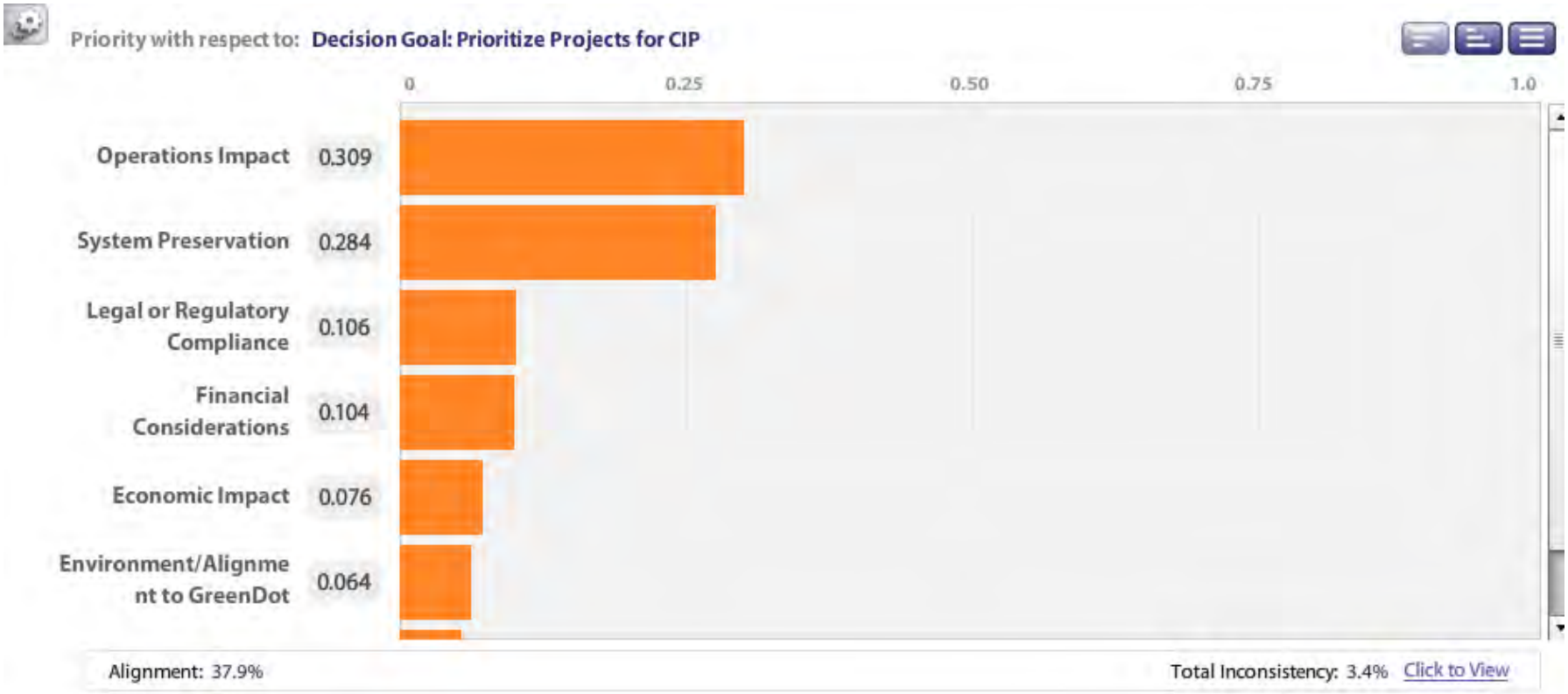
Between Children



Decision support tool:

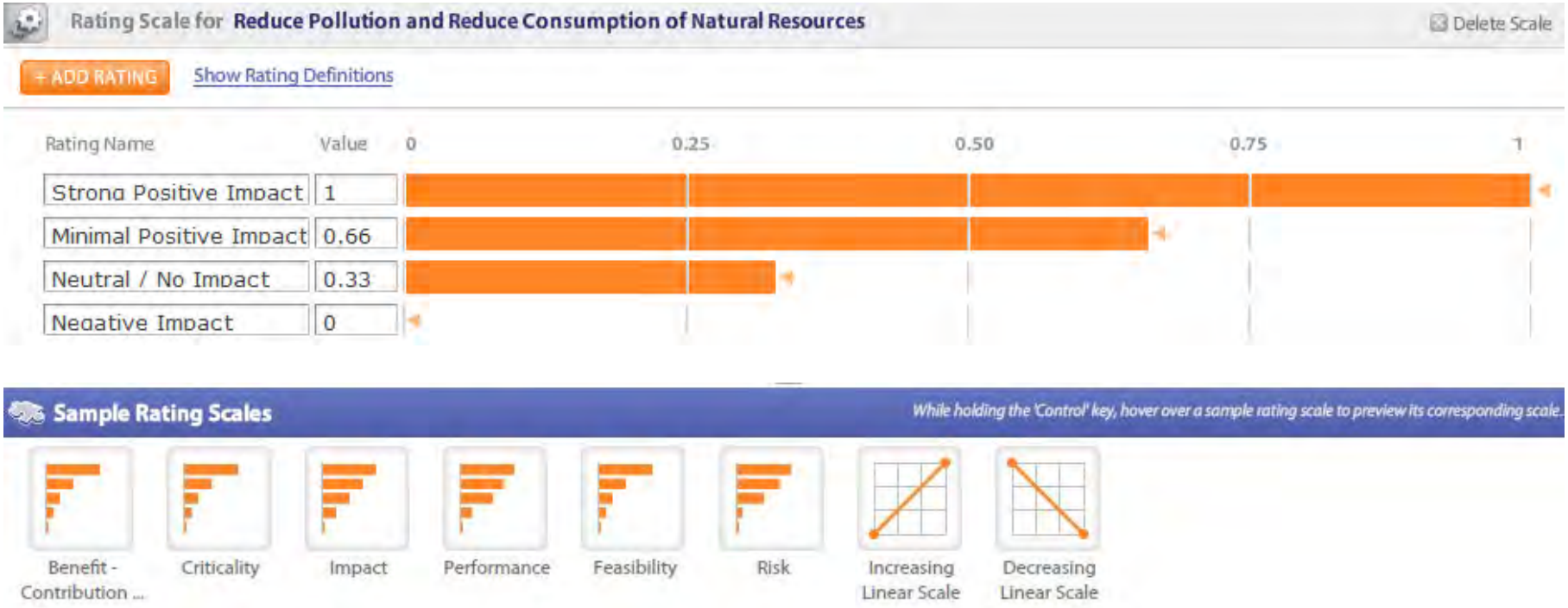
Determine criteria weights

Between Parents



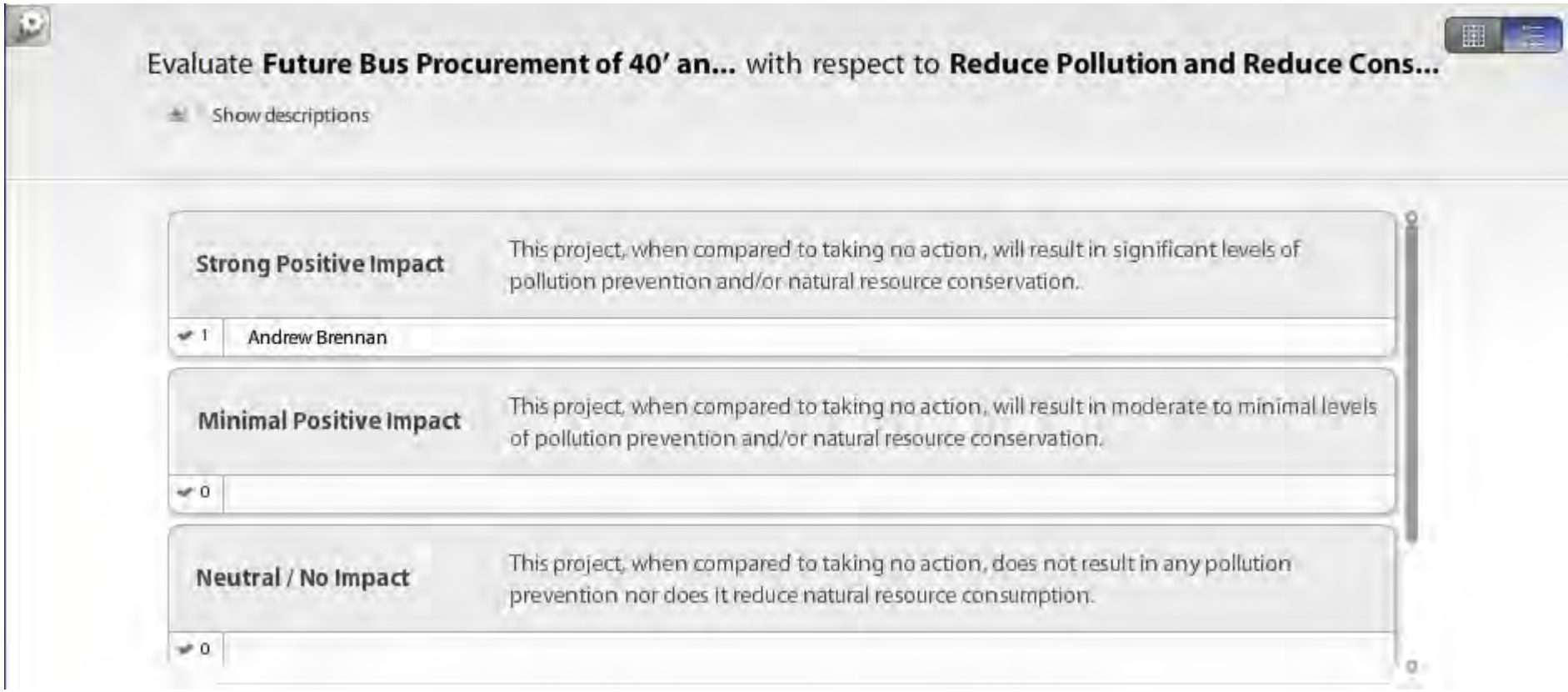
Decision support tool:

Establish criteria rating scales



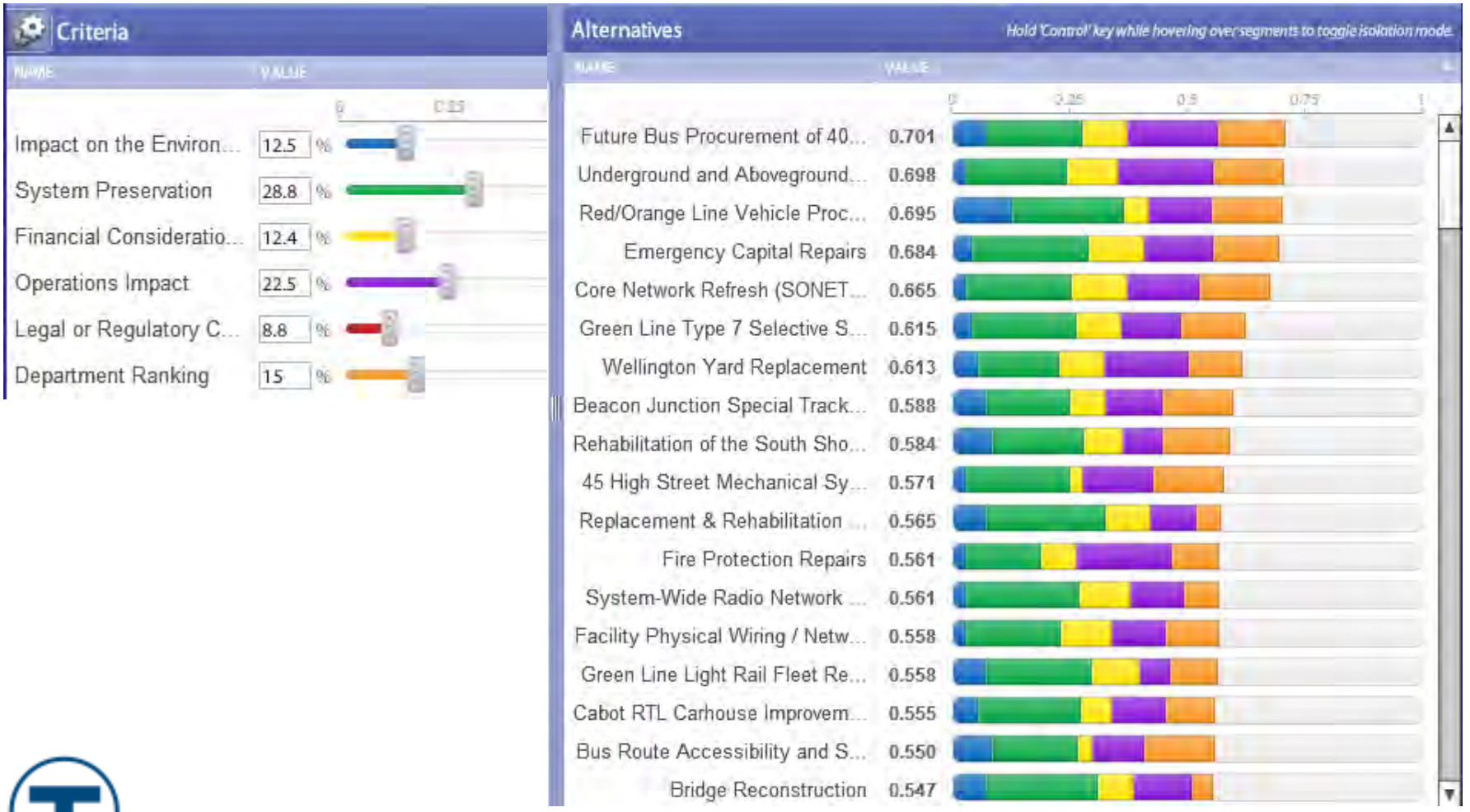
Decision support tool:

Score capital funding requests



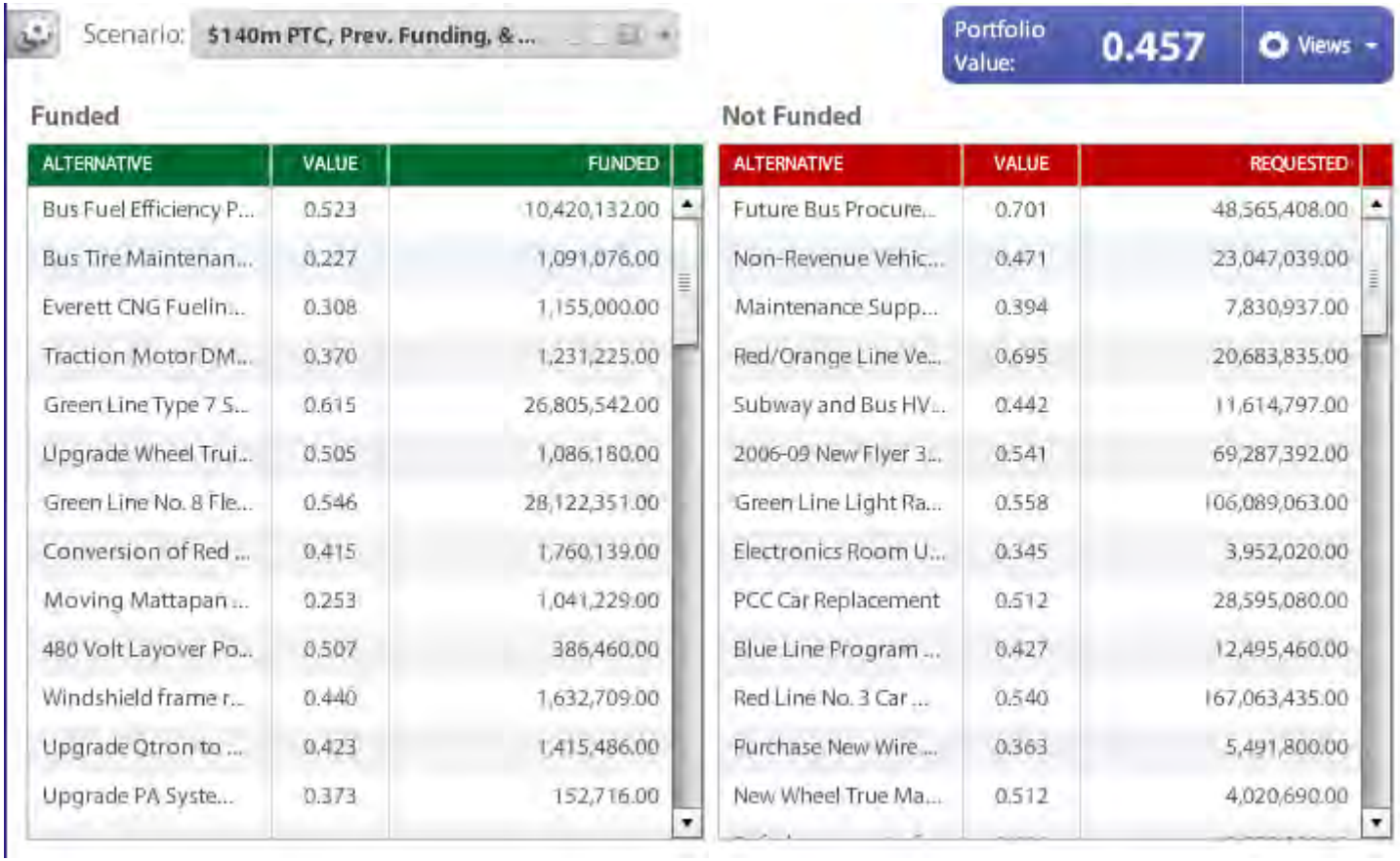
Decision support tool:

Prioritize capital funding requests



Decision support tool:

Prioritize capital funding requests


Scenario: $140m PTC, Prev. Funding, &...

Portfolio Value: 0.457

Views

Funded

ALTERNATIVE	VALUE	FUNDED
Bus Fuel Efficiency P...	0.523	10,420,132.00
Bus Tire Maintenan...	0.227	1,091,076.00
Everett CNG Fuelin...	0.308	1,155,000.00
Traction Motor DM...	0.370	1,231,225.00
Green Line Type 7 S...	0.615	26,805,542.00
Upgrade Wheel Trui...	0.505	1,086,180.00
Green Line No. 8 Fle...	0.546	28,122,351.00
Conversion of Red ...	0.415	1,760,139.00
Moving Mattapan ...	0.253	1,041,229.00
480 Volt Layover Po...	0.507	386,460.00
Windshield frame r...	0.440	1,632,709.00
Upgrade Qtron to ...	0.423	1,415,486.00
Upgrade PA Syste...	0.373	152,716.00

Not Funded

ALTERNATIVE	VALUE	REQUESTED
Future Bus Procure...	0.701	48,565,408.00
Non-Revenue Vehic...	0.471	23,047,039.00
Maintenance Supp...	0.394	7,830,937.00
Red/Orange Line Ve...	0.695	20,683,835.00
Subway and Bus HV...	0.442	11,614,797.00
2006-09 New Flyer 3...	0.541	69,287,392.00
Green Line Light Ra...	0.558	106,089,063.00
Electronics Room U...	0.345	3,952,020.00
PCC Car Replacement	0.512	28,595,080.00
Blue Line Program ...	0.427	12,495,460.00
Red Line No. 3 Car ...	0.540	167,063,435.00
Purchase New Wire ...	0.363	5,491,800.00
New Wheel True Ma...	0.512	4,020,690.00

Decision support tool:

Schedule

- Year 1: Capital Investment Program (CIP) for FY 2015 – 2019
- Year 2: Capital Investment Program (CIP) for FY 2016 – 2020 and other MBTA departments' decision-making needs (e.g., Accessibility, IT)
- Year 3: MBTA option year

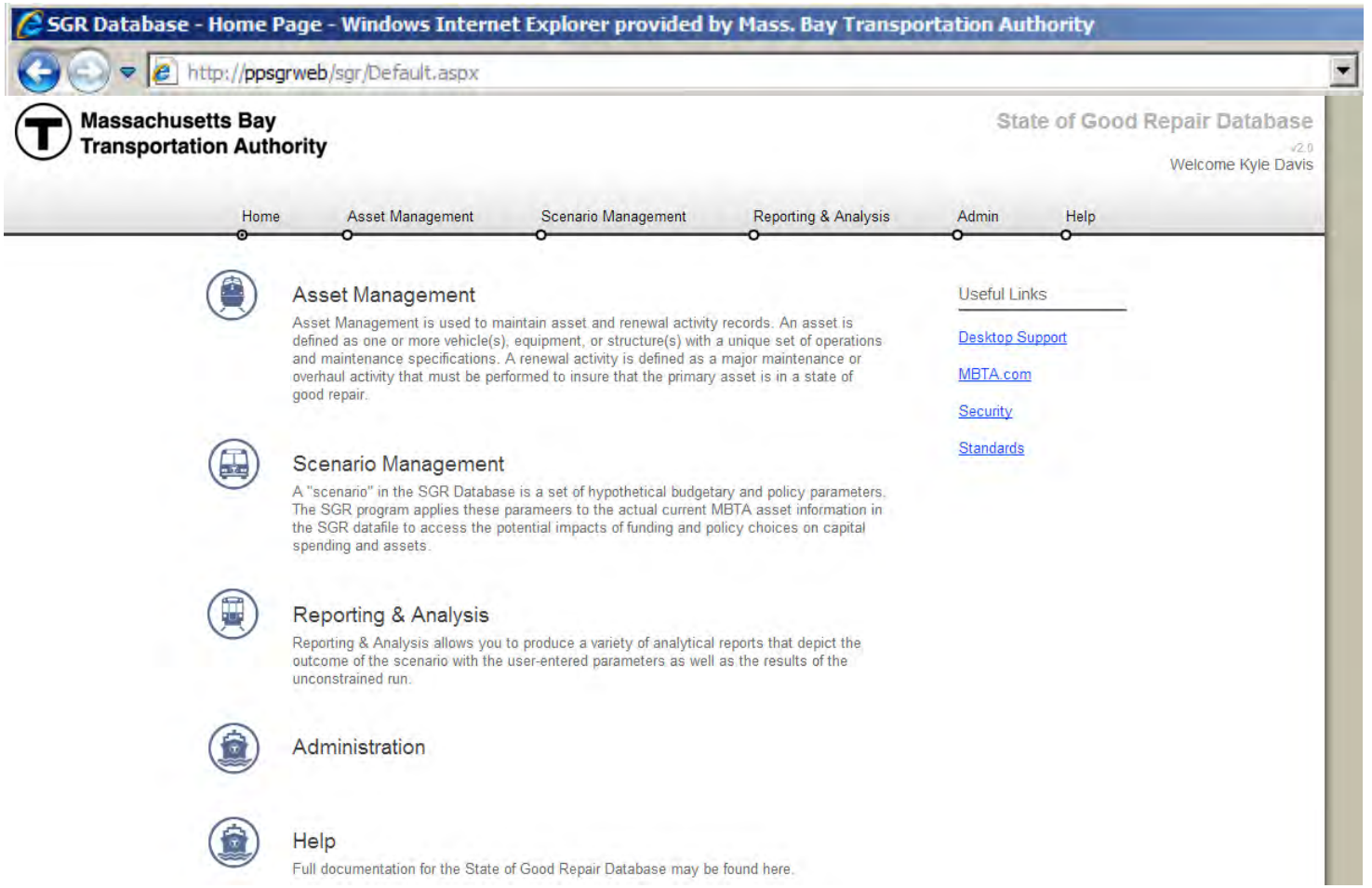
SGR database enhancements

Goals

- **Convert from PC-based to web-based version** - to provide direct access for field and maintenance personnel, and to facilitate the updating of asset data on a continuous basis
- **Revisit asset structure and detail** – to facilitate future NTD and MAP-21 reporting, to better integrate with the Capital Investment Program, and to identify the optimal level of asset line item granularity
- **Incorporate condition ratings** – to comply with MAP-21 and to better analyze the relationships between age and condition
- **Incorporate decay curves** - to recognize that asset condition deteriorates at different rates over the useful life, and to forecast future SGR
- **Revise asset prioritization methodology** – to support future capital and maintenance decisions

SGR database enhancements

Web-based version



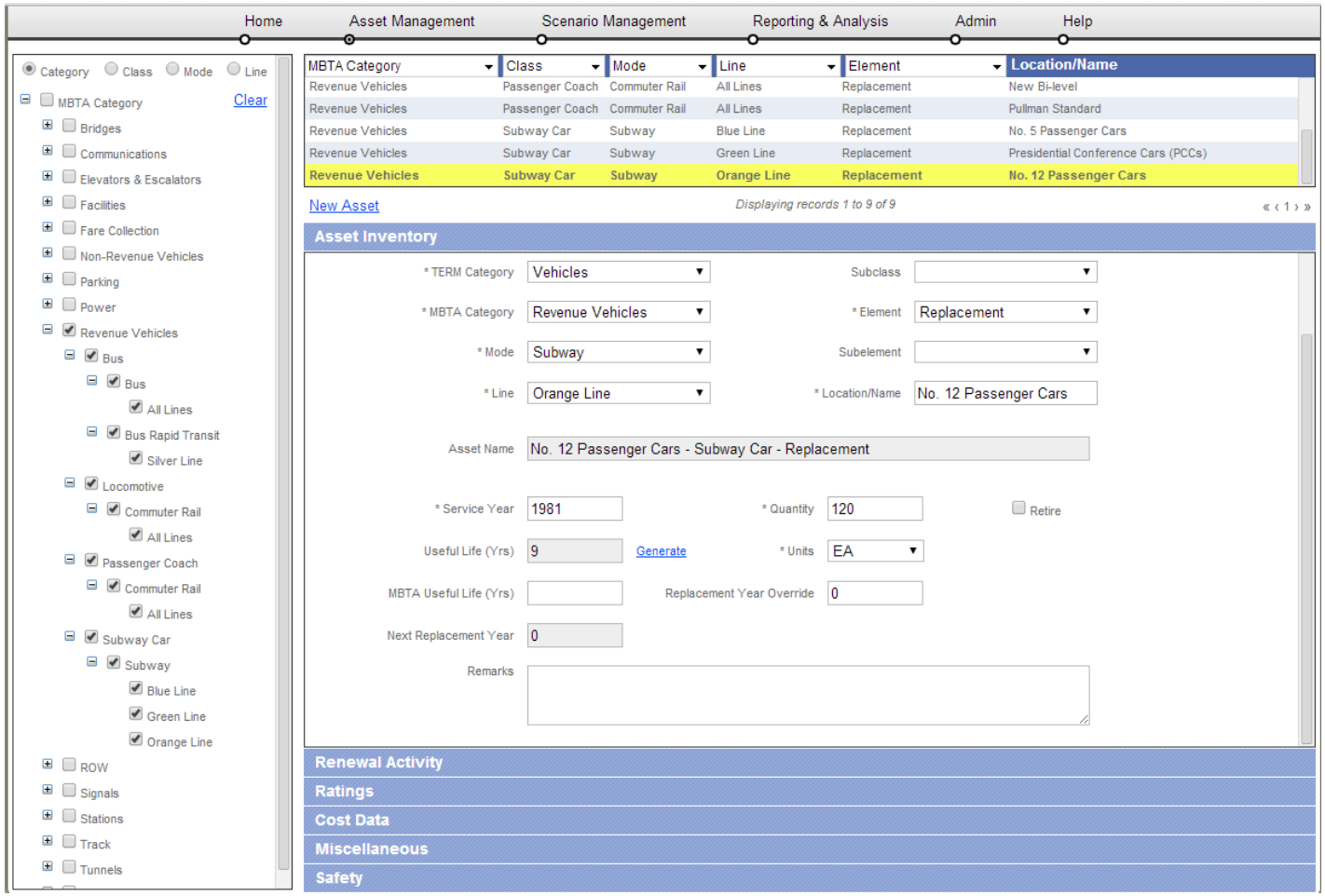
SGR database enhancements

Asset inventory structure and asset data

- Three possible structures:
  - MBTA Capital Investment Program (CIP) category
  - TERM
  - NTD
- MBTA inventory hierarchy:
  - MBTA Category -> Class -> Element -> Sub-Element
- Increase in number of assets in inventory
- Several new data fields:
  - Decision support tool score, data responsibility, maintenance responsibility, level of expertise, redundancy of expertise, affected by existing/planned capital project

SGR database enhancements

Asset structure and detail



SGR database enhancements

State of Good Repair (SGR) score

Age, condition rating, performance rating

- All three have user-defined weights and are based on 1-5 scale, with 2.5 = SGR
- Age rating is based on age / useful life, with 2.5: age = useful life
- Condition and performance ratings based on decay curves

Decay curves are MBTA-specific or TERM

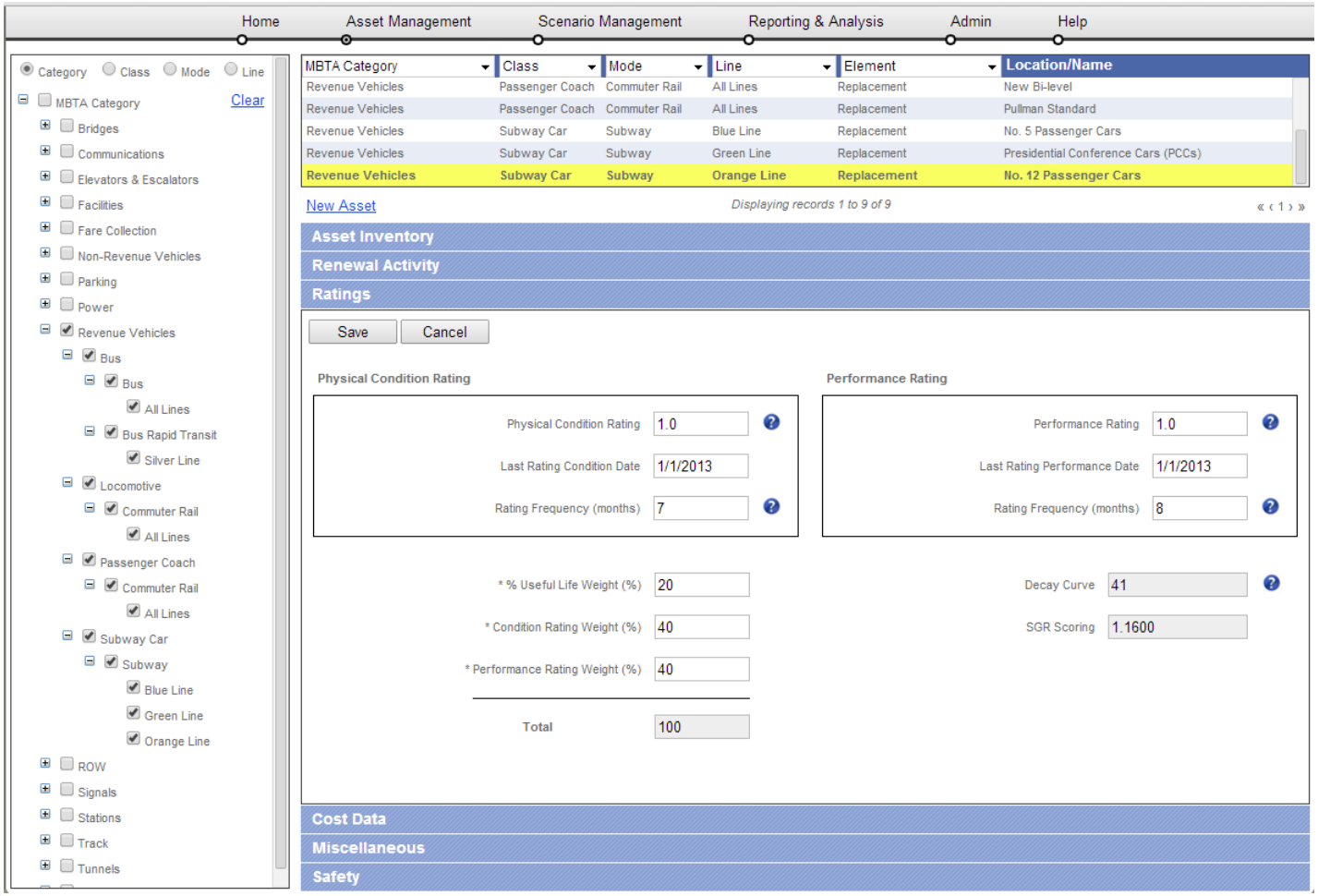
- Curves reflect MBTA-defined useful lives, but can be transposed using MBTA useful life and shifted used MBTA ratings

Data collection:

- Data are collected for each asset at the element hierarchy level
- Decay curves are associated with each asset at the element hierarchy level

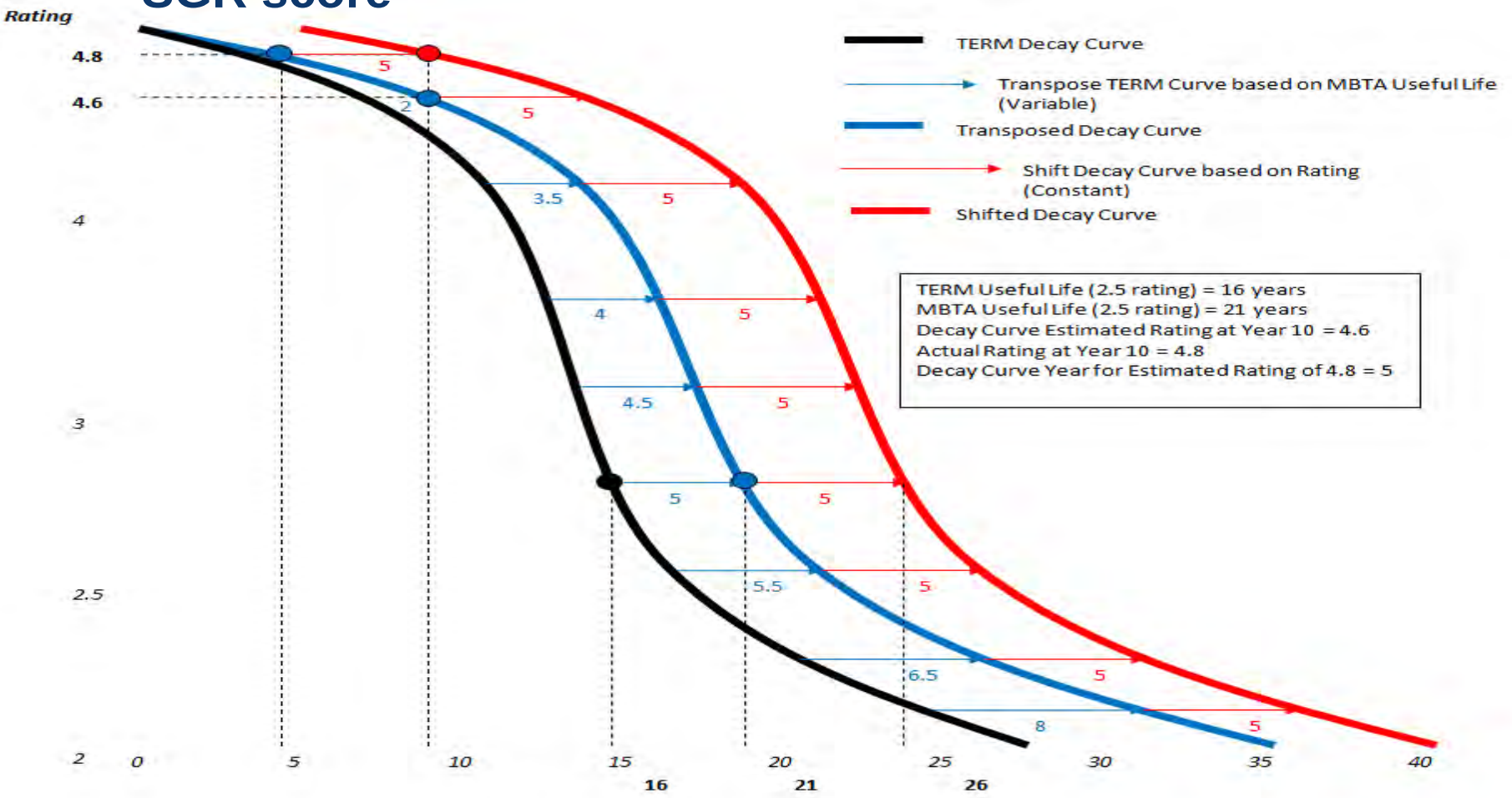
SGR database enhancements

SGR score



SGR database enhancements

SGR score



SGR database enhancements

Prioritization methodology

Age/Condition/Performance (ACP) Score

- Age = annual age / useful life
- Condition and Performance: based on decay curve

Criticality Score: measure of cost-effectiveness

- Likelihood of failure: percent beyond SGR Rating (calculated)
- Consequence of failure: affected daily ridership (data collection)
- Duration of failure: days out of service (data collection)
- Replacement cost (data collection)

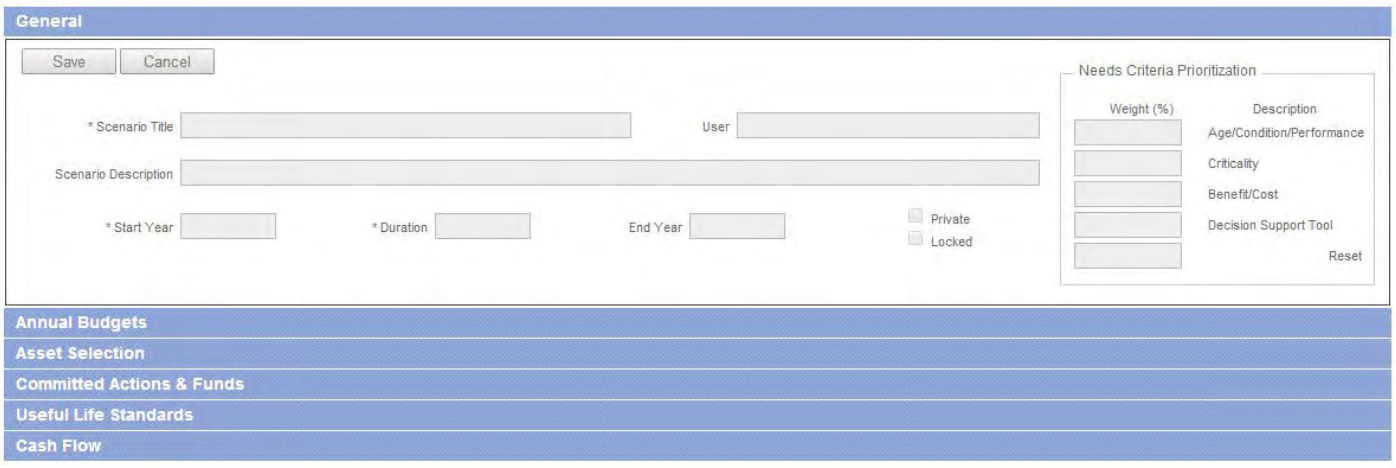
Benefit/Cost Score

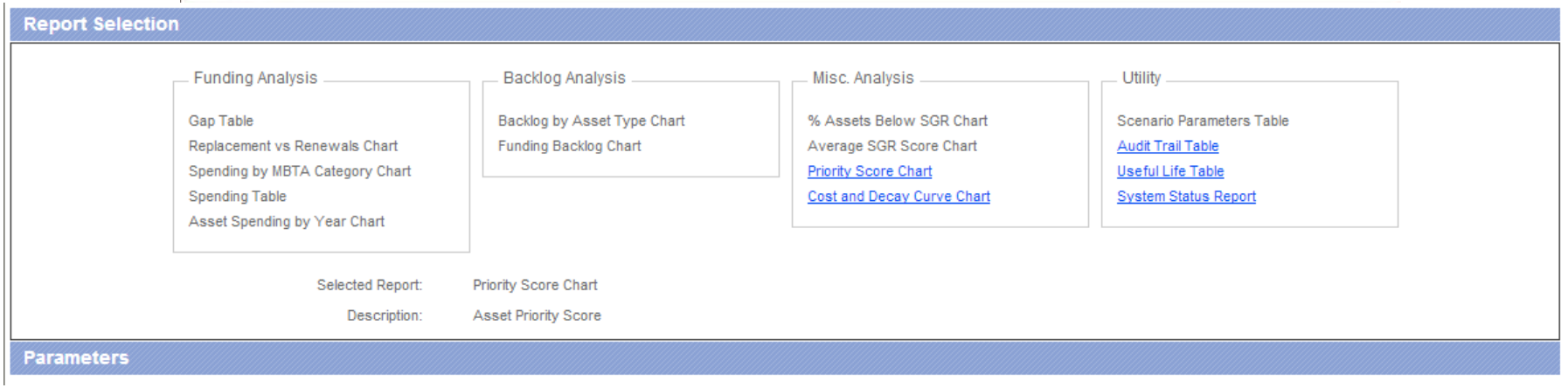
- Net present value of annual O&M savings using maintenance-cost curve

Decision Support Tool Score

SGR database enhancements

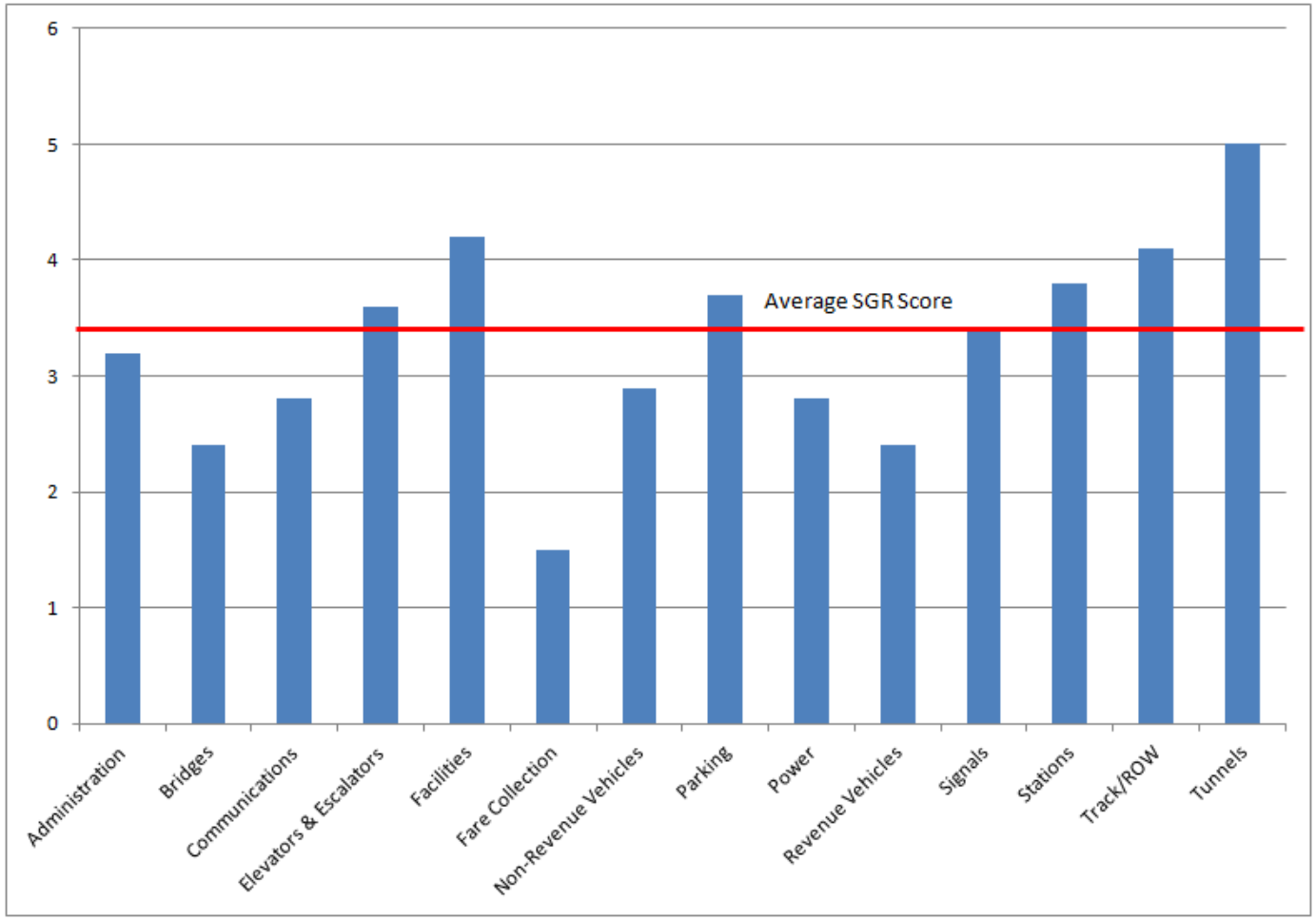
Prioritization methodology





SGR database enhancements

Prioritization methodology



SGR database enhancements

Schedule

- Database: Expected completion by April 2014
- Data Collection: Expected completion by Summer 2014

Our next challenge

System integration

These individual pieces need to meld together for an effective TAM program:

Asset Management Plan – The MBTA's overall roadmap to achieve its TAM goals

SGR Database – Asset inventory and long-term capital planning tool; shows impact of various funding scenarios on system condition and performance

Decision Support Tool – Project prioritization for annual CIP

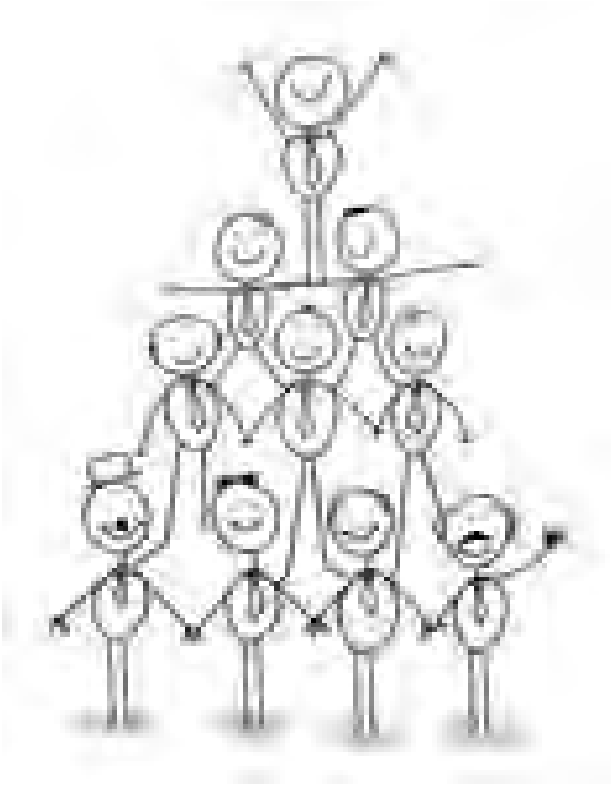
Maintenance Management Systems – Day-to-day maintenance and life-cycle management

TAM Team – Executives, managers and staff responsible for putting the TAM pieces together

Our team

The “TAM Team” includes committed staff, at all levels of the agency, to both guide and implement the various TAM initiatives:

- TAM Leadership Team (GM, senior staff)
- TAM Executive Sponsors (CFO, COO, CIO, Chief-Business Initiatives & Innovation)
- AMP Implementation Program Manager
- TAM Asset Management Working Group
- TAM Asset Class Leaders
- TAM Initiative Project Managers:
  - Finance - SGR database enhancements
  - Capital Budget - decision support tool
  - IT – MMS technology/business architecture
  - Commuter rail - MMS & LCM program
  - E&M – new MMS for facilities, linear assets
  - Fleet – Blue Line car RCM pilot program



Lessons learned

Agency buy-in

- Top leadership support a must
  - Strong leadership to endorse and drive the asset management program
  - Accountability for implementation
  - Commitment of resources – existing and new
- Need buy-in at all levels of the organization
  - Everyone needs to understand why the asset management program is important, and their role in making it successful
  - Provide forum for open and honest discussion of ideas – such as one-on-one interviews, smaller group discussions
  - Listen to asset managers – they live this every day
- Inclusive approach for AMP
  - Develop plans from bottom-up (to ensure buy-in at all levels)
  - Implement from top-down (to ensure accountability, commitment of resources)

Lessons learned - continued

Organizational structure

- Executive level leadership
  - Establish leadership team (GM and senior staff) for policy guidance, direction
  - Senior level executive sponsor(s) – to ensure accountability, resources
- Dedicated AMP implementation program manager
  - A dedicated program manager to oversee all aspects of AMP implementation
  - Reports directly to leadership team (e.g., executive sponsors)
- Cross-functional steering group
  - Ensures coordination and information sharing across departments/functions
  - Members will champion specific AM projects/initiatives within their departments
  - Provides critical support to the AMP program manager
- Strong PMs for specific projects
  - Subject matter experts driving their own projects

Lessons learned - continued

Outside support can help

- Learn from other transit agencies
  - No need to reinvent the wheel in many cases
  - There is a lot of good stuff happening out there, and staff are happy to help
- Independent review for baseline maturity
  - You may not be as good as you think you are
  - Best to compare against industry best practice, so need someone who understands what that is
- Targeted, short-term consultant support can be valuable
  - Lots of consultants with excellent AM experience and knowledge of industry
  - Can bring new ideas to the table, with real-life examples/benefits
  - Can help to develop manager/employee confidence in the program, especially during difficult transition phase
  - Plan for knowledge transfer to internal staff

Lessons learned - continued

Approach

- Walk before you run
  - Take small steps, and build on these over time
  - Focus initially on projects with biggest bang/ most support from staff
  - Recognize successes (no matter how small) and replicate where possible
- It's a marathon; not a sprint
  - Take a long-term approach - it may take years to reap benefits in some cases
  - Manage expectations accordingly
  - Think big picture when planning, but implement one step at a time
  - Prepare for transitions (leadership and staff)
- Be flexible, but maintain course
  - Establish a firm "roadmap" (i.e., goals, action items, schedule), but…
  - Be prepared for delays and setbacks (e.g., resistance, competing priorities)
  - Monitor/report progress quarterly, and update plan annually
  - Keep chugging along – it's well worth the effort

Thank you

If you have any questions or want additional information on our TAM program, call or email anytime:

Robert Guptill
rguptill@mbta.com
617-222-5755

Eric Waaramaa
ewaaramaa@mbta.com
617-222-1950