



Asset Sustainability Capital Creation Strategies

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Aging Infrastructure Impact

Public Assets (National)

- 20 Billion Square Feet
- \$3 Trillion Replacement Value

Backlog / Deferred Maintenance

- \$350 Billion Unfunded Backlog (today)
- \$740 Billion Unfunded (10 years)

Significant Capital re-investment is required

Common Challenges

On-going building deterioration /renewal



Capital budgets are constrained / growing deferred maintenance



Operating costs continue to grow



Carbon footprint reduction



Changing functional demands



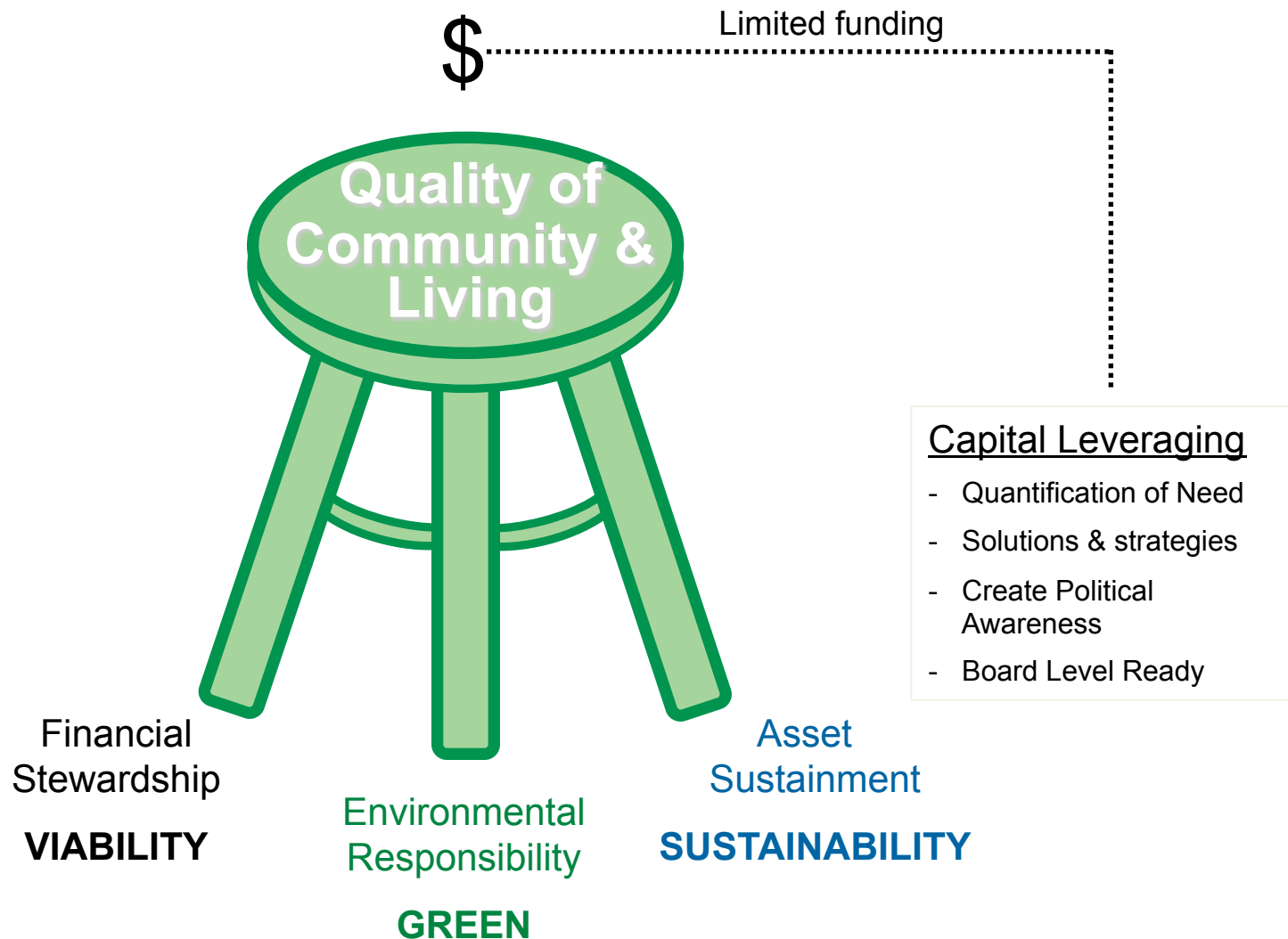
Level of service impact



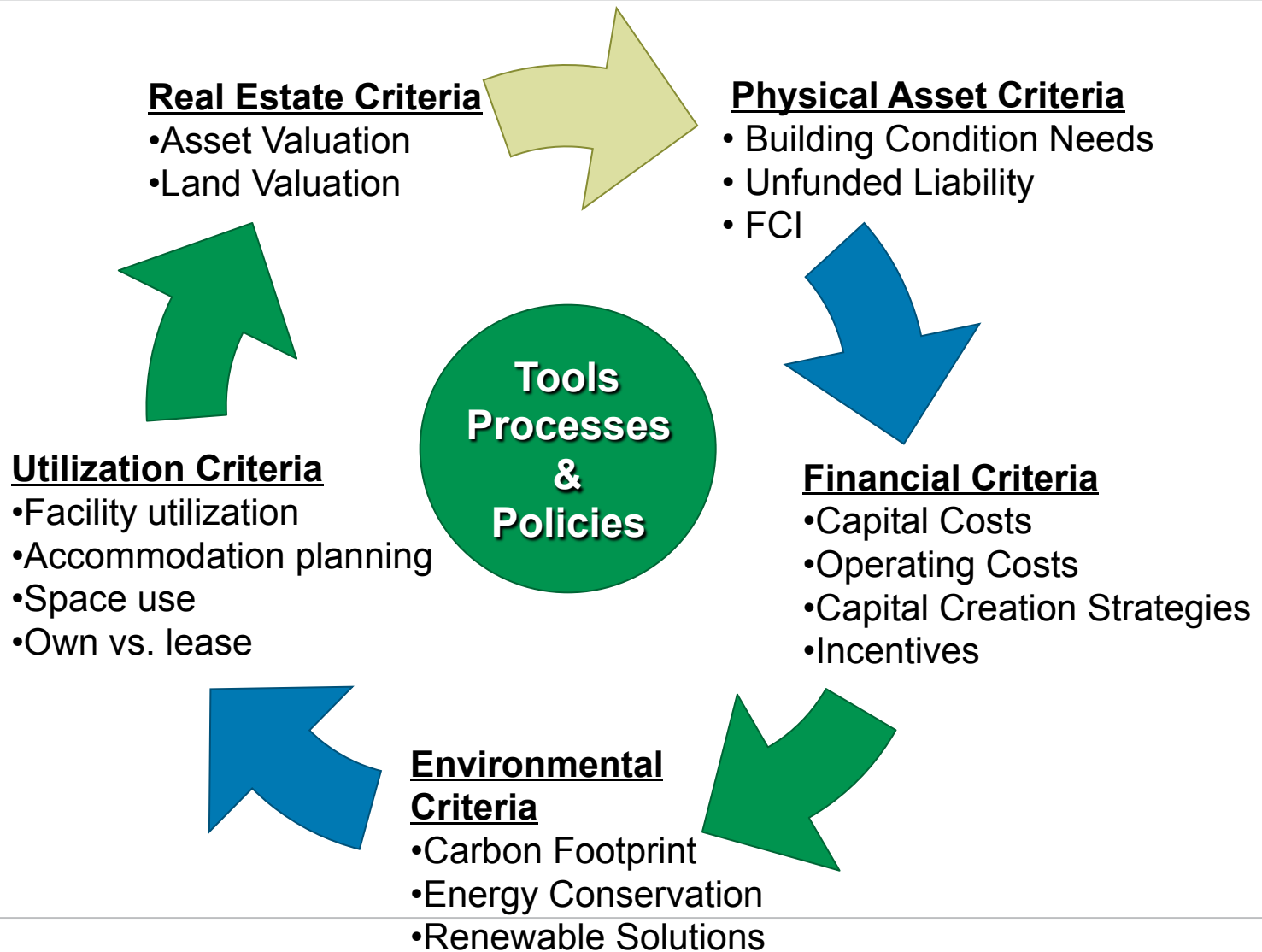
Holistic Prioritization Process



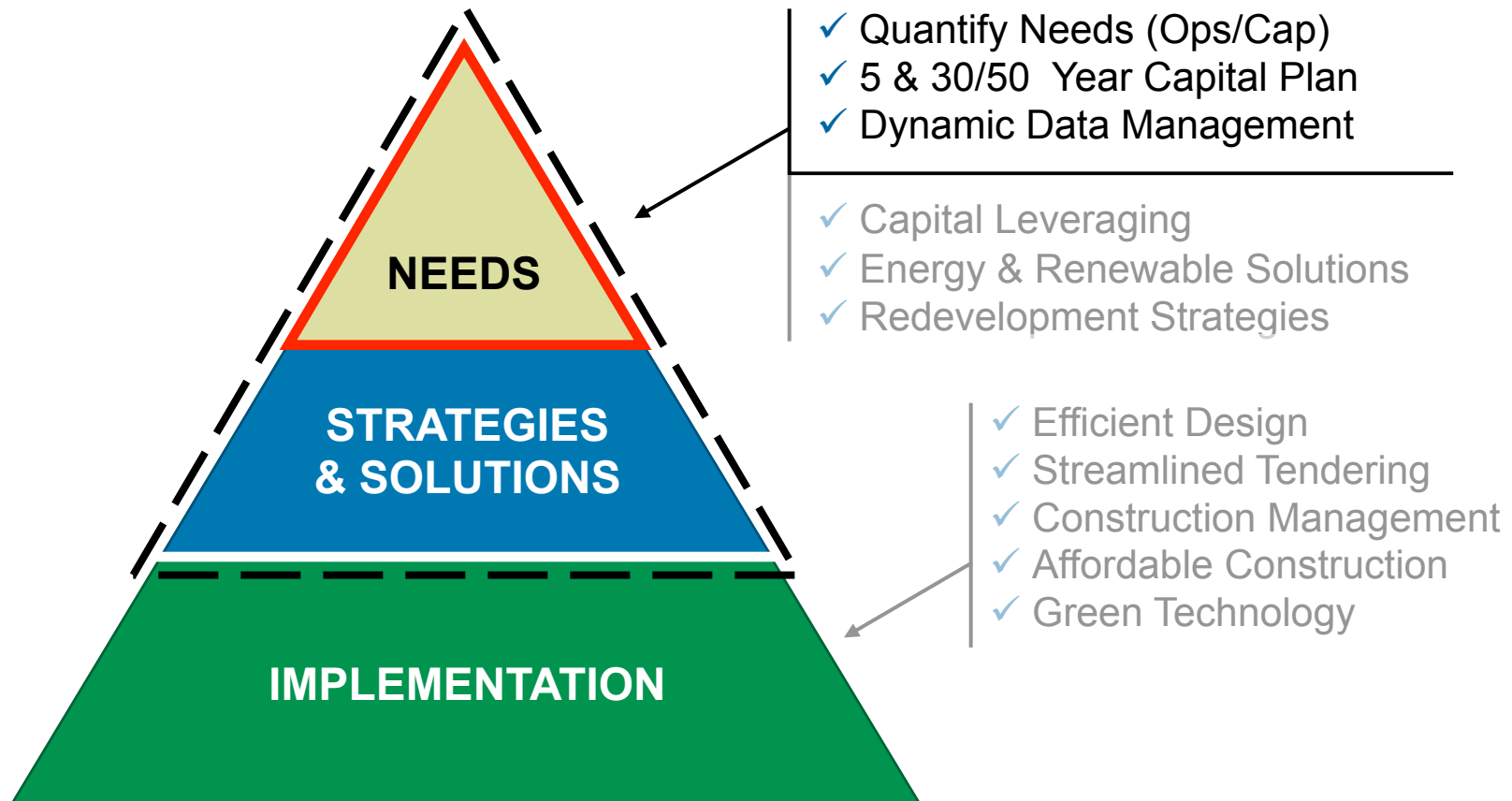
Quality of Space



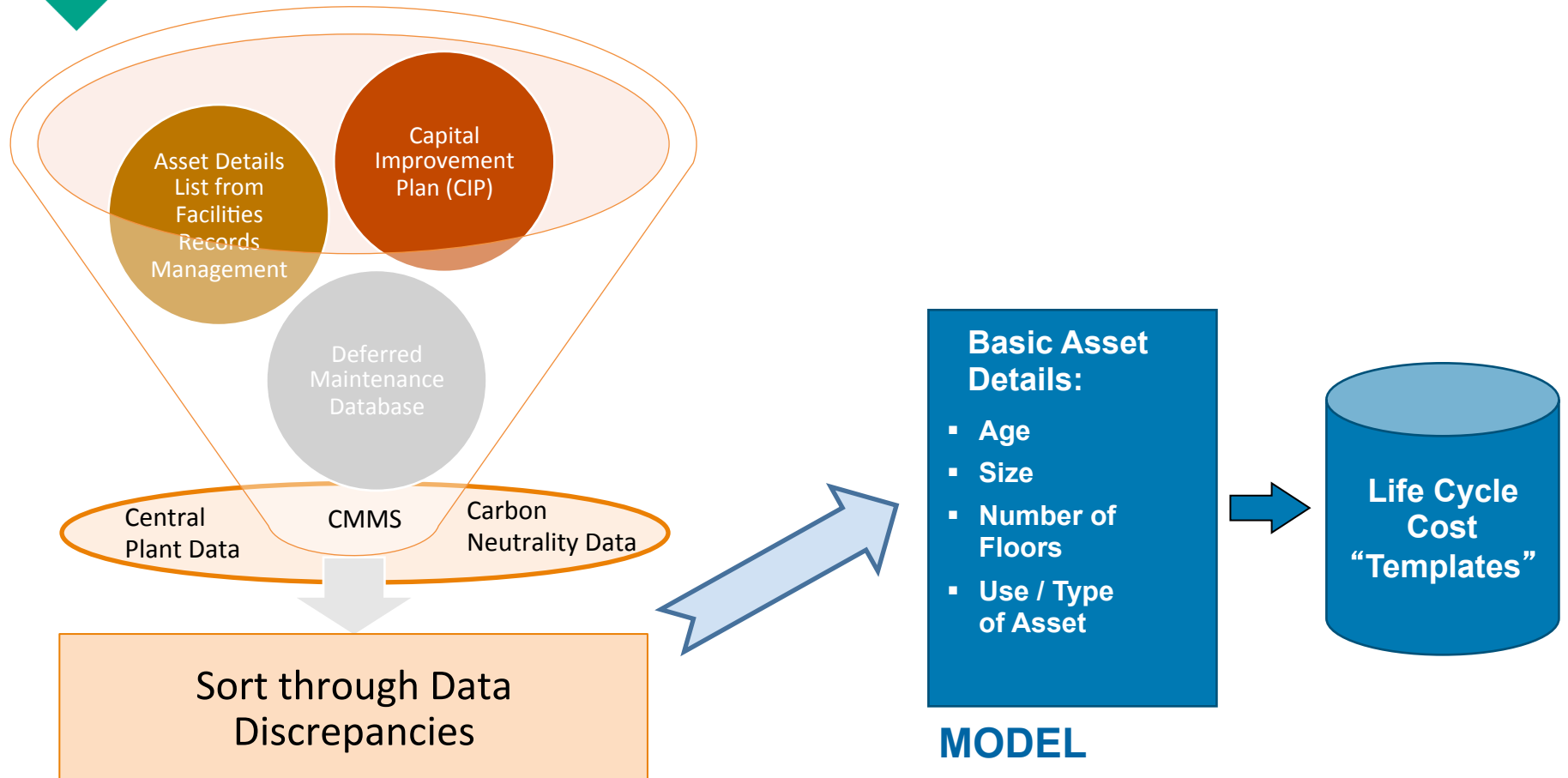
Decision Development Framework



Asset Optimization



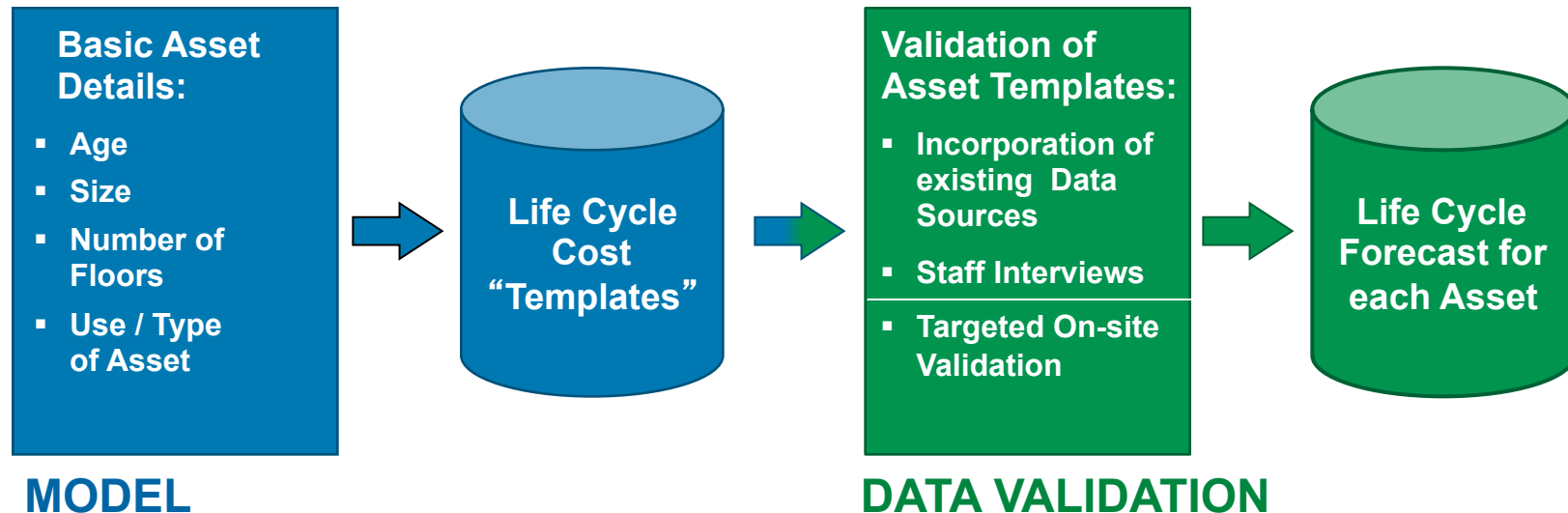
Data Development Process



Data Development Process

Unique Data Development : Best Practices

- ✓ **Quickly** establish Life Cycle cost profiles for all assets utilizing data modeling techniques
- ✓ **Consistency** and **Standardization**



Basic Asset Details

Basic Asset Details Required:

- Facility Name
- Facility Age
- Facility Size
- Number of Floors
- Facility Type:
 - Corporate
 - Office
 - Administration
 - Fire Hall
 - Police
 - Airport



Component Inventory

Mechanical

- Heating Systems
- Ventilation Systems
- Air Conditioning
- Plumbing / Drainage
- Building Controls
- Fire Prevention



Architectural / Structural

- Roofing, Windows, Exterior Doors
- Foundation & Exterior Walls
- Flooring & Ceilings
- Interior Walls / Doors / Millwork
- Painting & Window Coverings
- Accessories & Equipment



Electrical

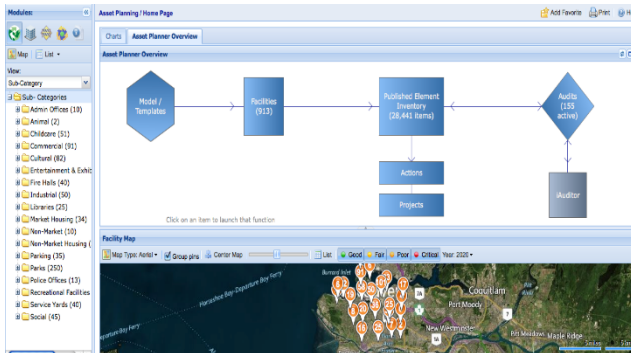
- Power & Distribution
- Interior Lighting
- Exterior Lighting
- Emergency Power
- Fire Alarm System
- Comm / IT Systems
- Security Systems
- Clock Systems

Property / Site

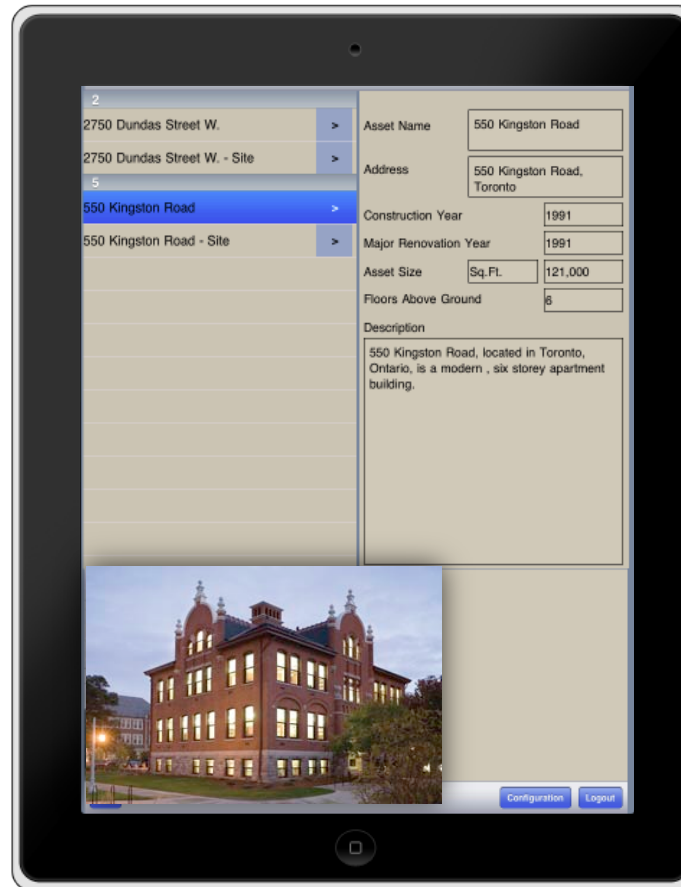
- Roadways / Driveways
- Paving & Walkways
- Retaining Walls
- Landscaping
- Fencing
- Underground Utilities

iAuditor™ - Data Capture and Management

Wireless Download
from Asset Planner












Wireless Upload
to Asset Planner
for QC



Assess Facilities
using iAuditor



Validated / Prioritized Deferred Listing & Forecast

Component	Component Replacement Value	Component What & Where	Component Commentary (Condition, etc.)	Component Data Source	Overall Condition	Action Brief Description	Action Commentary	Action Type	Action Cost	Photos
B2010 Exterior Walls	\$1,231,780	The principal exterior cladding at the building consists of brick veneer. Certain areas of the buildings structural concrete frame also acts as the exterior wall assembly.	The condition of the exterior wall assembly is good at this time. No areas of masonry cracking or spalling were identified. The concrete wall areas are in good condition with no areas of spalling identified. The exterior cladding system underwent rehabilitation in 2006 to repair problem	Validated	Good	Repair exterior walls	This item is a cyclical allowance towards major repairs of the exterior masonry walls and the concrete shear walls. It is our experience that, while these components typically last for the life of the building, however, fairly major repairs are required from time to time. It is difficult to establish exactly	Repair	\$225,400	
B2020 Exterior Windows	\$558,000	These components are constructed of good quality thermal glazing with aluminum frames. These components are very durable and should provide a service life of at least 40 years. However, less durable components (e.g., hardware weatherstripping.)	The window frames are in good condition with no significant problems noted. No major work is anticipated with these components within the time frame of this study.	Validated	Good	Replace entire window system	No failed thermal panes were observed at the areas reviewed. Weatherstripping generally appeared intact and in sufficiently good condition to serve its intended function	Replacement	\$558,000	
B2030 Exterior Doors	\$9,800	These doors are typically constructed of steel and are usually very durable.	All exterior doors are functional and in satisfactory condition.	Validated	Good	Replace or refurbish the exterior doors and their hardware.		Replacement	\$9,800	
B30 Roofing	\$204,000	The main flat roof consists of an inverted membrane. The membrane is concealed by the overlying thermal insulation and gravel ballast. Terrace areas at the north end of the building exist at the 6th, 5th and 4th floors.	No significant problem areas were noted other than weed growth beneath/between the pavers at some of the terrace areas that should be removed as a maintenance item. No reports were given with respect to suspected water leakage. No significant work requirements are	Validated	Fair	Remove the existing ballast and thermal insulation, remove the existing waterproofing membrane, install new roofing and replace the existing insulation and ballast.		Replacement	\$204,000	
C20 Stairs	\$616,616	Stairs		Life Cycle Model	Good					
D1010 Elevators & Lifts	\$30,000	The existing elevator cabs had been completely refurbished with new tile flooring, mirrored panels, and stainless steel trims in approximately 1999. The building is provided with 2 Northern geared traction elevators.	The finishes are in acceptable condition and no remedial work is anticipated during the study period. As per the work program, the service provider for elevator maintenance was contacted to discuss the condition of the devices and the requirements for any expected remedial work within the	Validated	Good	Modernization of elevator motors and controls.		Repair	\$30,000	
D2020 Domestic Water Distribution	\$300,000	The units are aging and failing on a regular basis. The capital plan should allow for a replacement of at least 15 Units per year which allows for a 10% replacement factor. Domestic hot water is circulated continuously through the building.	The building is at the age where domestic water lines typically experience pinholing particularly at the hot water riser line and replacement needs to be planned. Various leaks and repairs of pin-holes has been reported to have commenced at the building. The pumps were not	Validated	Fair	Replace domestic hot and cold water risers to the suites in a phased approach coordinated with suite bathroom work.		Replacement	\$60,000	
D2030 Sanitary Waste	\$200,000	Drainage piping consists of cast iron stacks that convey waste-water from the suites and common areas to the municipal sewer system. Duplex sump pump systems are located in the sub-basement area below the commercial kitchen area.	Drainage piping is not under pressure and generally lasts for the life of the building except for isolated repair. No significant repair requirements are anticipated. The pumps are located in pits and cannot be directly reviewed. There was no alarm condition and the pumps operated satisfactorily in the	Validated	Good	Allowances to replace or repair sections of the drainage piping as needed.	Includes both sanitary and rain water drainage piping	Replacement	\$8,000	
D2095 Domestic Water Heaters	\$25,000	Domestic hot water for the building is provided by 2 Teledyne Laars Model PW 1010 boilers with an input of 1000 MBH each. The domestic hot water is stored in a vertical tank adjacent to the boiler installation in the mechanical penthouse of the building	The domestic water boilers are known to be a quality product and no problems were observed or reported to Enerplan during our reviews. Replacement of the boilers is not anticipated to be required within the time frame of this study. No problems with the tank were observed or	Validated	Good	Replace domestic water heaters		Replacement	\$40,000	

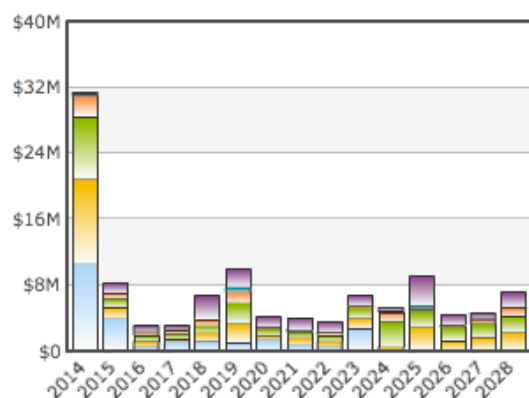
Asset Map / Dashboard

Asset Planning / Home Page

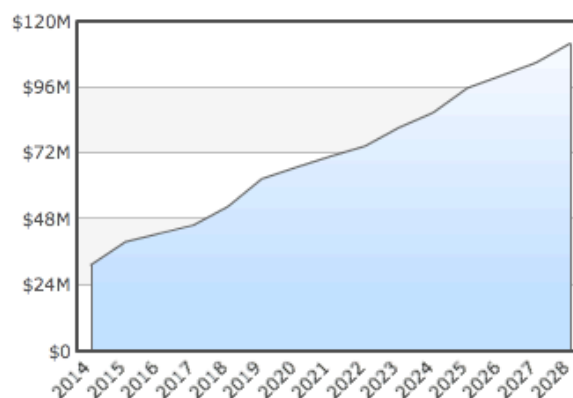
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Charts Asset Planner Overview

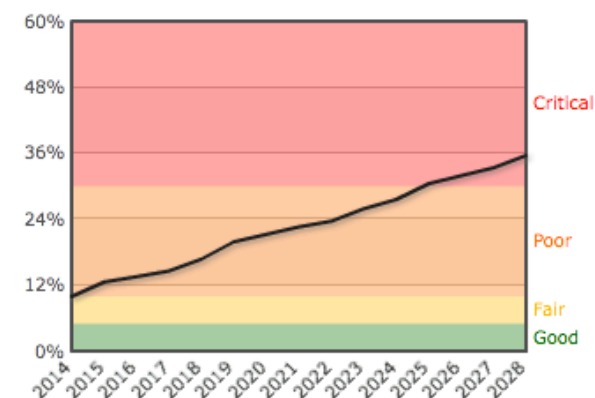
Cost by Discipline



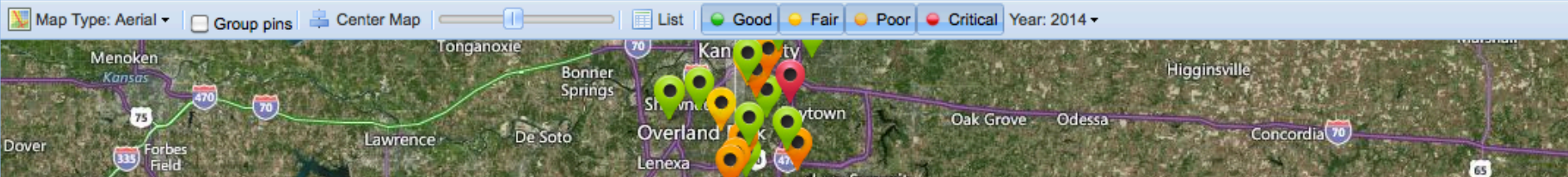
Cumulative Unfunded Liability



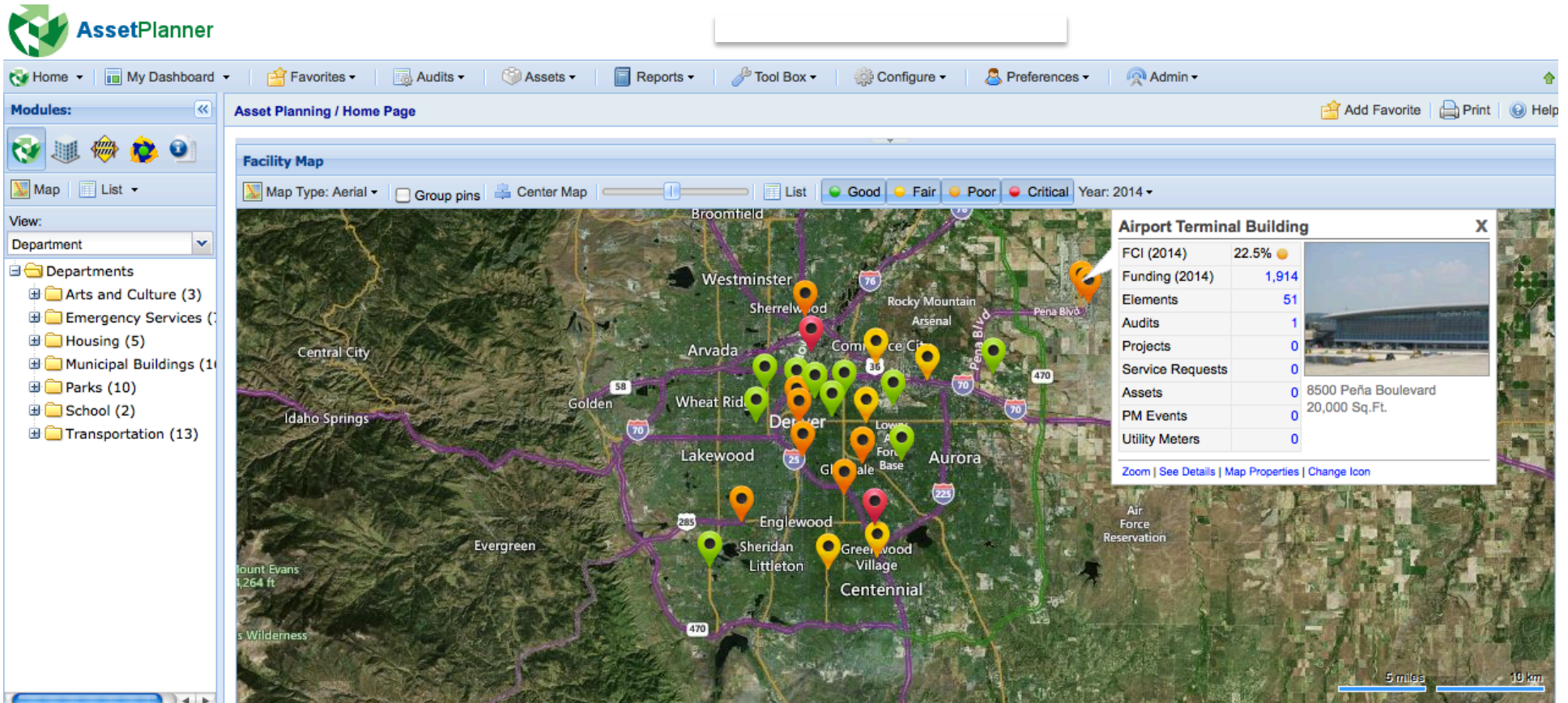
Average FCI after Funding



Facility Map



Dashboards



Linear Assets

Asset Map

ID	Parent Type	Facility	ekWh Per...	Label	Description	GeoData
4	Asset	Prairieville		PVC Sewer Pipe	10004	LINESTRING(51.222802 -102.438571,51.222198
6	Asset	Prairieville		PVC Sewer Pipe	10006	LINESTRING(51.223427 -102.438564,51.222779
9	Asset	Prairieville		PVC Sewer Pipe	10009	LINESTRING(51.224348 -102.436534,51.224351
10	Asset	Prairieville		PVC Sewer Pipe	10010	LINESTRING(51.224345 -102.437889,51.224348
11	Asset	Prairieville		PVC Sewer Pipe	10011	LINESTRING(51.224047 -102.438566,51.223454
18	Asset	Prairieville		Concrete Sewer ...	10019	LINESTRING(51.217683 -102.478681,51.217684
19	Asset	Prairieville		Concrete Sewer ...	10020	LINESTRING(51.217683 -102.480286,51.217682
20	Asset	Prairieville		Concrete Sewer ...	10021	LINESTRING(51.217683 -102.481885,51.217683
21	Asset	Prairieville		PVC Sewer Pipe	10022	LINESTRING(51.217667 -102.482799,51.217700
22	Asset	Prairieville		Clay Sewer Pipe	10023	LINESTRING(51.224938 -102.477771,51.225060
25	Asset	Prairieville		PVC Sewer Pipe	10026	LINESTRING(51.227674 -102.497802,51.227673
26	Asset	Prairieville		PVC Sewer Pipe	10027	LINESTRING(51.226332 -102.497511,51.225432
27	Asset	Prairieville		PVC Sewer Pipe	10028	LINESTRING(51.225523 -102.497512,51.224803
28	Asset	Prairieville		PVC Sewer Pipe	10029	LINESTRING(51.227227 -102.497509,51.226333
29	Asset	Prairieville		PVC Sewer Pipe		
30	Asset	Prairieville		PVC Sewer Pipe		
31	Asset	Prairieville		PVC Sewer Pipe		
32	Asset	Prairieville		PVC Sewer Pipe		
33	Asset	Prairieville		PVC Sewer Pipe		
34	Asset	Prairieville		PVC Sewer Pipe		
35	Asset	Prairieville		PVC Sewer Pipe		
36	Asset	Prairieville		PVC Sewer Pipe		
37	Asset	Prairieville		PVC Sewer Pipe		
38	Asset	Prairieville		PVC Sewer Pipe		
39	Asset	Prairieville		PVC Sewer Pipe		
40	Asset	Prairieville		PVC Sewer Pipe		
41	Asset	Prairieville		PVC Sewer Pipe		
42	Asset	Prairieville		PVC Sewer Pipe		
43	Asset	Prairieville		PVC Sewer Pipe		
44	Asset	Prairieville		PVC Sewer Pipe		
45	Asset	Prairieville		PVC Sewer Pipe		
46	Asset	Prairieville		PVC Sewer Pipe		
47	Asset	Prairieville		PVC Sewer Pipe		

PVC Sewer Pipe - PVC Sewer Pipe

Asset ID	10018
Category	Public Works
Manufacturer	
Model	
PM's	0
SR's	0
Projects	0

No Picture

10018

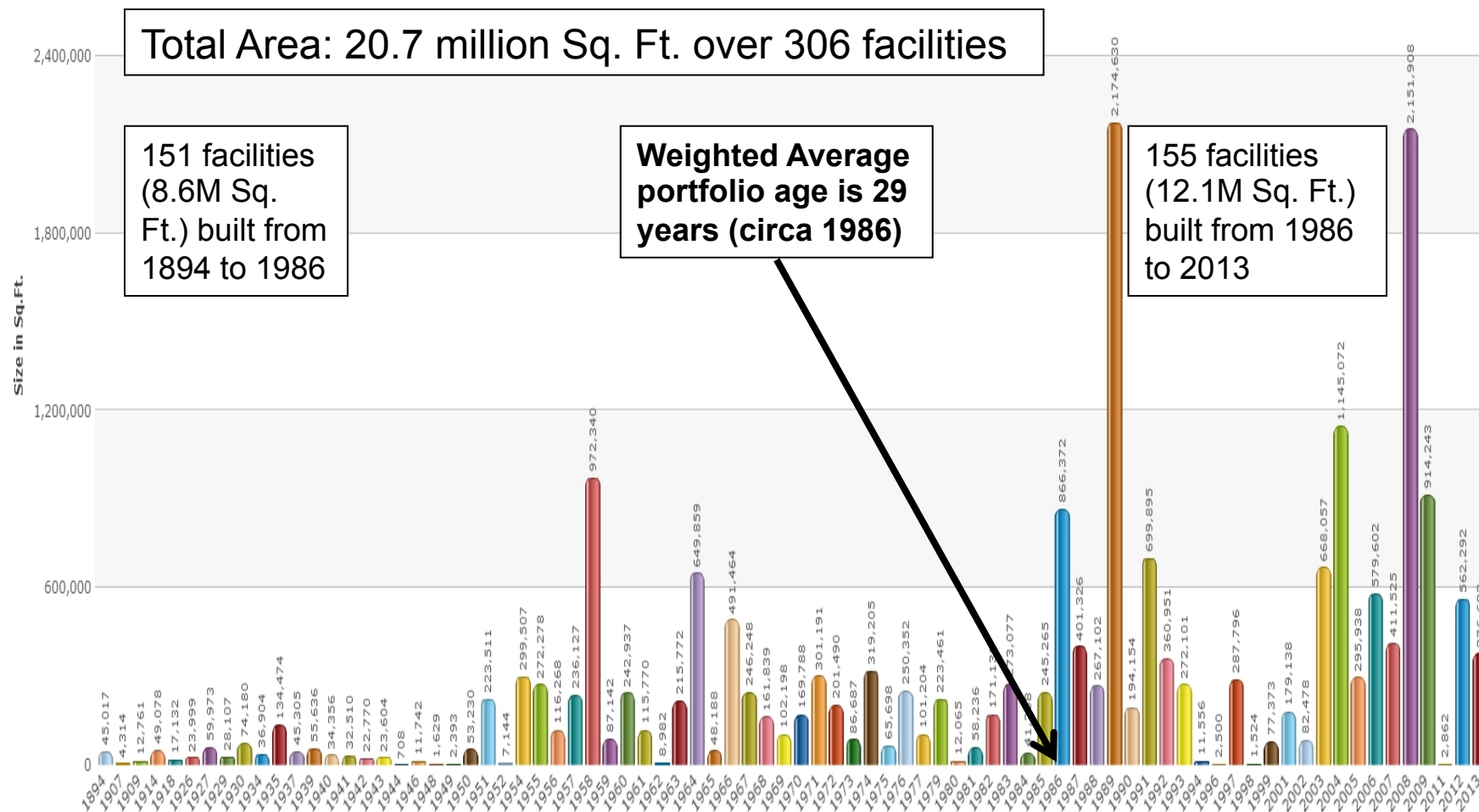
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CASE STUDY

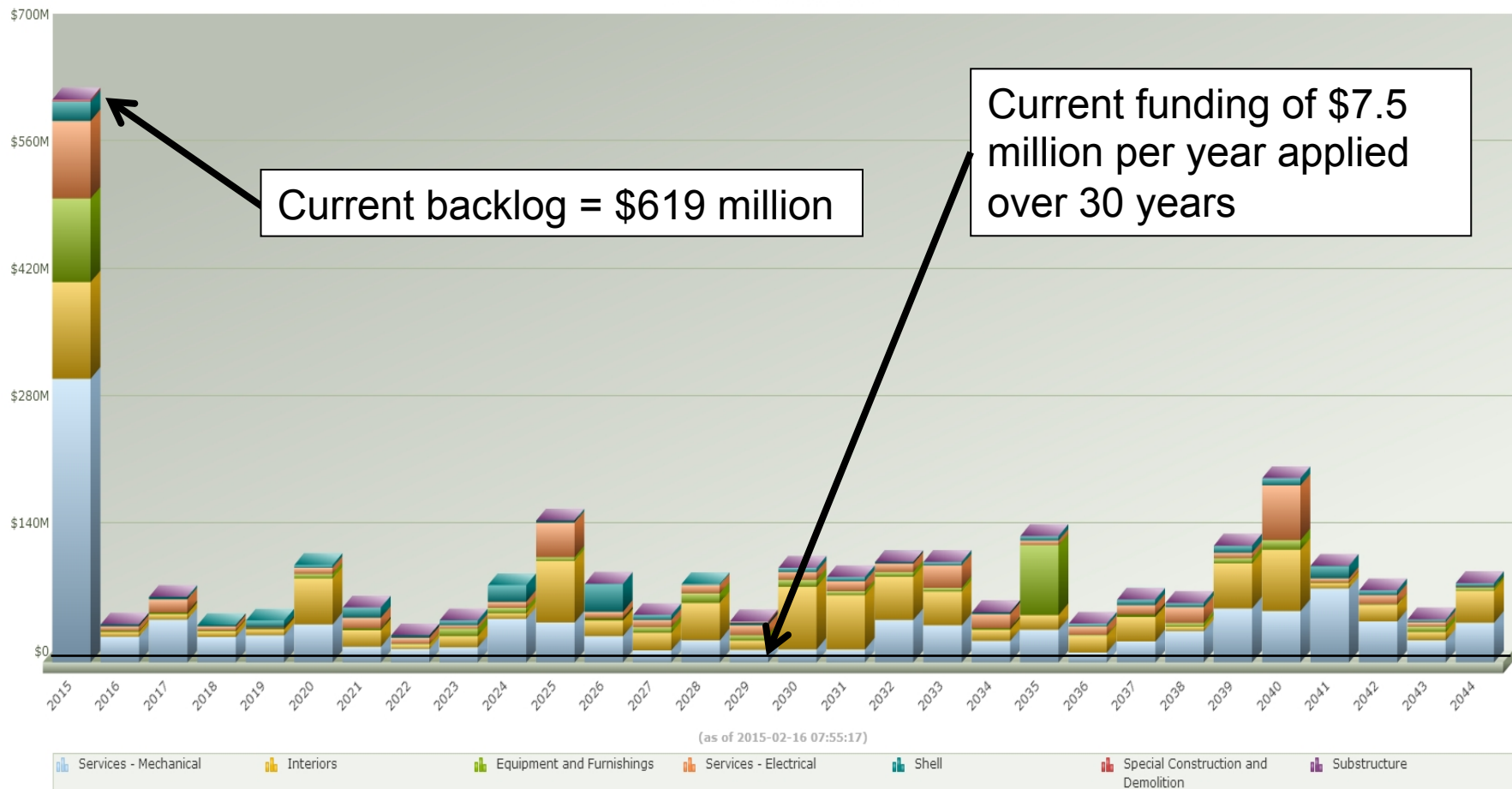
Asset Sustainability - Needs Analysis

Arizona State University *Campus Overview*

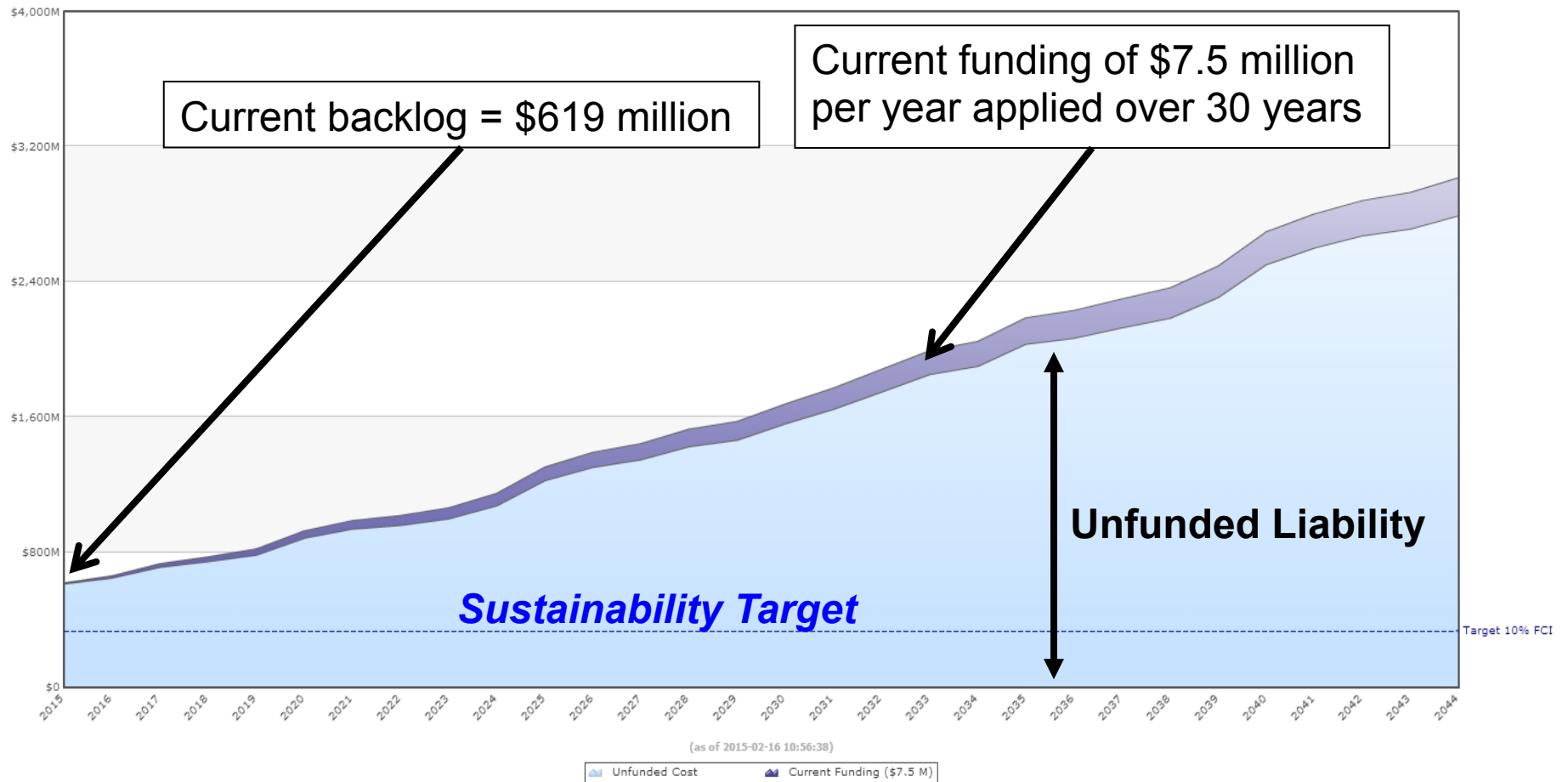
Portfolio Age Profile



Costs by Discipline Profile



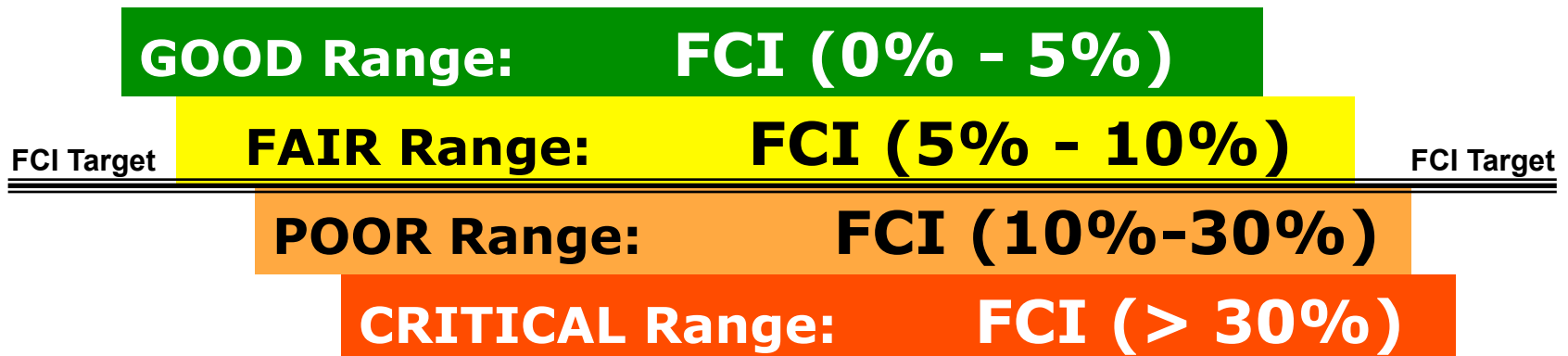
Sustainability Target



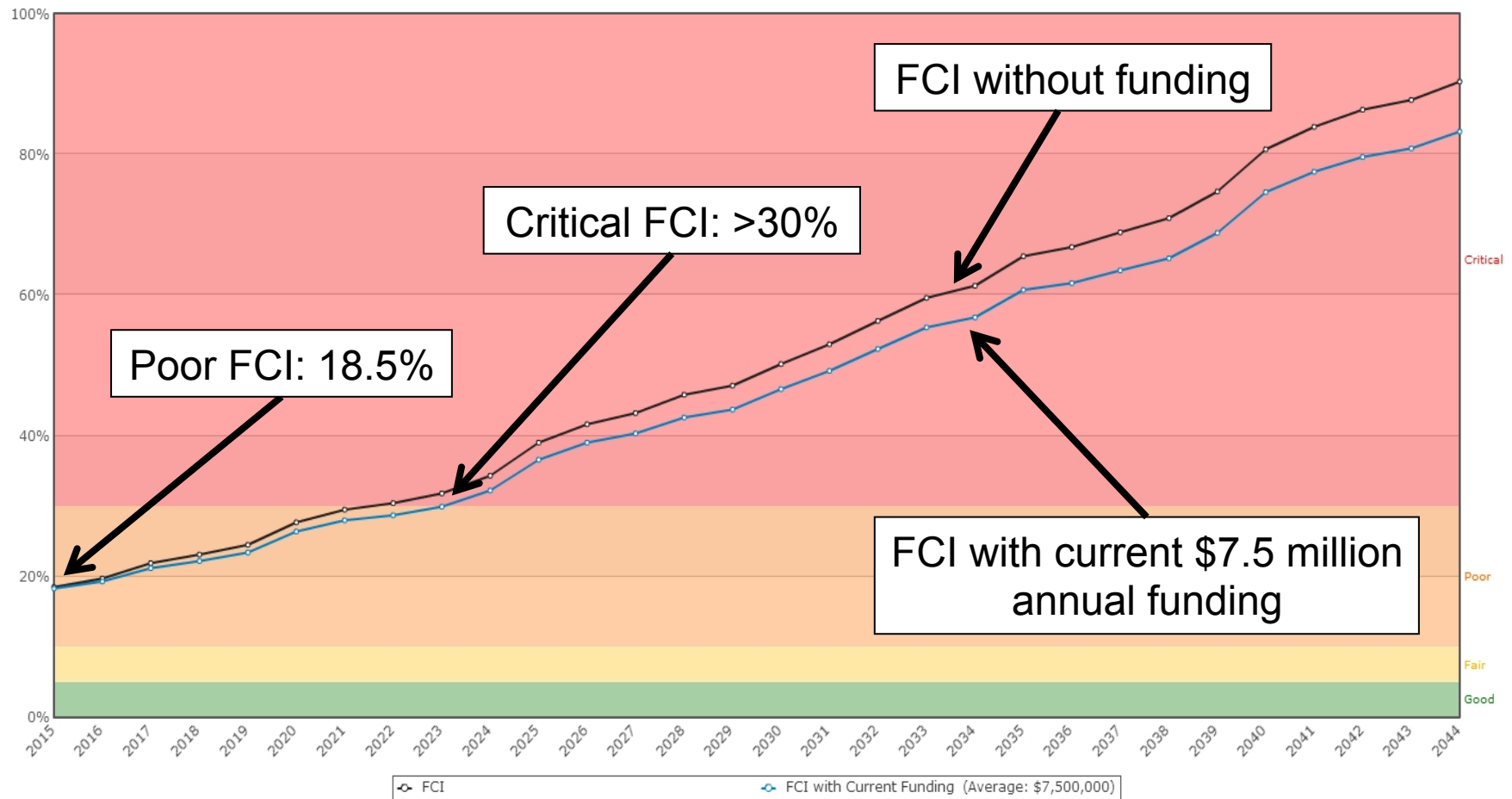
Facility Condition Index (FCI)

Industry Standard Used to Track Deferred
Replacements/Repairs of Facilities / Portfolios:

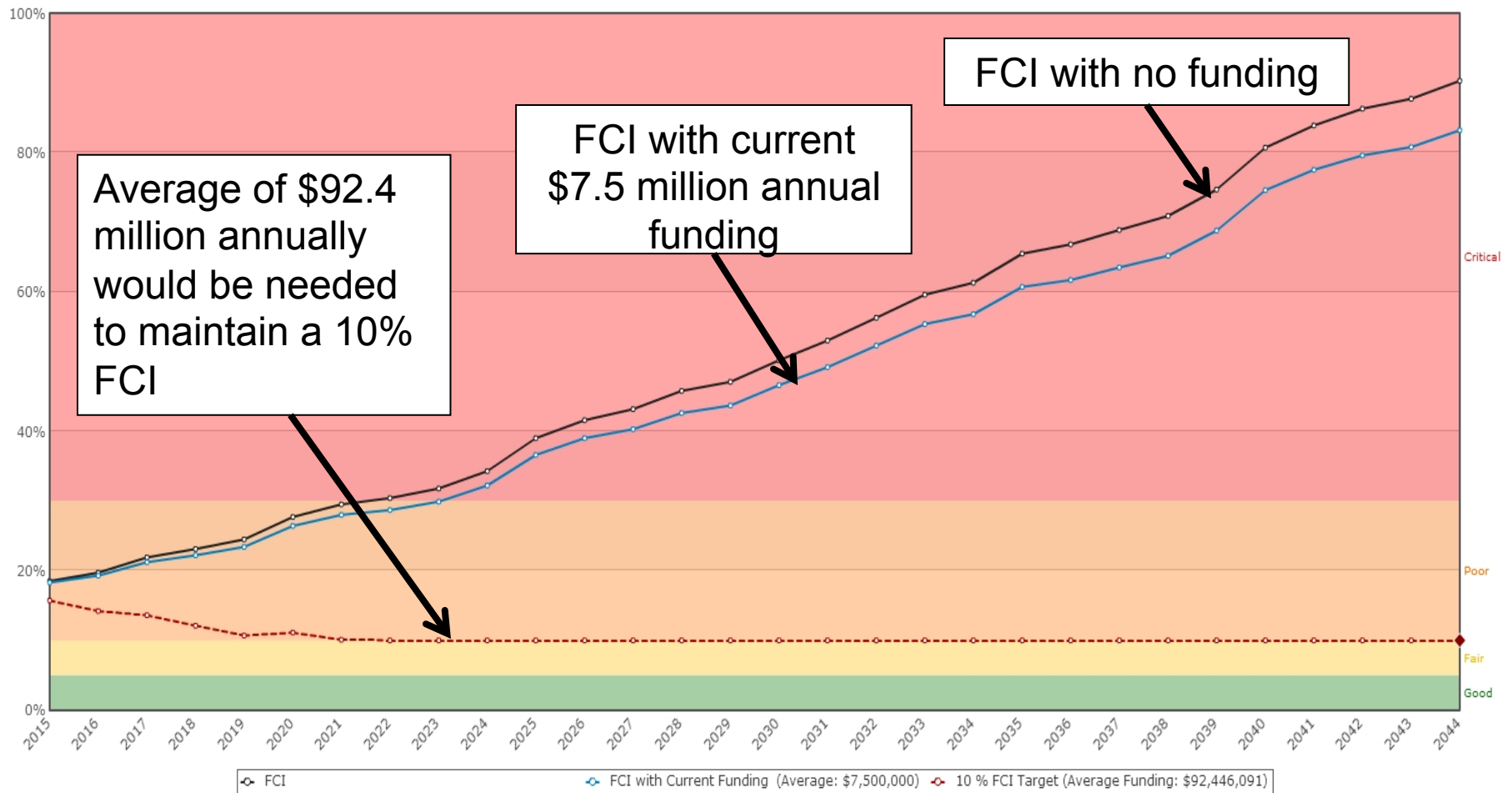
$$\text{FCI} = \frac{\text{Renewal and Repair Costs}}{\text{Replacement Cost}}$$



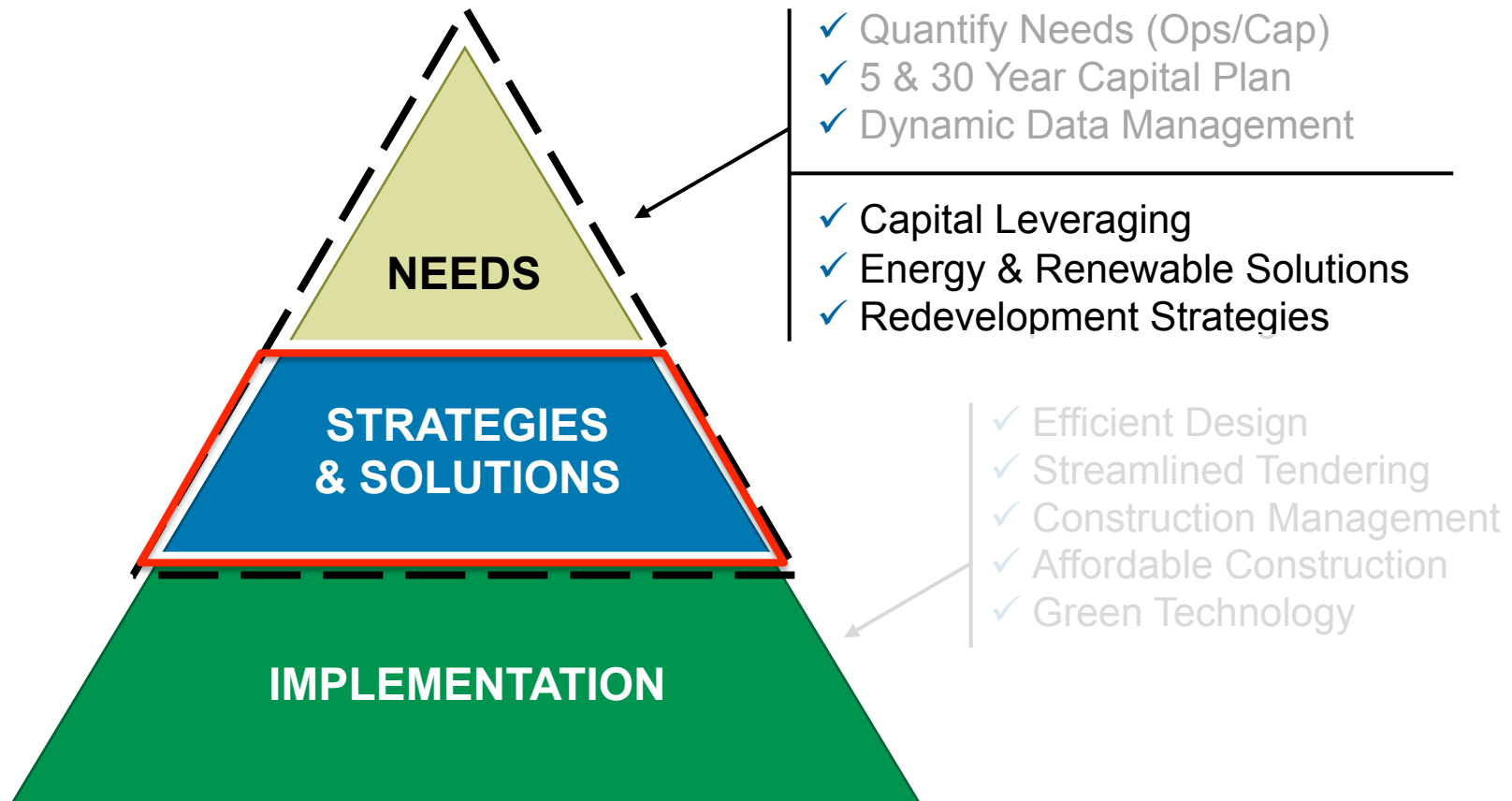
Facility Condition Index Profile



Funding Levels to Reach FCI Targets



Asset Optimization



Strategies / Solutions

Establish Renewal “Reduction” Strategies to Reduce Risk and Capital Renewal Liabilities

- Establish strategies that reduce renewal liability
- Present full range of fully leveraged & bundled solutions
combining capital creation strategies with operational savings
- Create effective business plan
- Develop communication plan

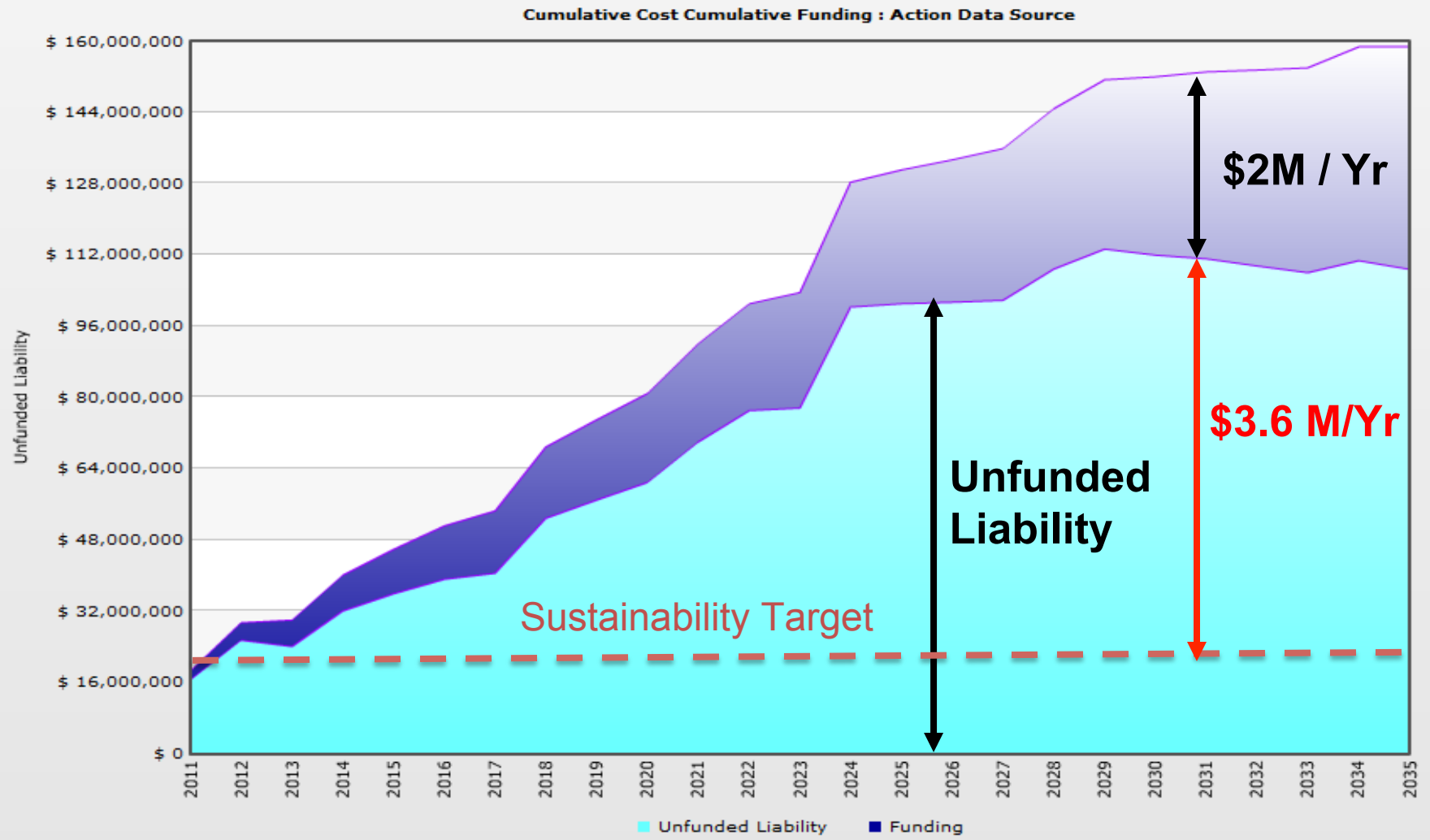
Capital Creation Strategies

Leveraged and Bundled *Capital Creation Strategies*TM:

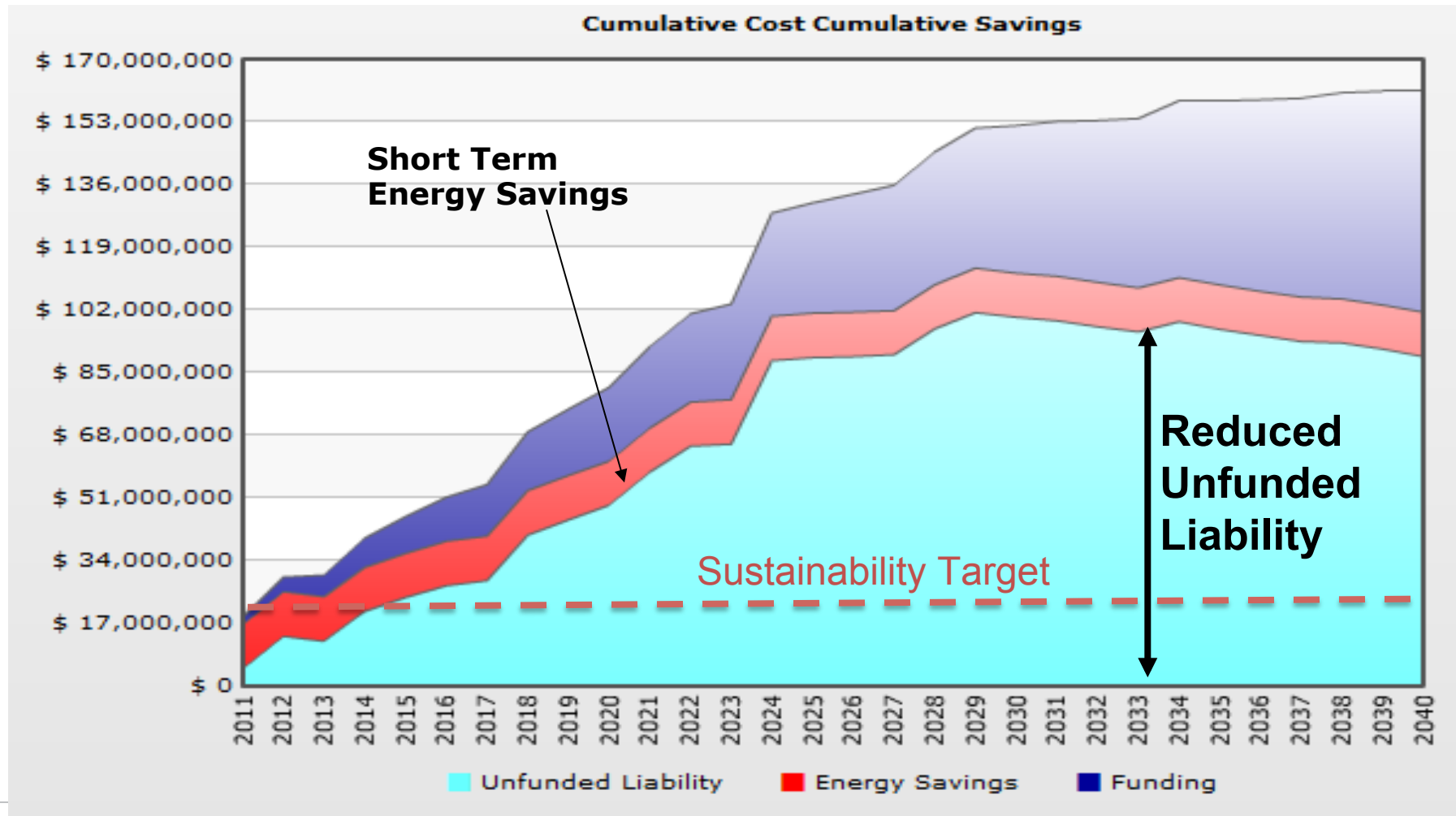
- ✓ Energy Conservation
- ✓ Deep Retrofits
- ✓ Renewable Solutions
- ✓ Maintenance Optimization
- ✓ Consolidation Strategies
- ✓ Redevelopment Strategies:
 - New Infrastructure
 - Existing Infrastructure



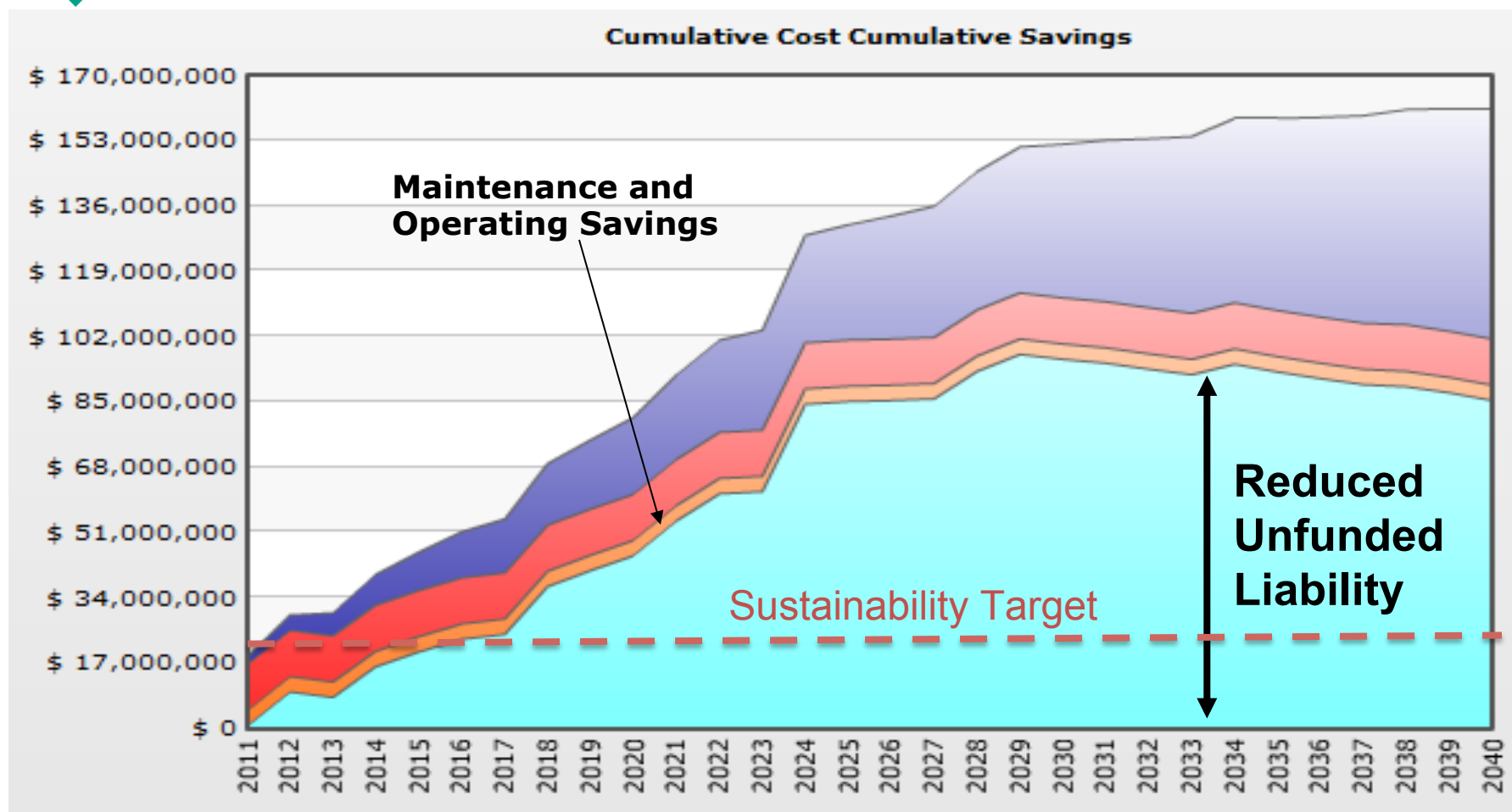
Projected Unfunded Liability



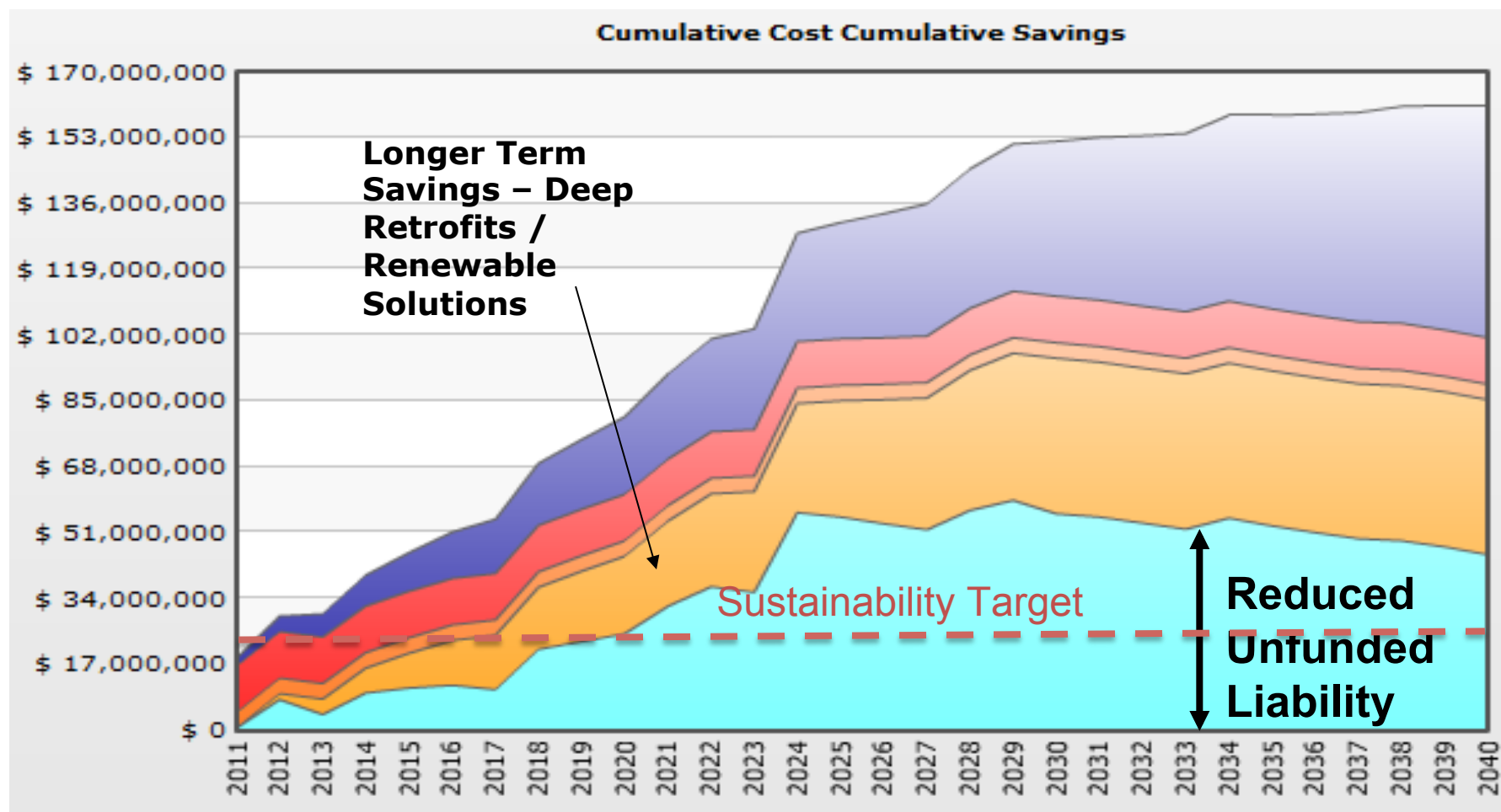
Capital Creation Strategy



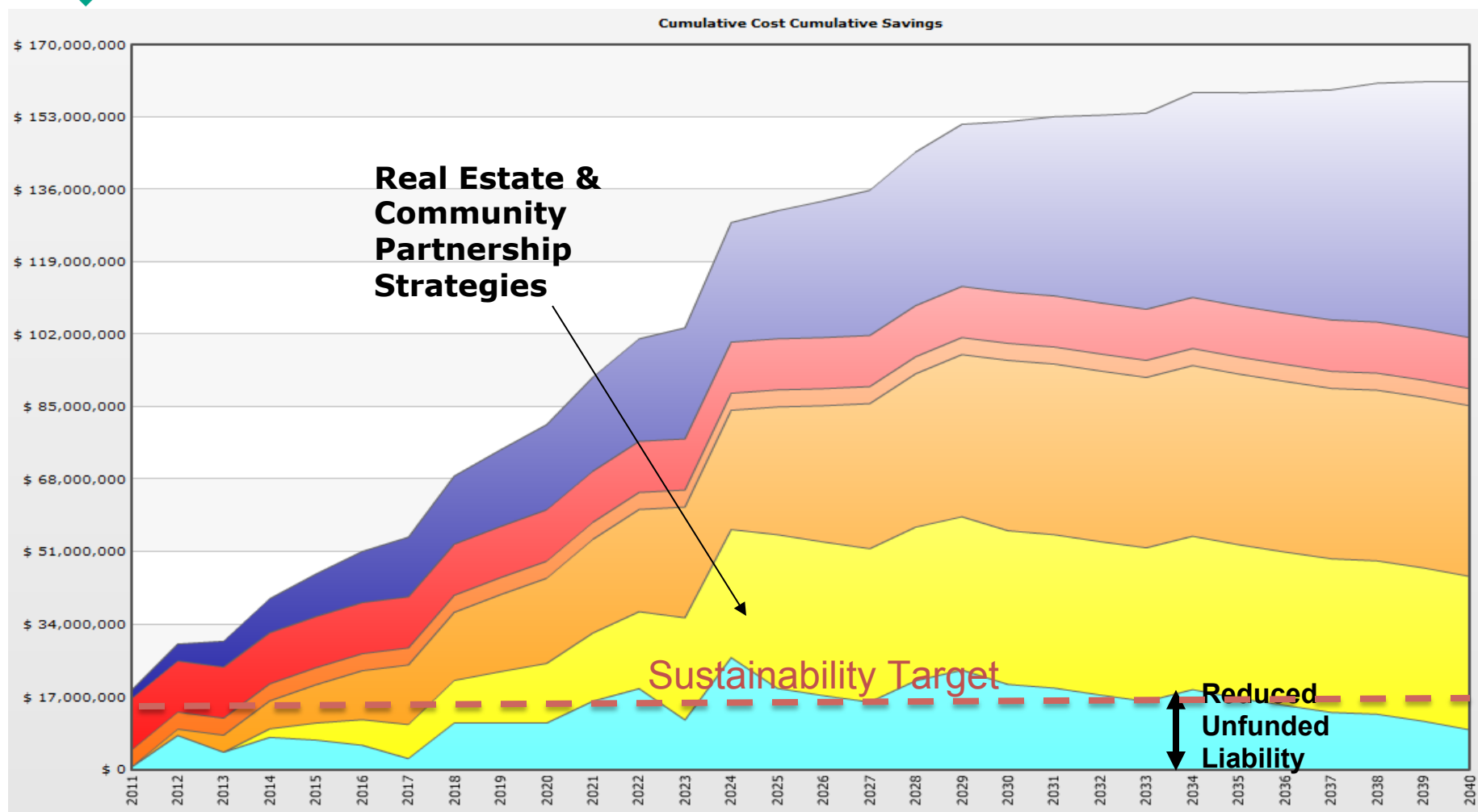
Capital Creation Strategy



Capital Creation Strategy

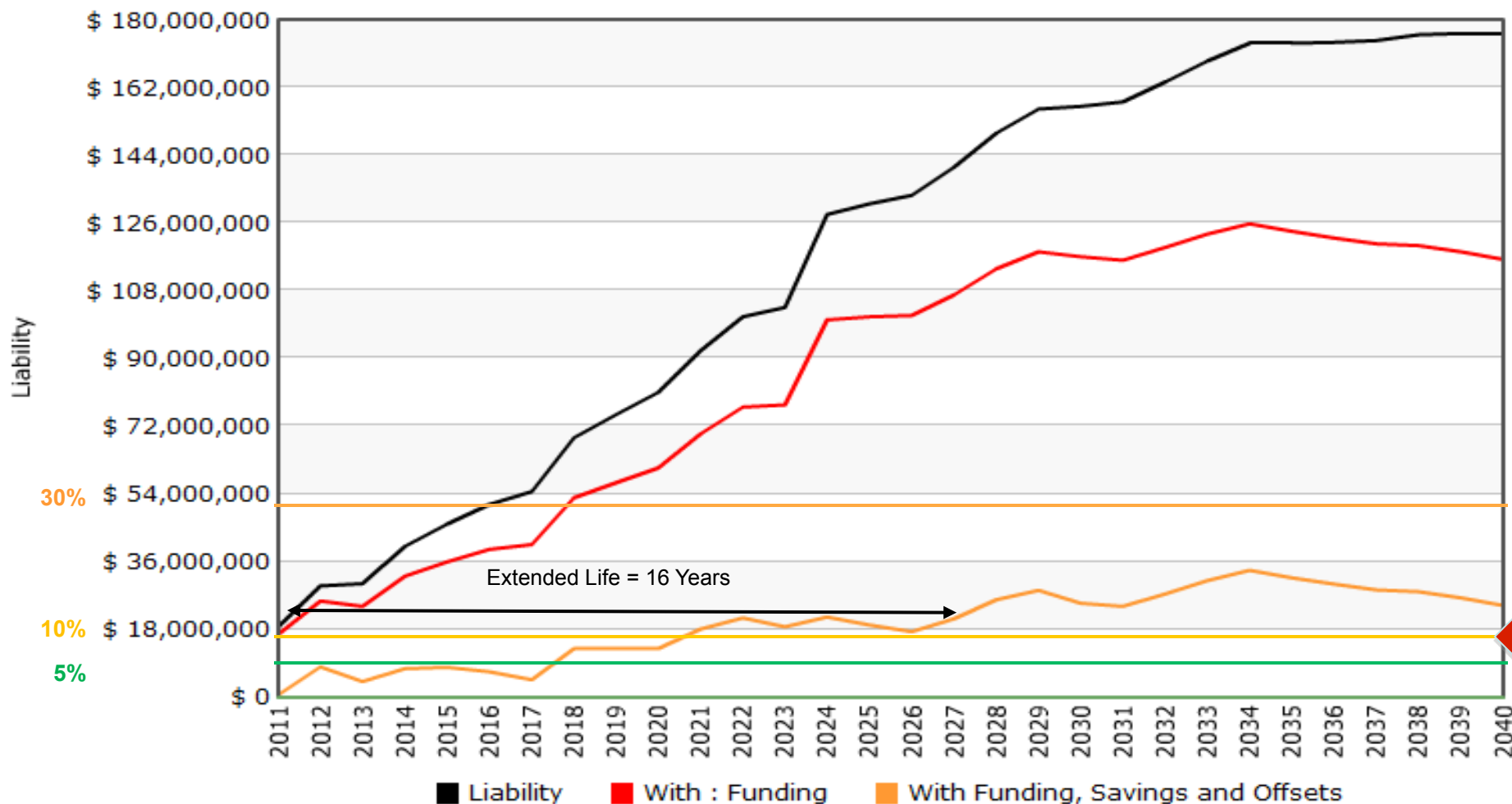


Capital Creation Strategy



FCI Reduction Strategy

Cumulative FCI - Savings/Offsets

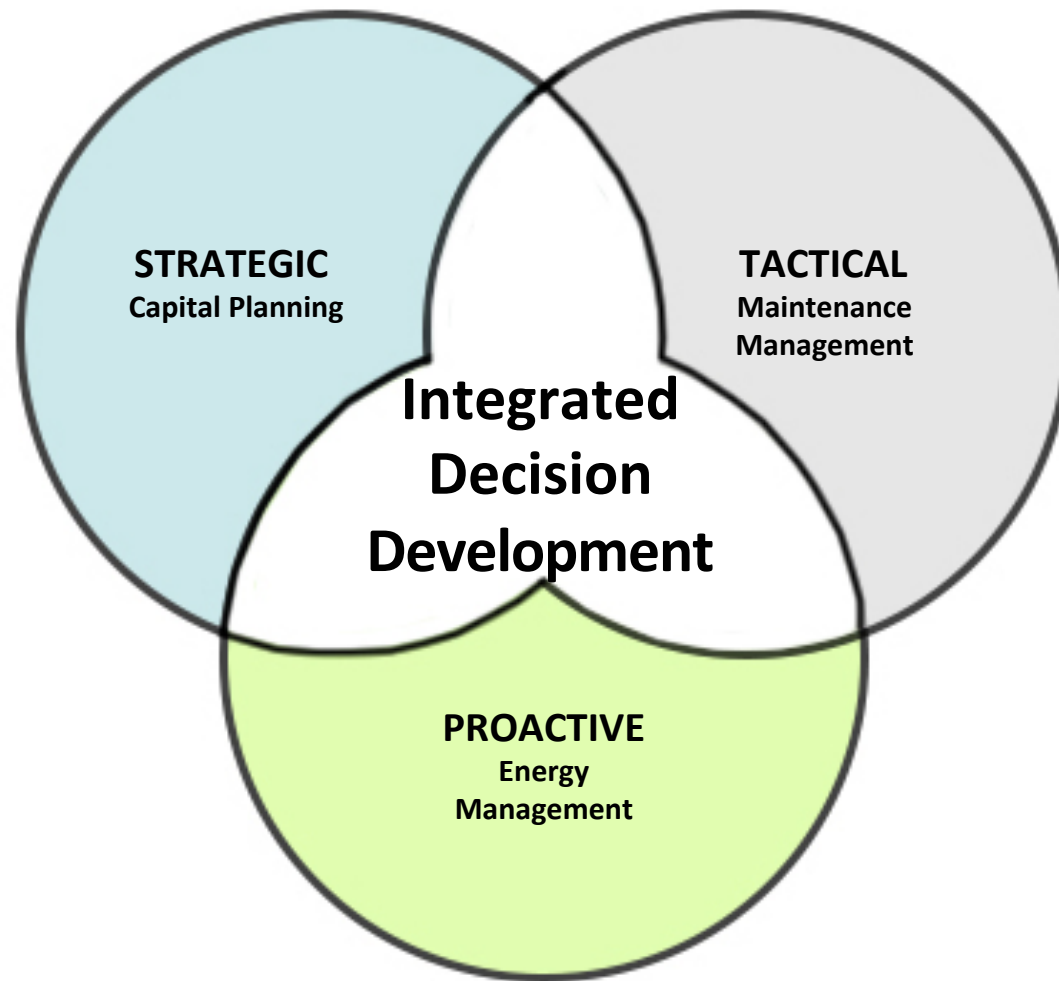


Strategic Outcomes

Outcomes Enhancing “Quality of Community and Living”

1. Understanding and quantifying capital replacement needs
2. Holistic Asset Class Prioritization
3. Establish Strategies to Create Capital
4. Enhanced decision making framework utilizing best practices
5. Enhanced asset value and level of service
6. Asset sustainability targets
7. On-going measurement – continuous and dynamic

Holistic Portfolio Planning





Asset Sustainability Capital Creation Strategies

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