Addressing Deferred Maintenance with Advanced Facility Condition Assessments at the University of Arizona

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Rocky Mountain APPA 2018 Conference

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RMA
Networking. Mentorship. Professional Development.

UA Campus Overview

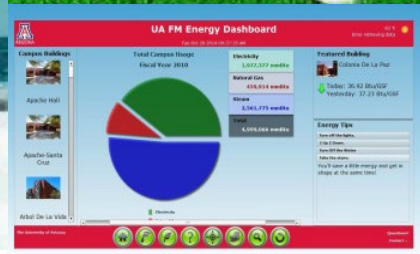
- +43,000 students
- 11 million sq ft
- +267 buildings
- 600 facilities staff
- 3 central plants
- 22 chillers
- 2 turbines
- 33% electricity produced onsite
- 300 storage tanks ice storage

THE UNIVERSITY OF ARIZONA

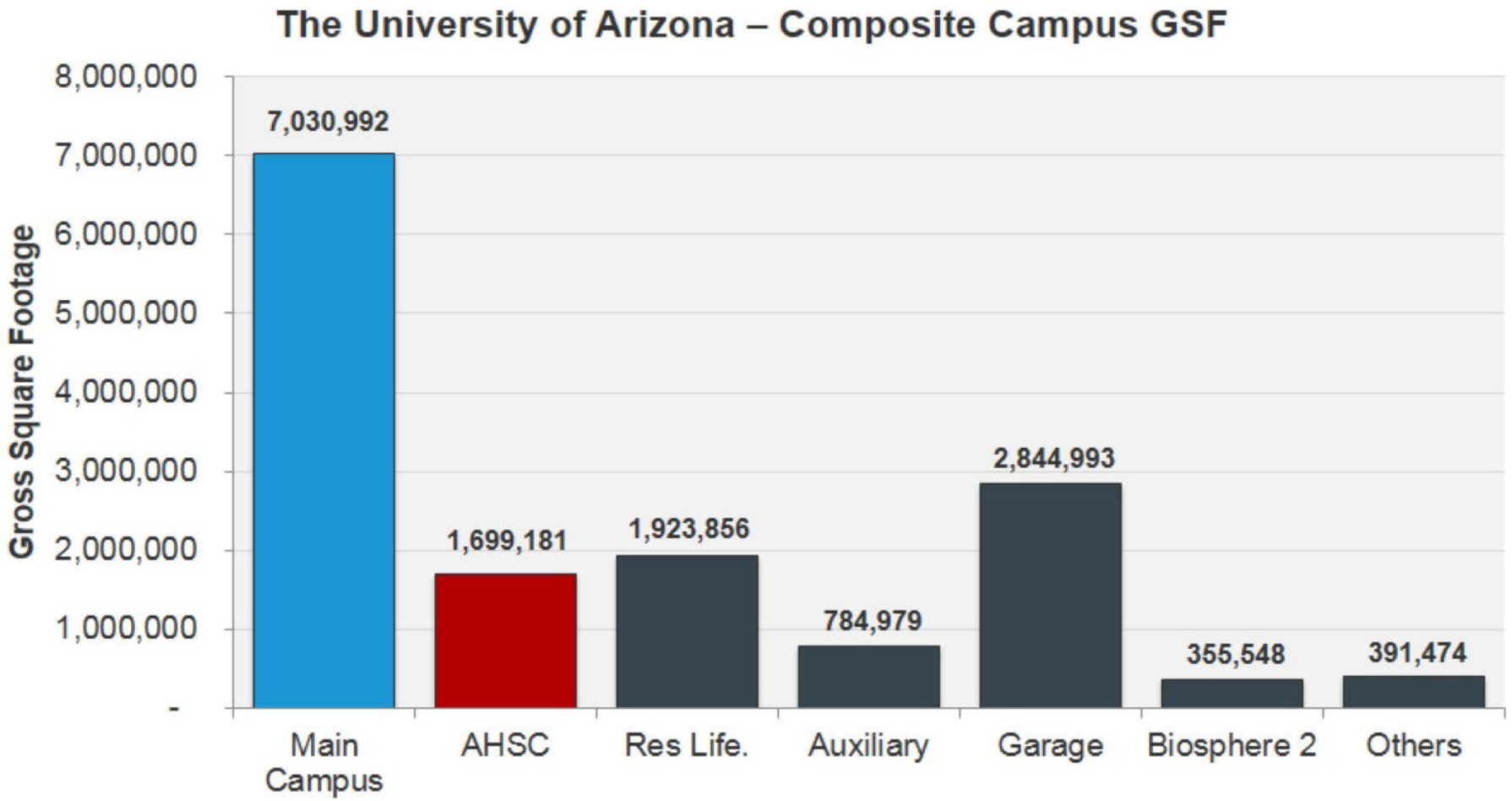
The University of Arizona
Facilities Management Department

NEVER SETTLE

The plan for the University of Arizona

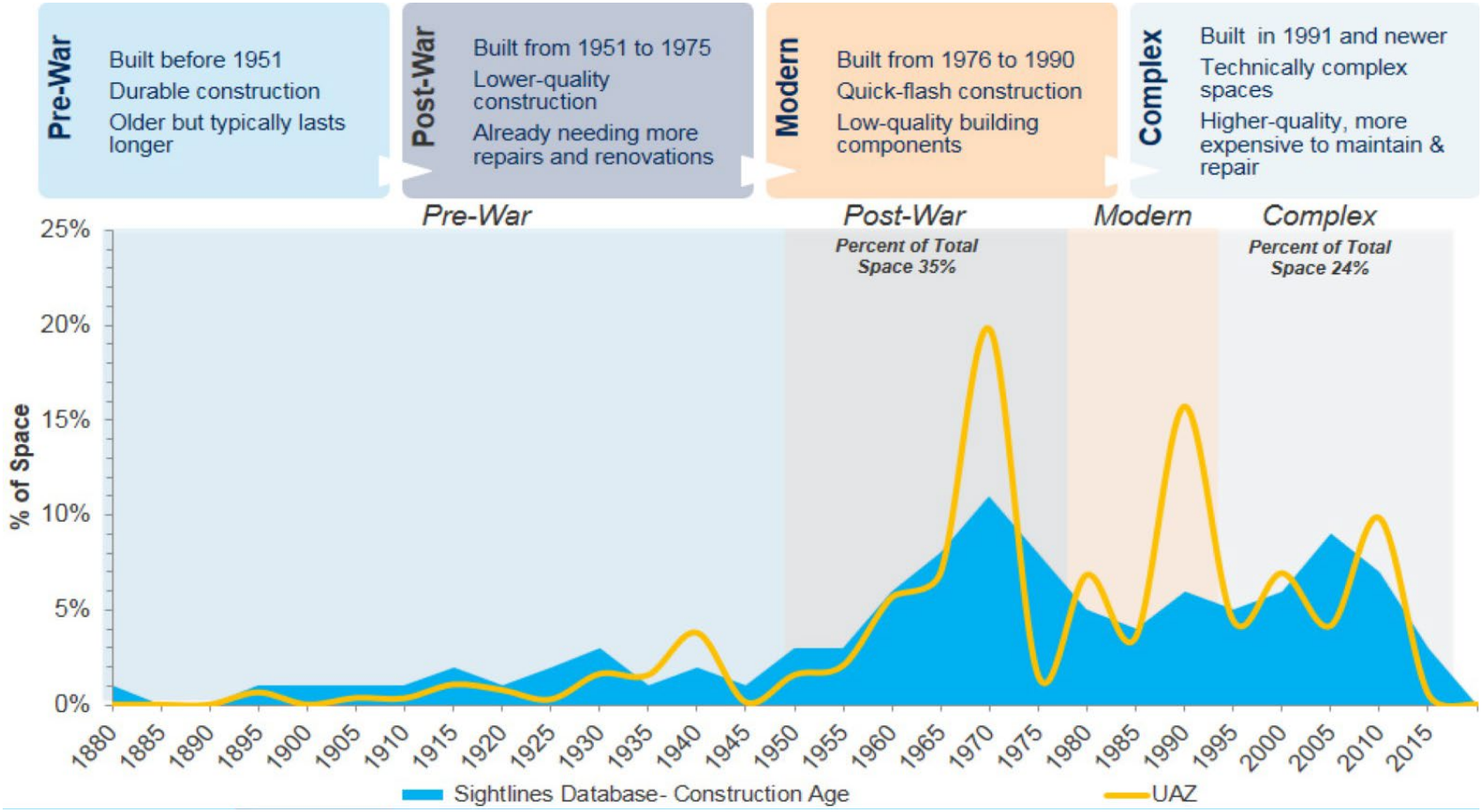


The University of Arizona Space Profile



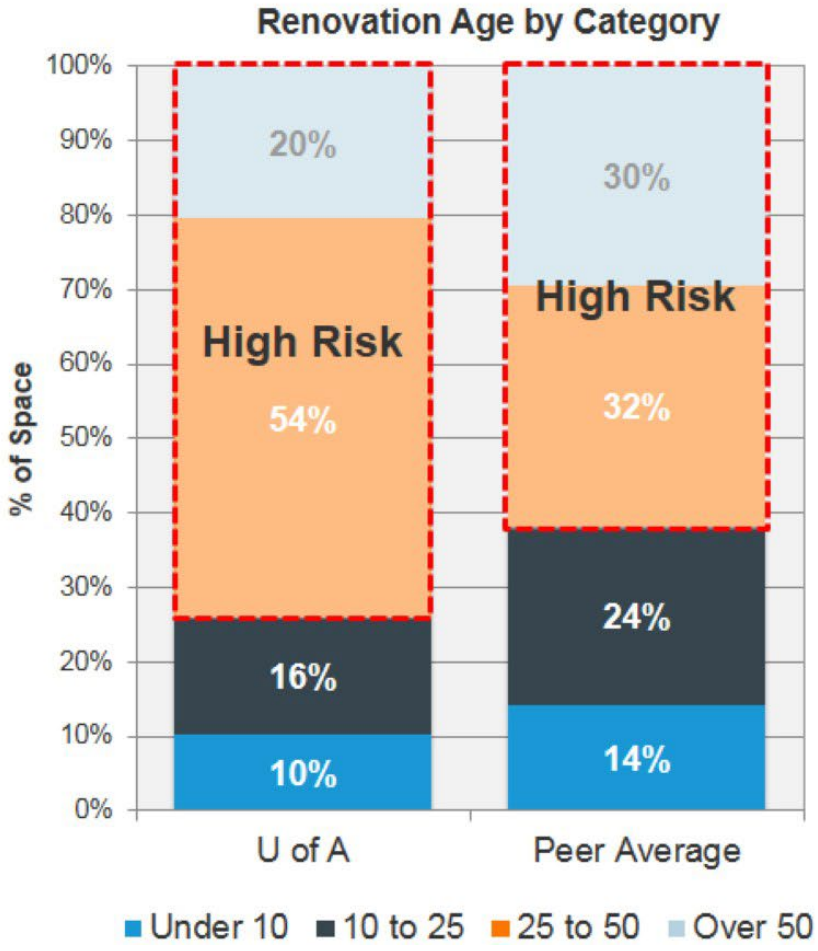
Putting Your Campus Building Age in Context

The campus age drives the overall risk profile



Campus Age Profile

Impacts of concentrated age profile



Buildings over 50

Life cycles of major building components are past due. Failures are possible. Core modernization cycles are missed.

Highest risk

Buildings 25 to 50

Major envelope and mechanical life cycles come due. Functional obsolescence prevalent.

Higher Risk

Buildings 10 to 25

Short life-cycle needs; primarily space renewal.

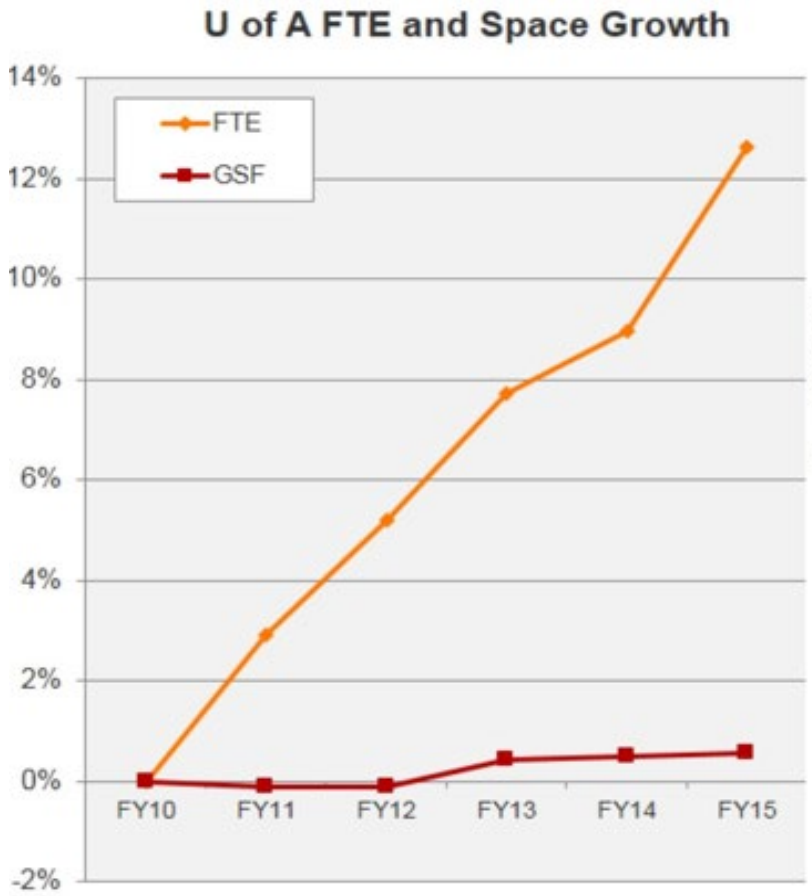
Medium Risk

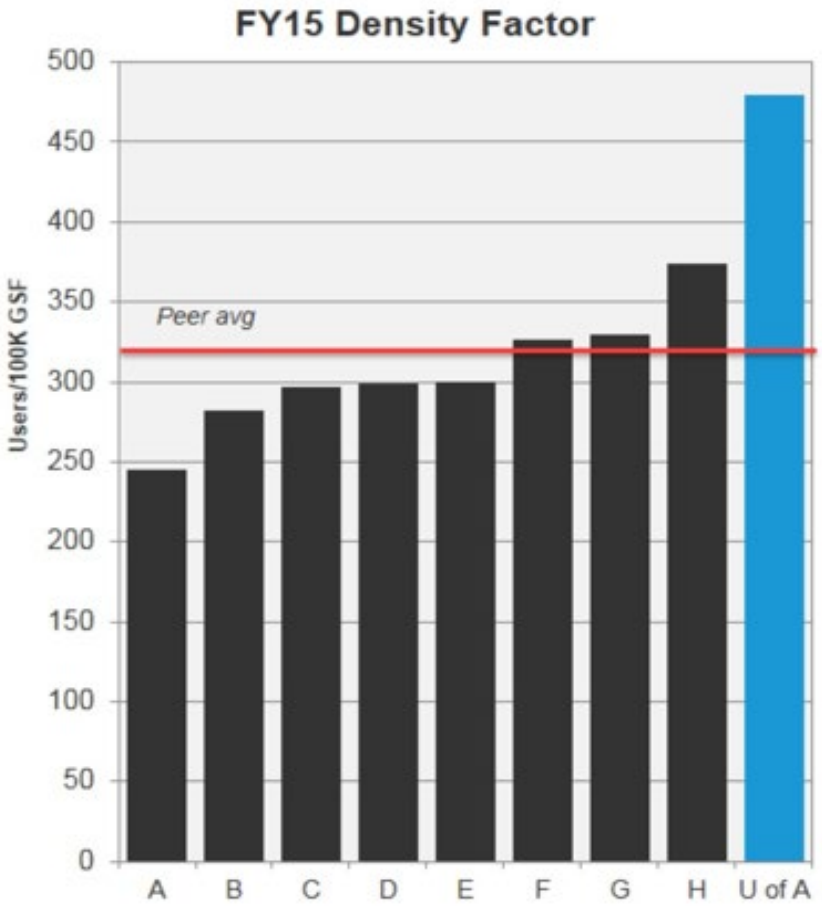
Buildings Under 10

Little work. "Honeymoon" period.

Low Risk

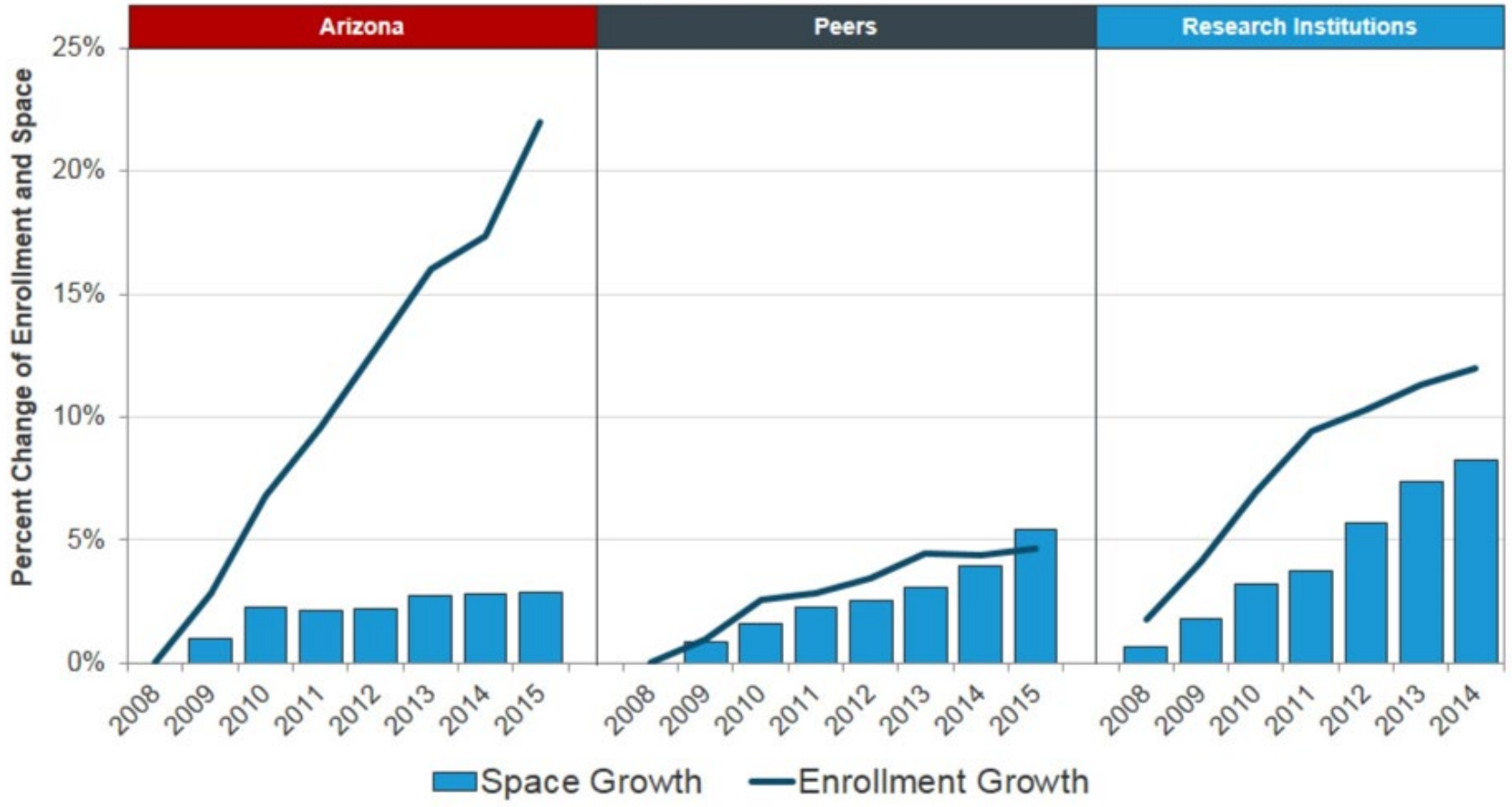
With More Users, Density Increases





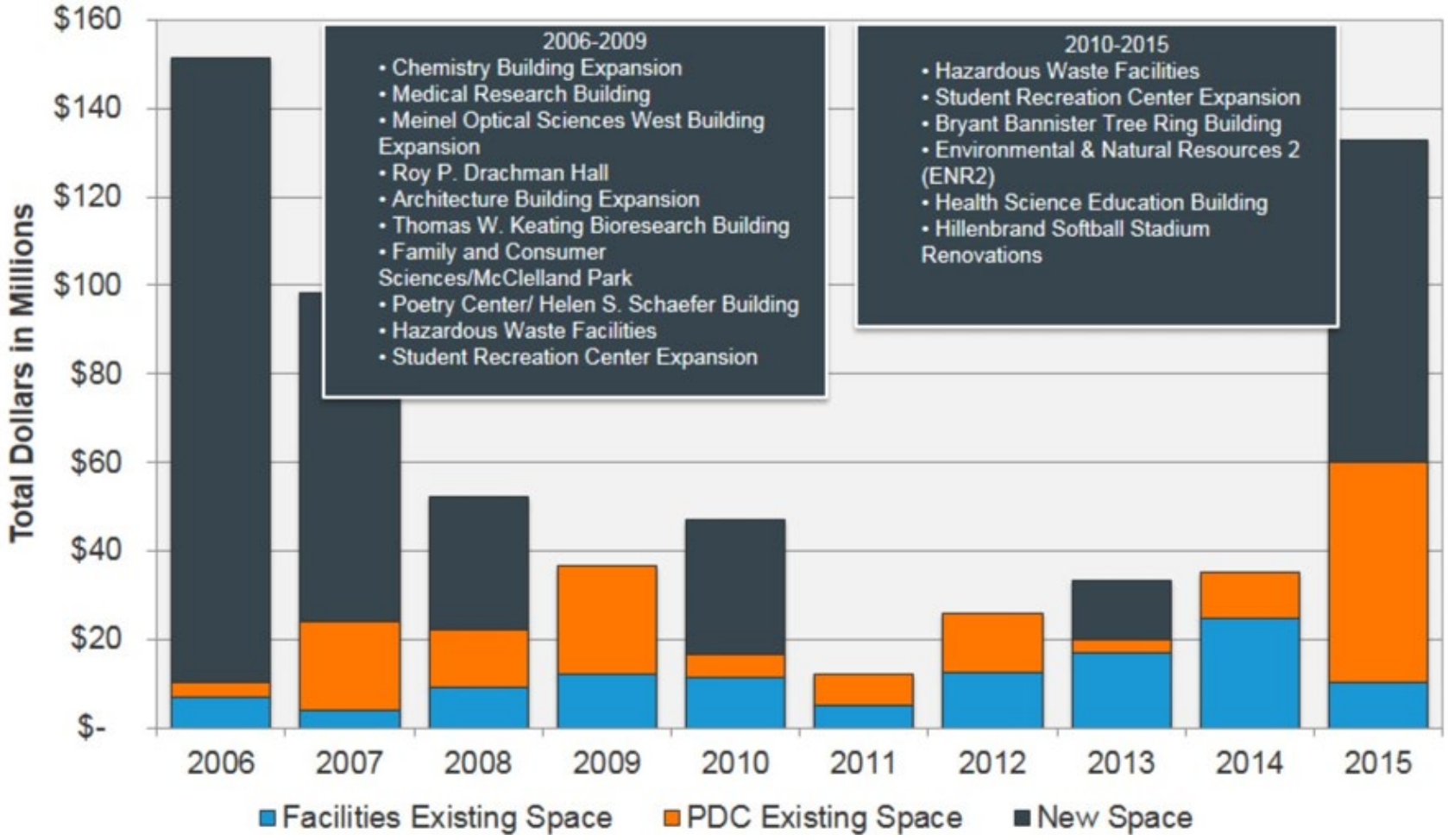
Campus Space and Enrollment

U of A's student population growing at faster pace than peers



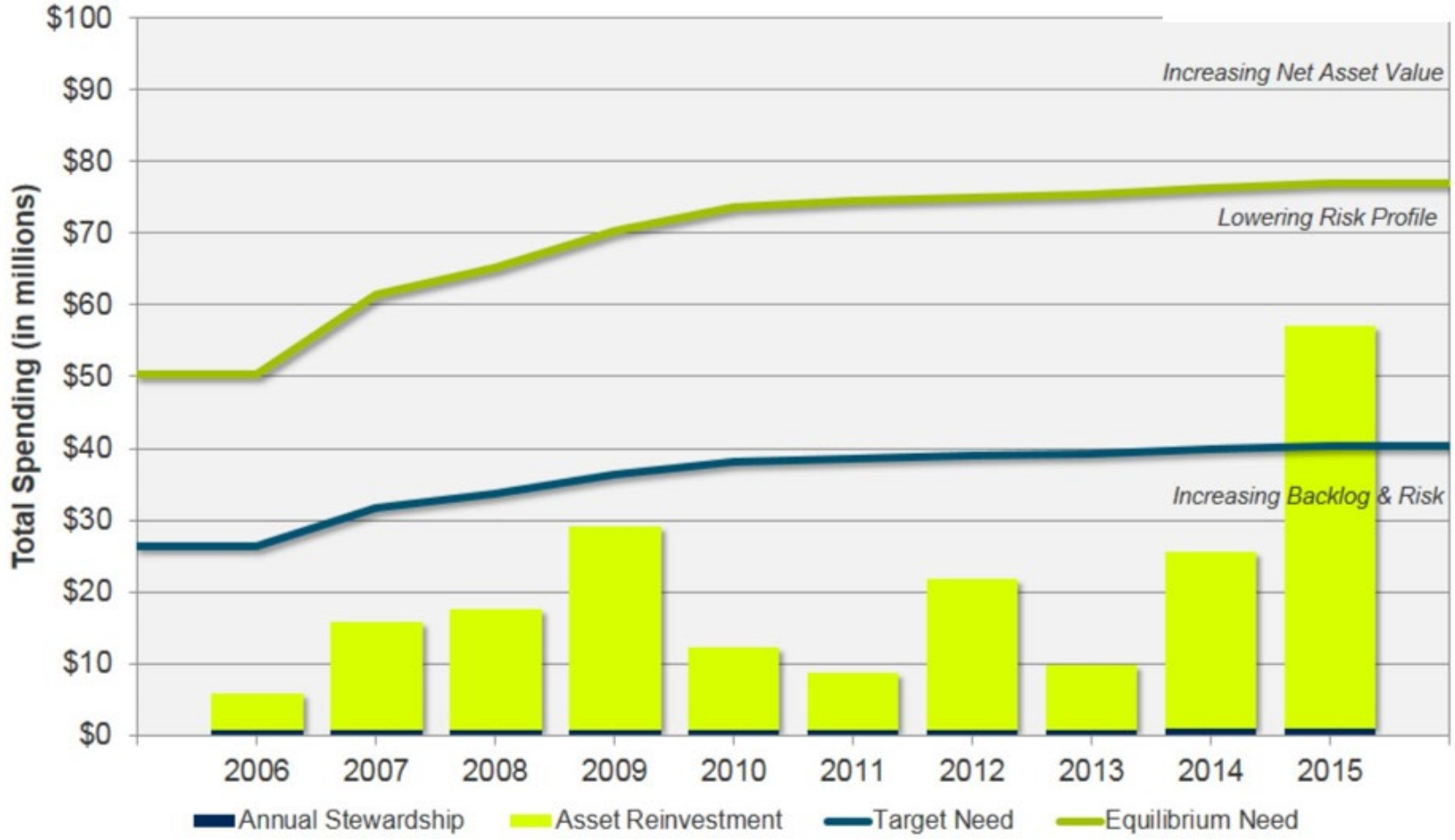
Total Project Spending

Composite



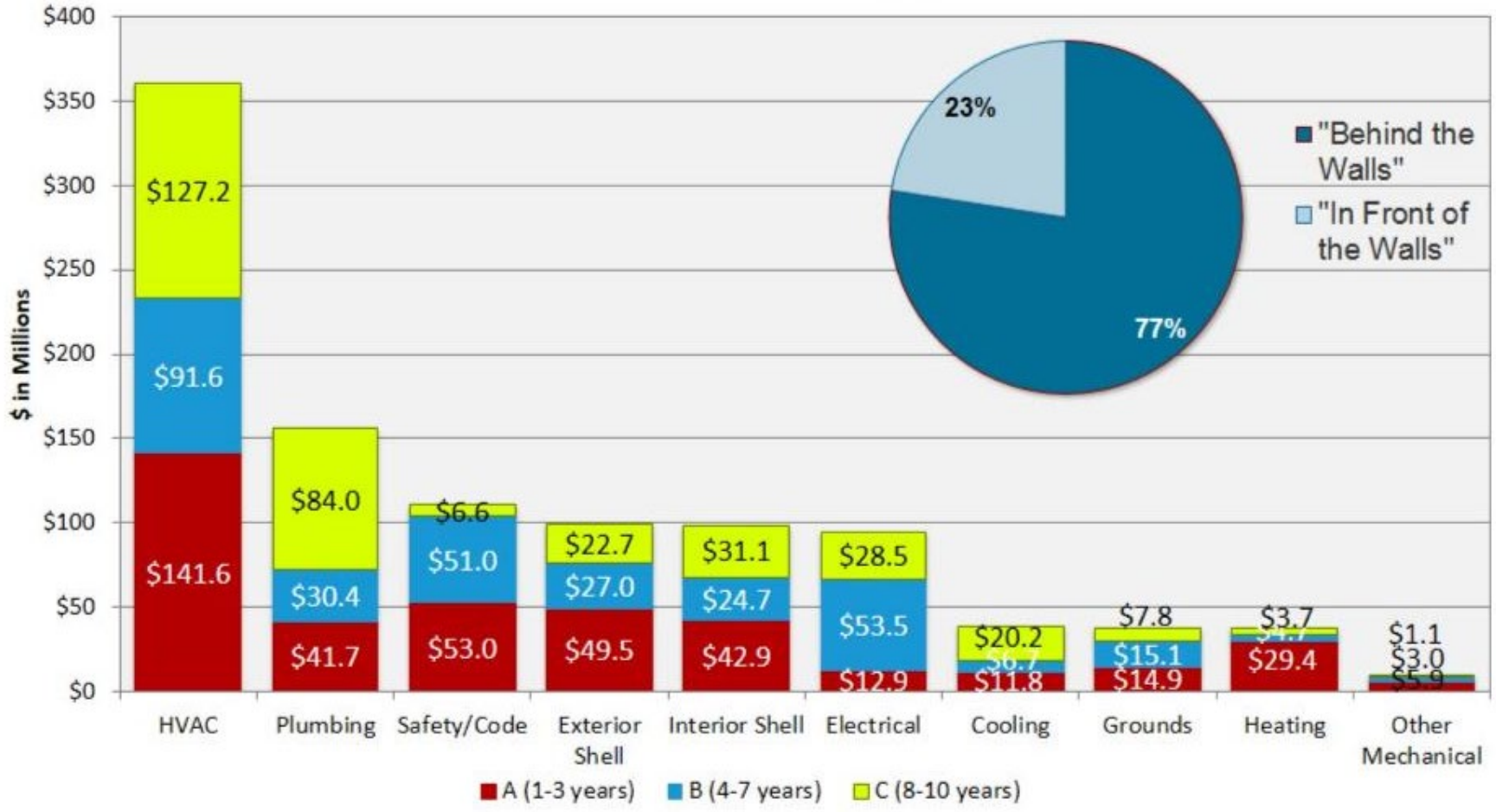
Lack of Capital Leads to Increasing Needs

Meeting target need with one-time capital



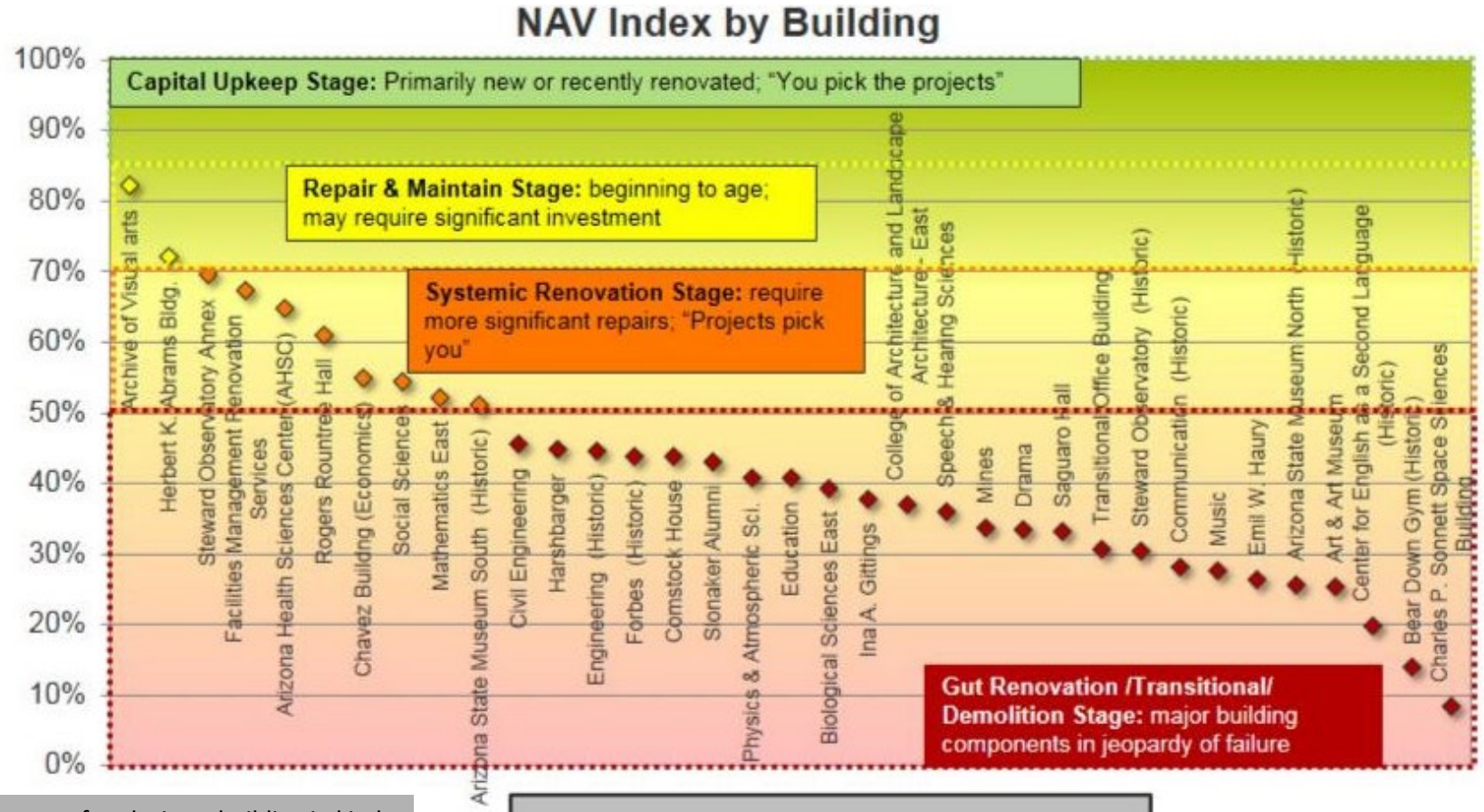
Identified Needs by System - $1.04B

Timeframes A, B, & C only – excluding new construction



Net Asset Value

Buildings over 50 years old; average NAV of 42%



Replacement Value: the cost of replacing a building in kind. Influenced by building function and technical complexity.
Building Needs: identified backlog of critical needs and upcoming 10 year lifecycle needs.

$$\text{NAV Index} = \frac{\text{(Replacement Value-Building Needs)}}{\text{Replacement Value}} \times 100$$

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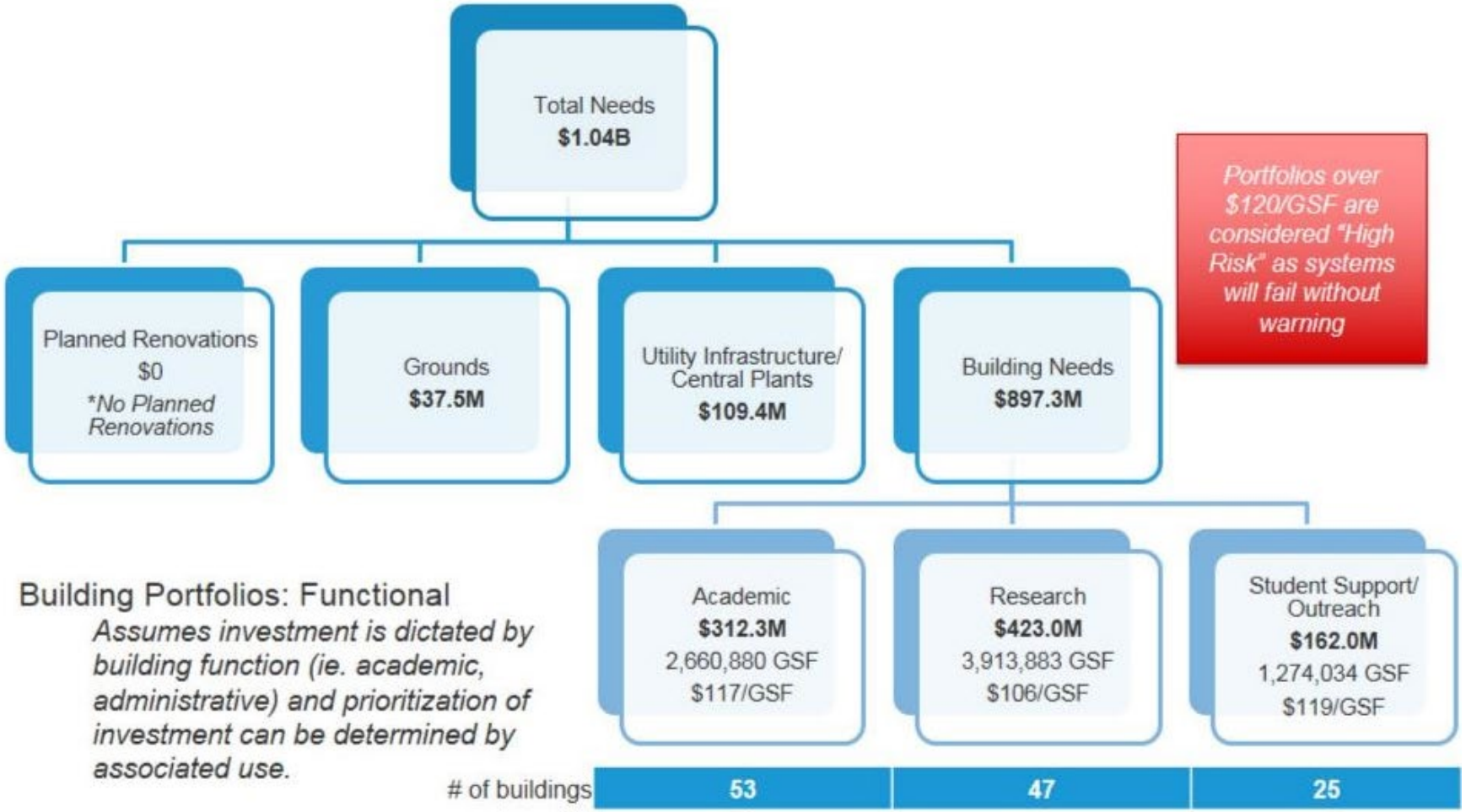
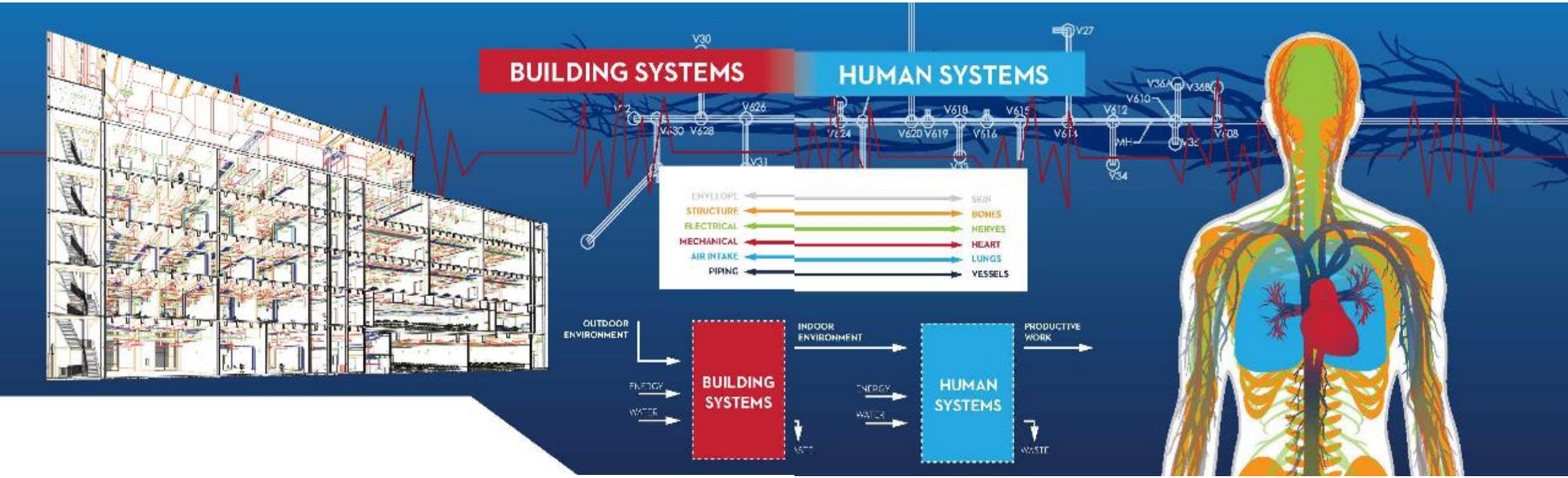
Building Portfolios



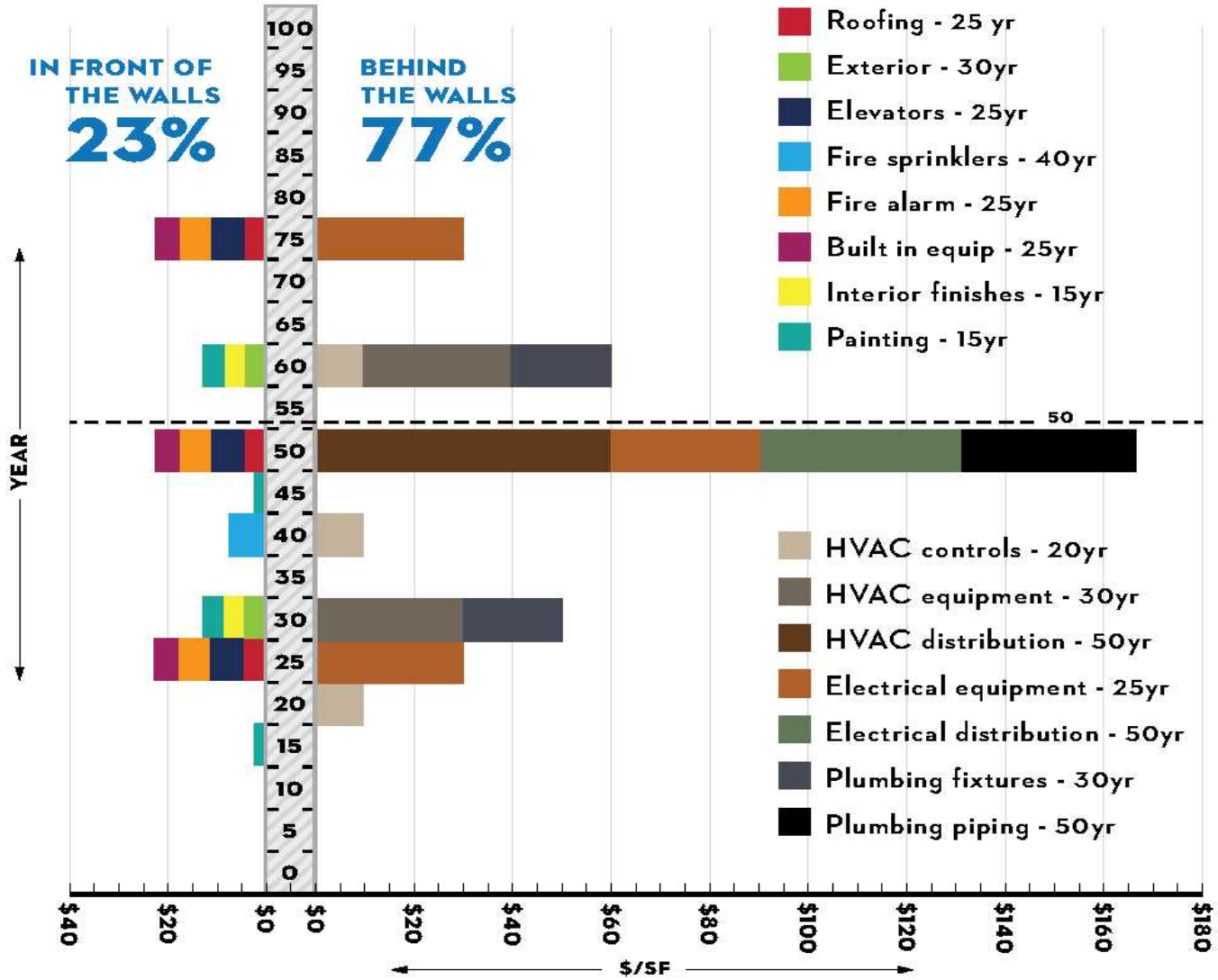
Building Portfolios: Functional

Assumes investment is dictated by building function (ie. academic, administrative) and prioritization of investment can be determined by associated use.

Two Systems: Buildings and Humans



Life Cycles and Periodic Renewal Costs of Building Systems



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Indoor Health Issues

The effect of building health on the humans and human systems housed within is not insignificant.

Emerging research suggests long term exposure to very low concentrations of certain molds, allergens and other airborne contaminants may lead to sensitization, manifested in a broad spectrum of symptoms.

Occupants spend up to one third of their lives within the indoor environment.

Many of the symptoms associated with indoor air quality directly affect concentration and productivity.

Long term effects of temperature, humidity, pressure, noise, vibration, particulates and airborne contaminants may have direct and indirect consequences on individual health.

Buildings are communities where the knowledge, perception and concern of individuals becomes a part of the collective experience.

Indirect effects of indoor building health include recruitment, retention, productivity, and culture.

Detailed Facility Condition Assessment

When to Perform an FCA

- Aging building suffering from compounded deferred maintenance
- Increasing amounts of ongoing repairs
- Loss of functionality
- Health concerns from occupants

Goal of FCA

- Systematic identification of major deficiencies
- Generation of Building Renewal Roadmap
- Comprehensive building system assessment

FCA Analysis

- Assemble Project Task Force Team
- Weekly meetings / interview occupants
- Coordinate and work with building manager
- Room-by-room Architect / Engineer survey
- Airflow Testing
- Fire Safety / Emergency Egress assessment
- Structural assessment
- Building Envelope / evaluation of water infiltration
- Above-ceiling survey
- Camera survey of HVAC systems
- Terminal Unit dissection
- Ventilation assessment
- Laboratory testing of contaminants (CO, CO2, SO2, mold spores, airborne debris)
- Energy savings

Facility Condition Assessment Results

- Cracked concrete floors
- Antiquated cold rooms
- Envelope leakage
- Asbestos fireproofing
- Deteriorated insulation
- Duct leakage
- Constant volume air handlers
- Inefficient lab exhaust
- No energy recovery
- Low air changes
- Dirty ductwork
- Interior duct lining
- Exterior standing water
- Grading/site drainage issues
- Piping dead legs
- Industrial Hygienist results












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Detailed Facility Condition Assessment

Mold Testing/Results

- Mold is ubiquitous in nature
- No standards for testing
- No standards for acceptable levels
- Differing opinions among experts
- Differing sensitivity levels
- ASHRAE design guidelines (Standard 160)
- NYC Department of Health guidelines

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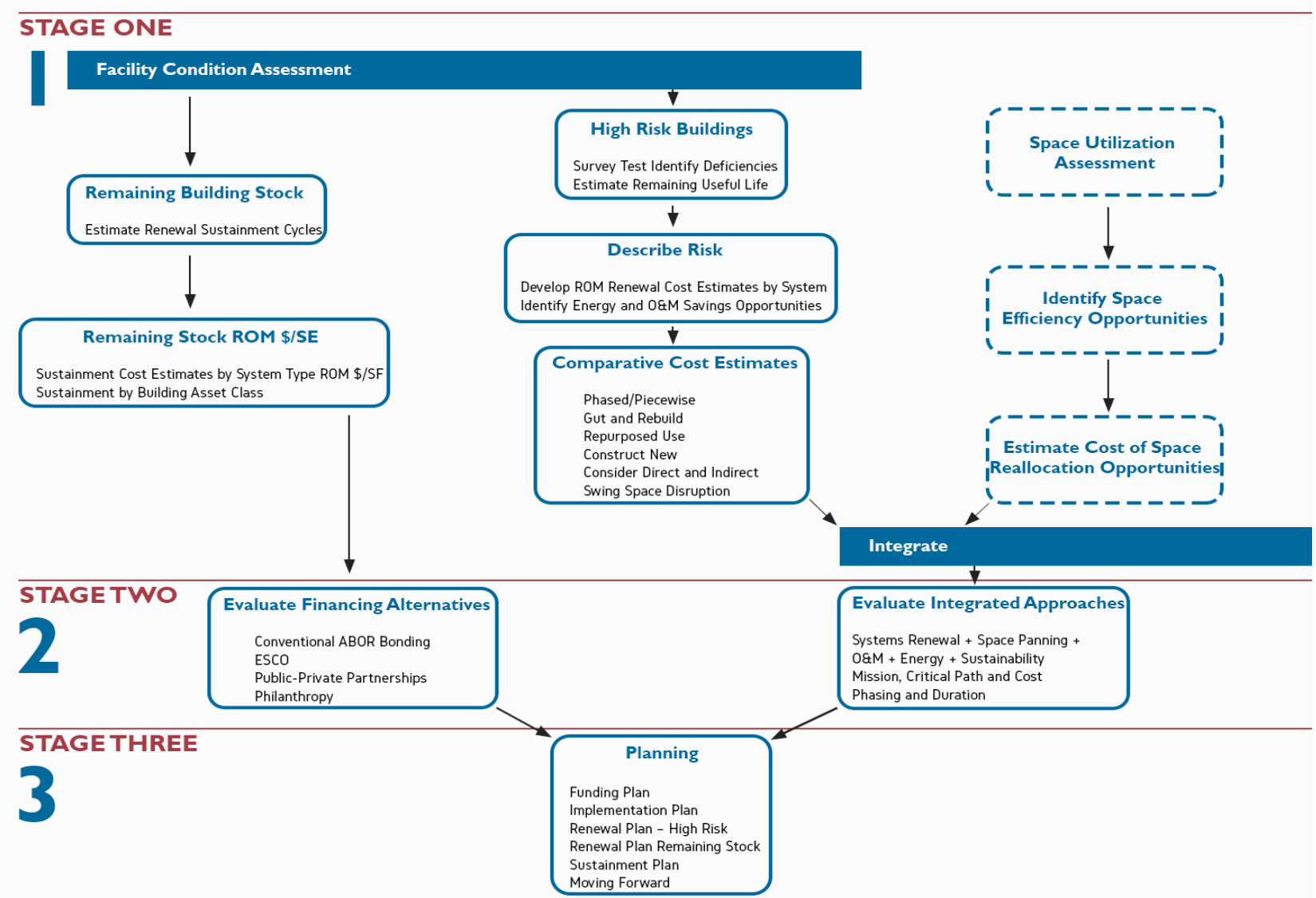
Comprehensive Campus Plan, Vision, Mission



Renovate or Replace?

RENOVATE

$300/sf

- Architectural - $44/sf
- HVAC - $194/sf
- Plumbing - $44/sf
- Electrical - $18/sf

REPLACE

$750/sf

COST FACTORS

- Building type (lab/classroom/offices)
- Quality of construction
- Space usage efficiency

Building Renewal Funding

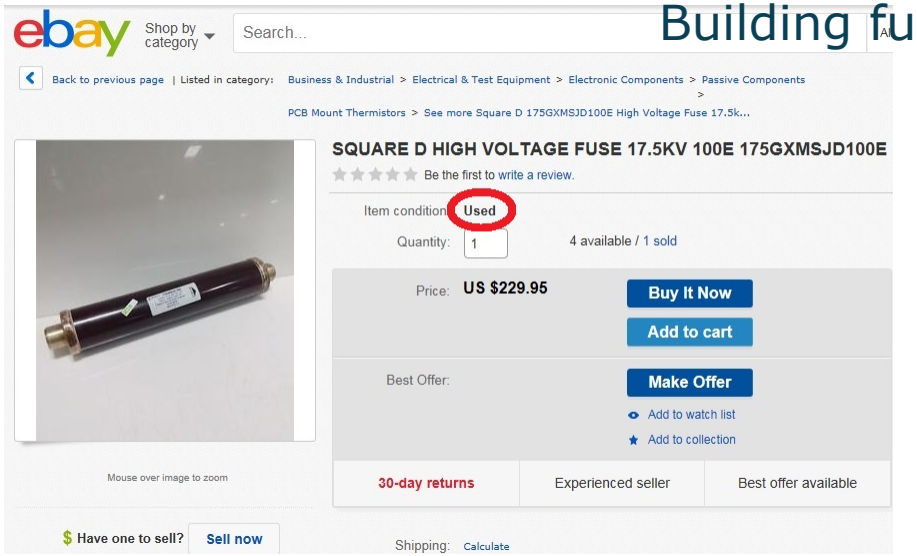
Planned/Holistic vs. Temporary/Piecemeal

Temporary solutions easier to fund

- Downfall – Higher life-cycle cost
- Downfall – Do not comprehensively address issues

Deferred maintenance dollars typically allocated to life safety

- Downfall – Little left over for latent issues:
  Building functionality, health, energy efficiency



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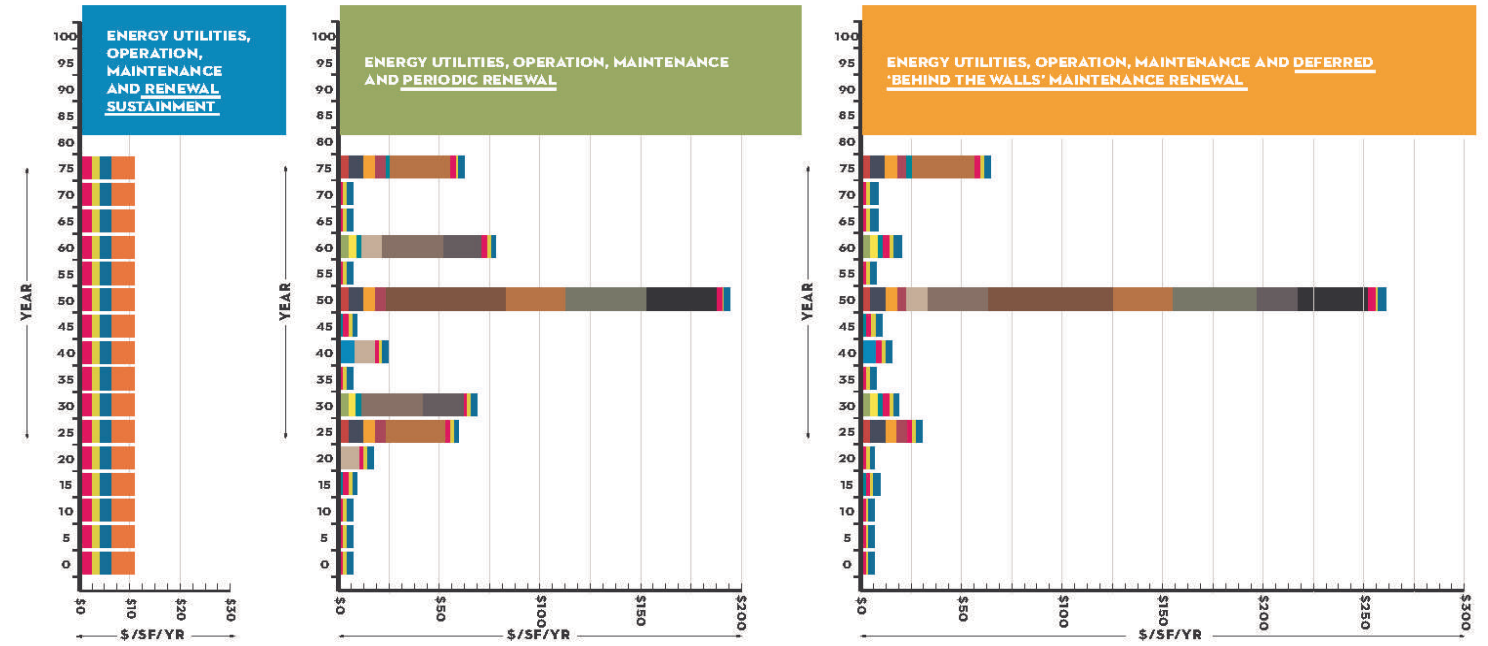
Options for Renewal Approach

From a Life Cycle Standpoint



SINKING FUND	PERIODIC RENEWAL	DEFER MAINTENANCE
• Regular annual contributions • Sustains life-cycle renewal costs	• Replace systems at term • Piecewise reinvestment	• Allow systems to deteriorate • Renewal costs approach replacement

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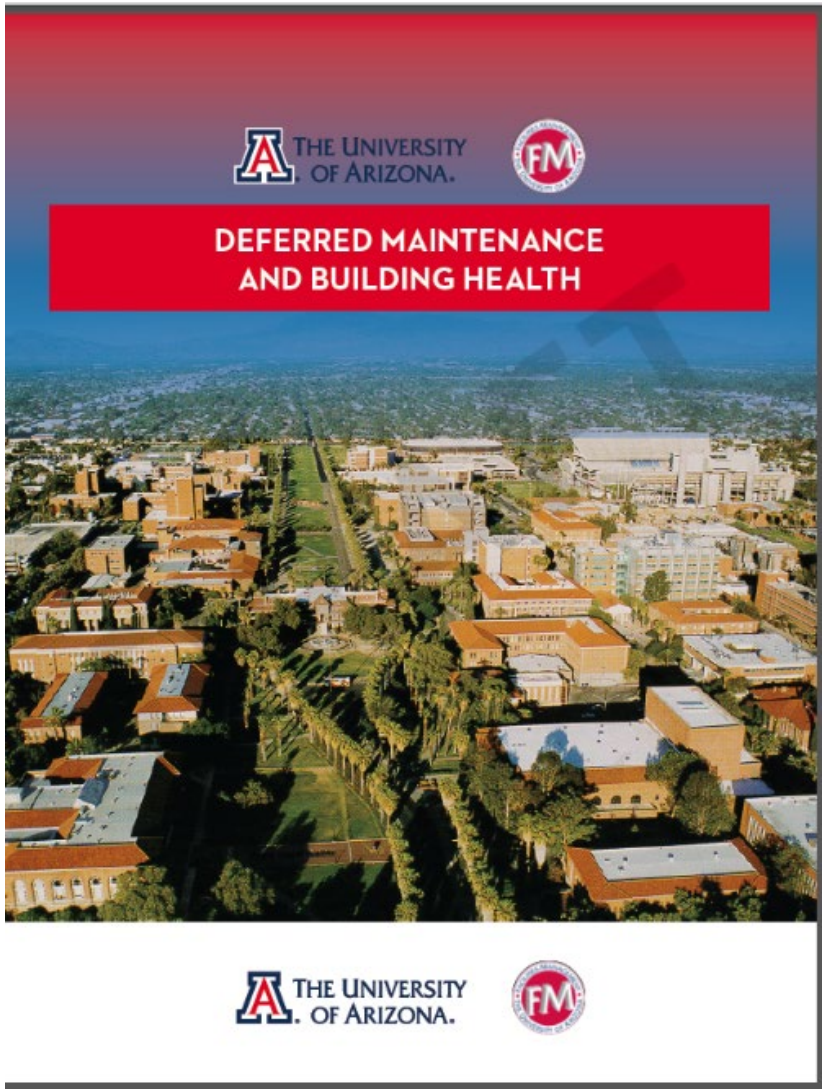
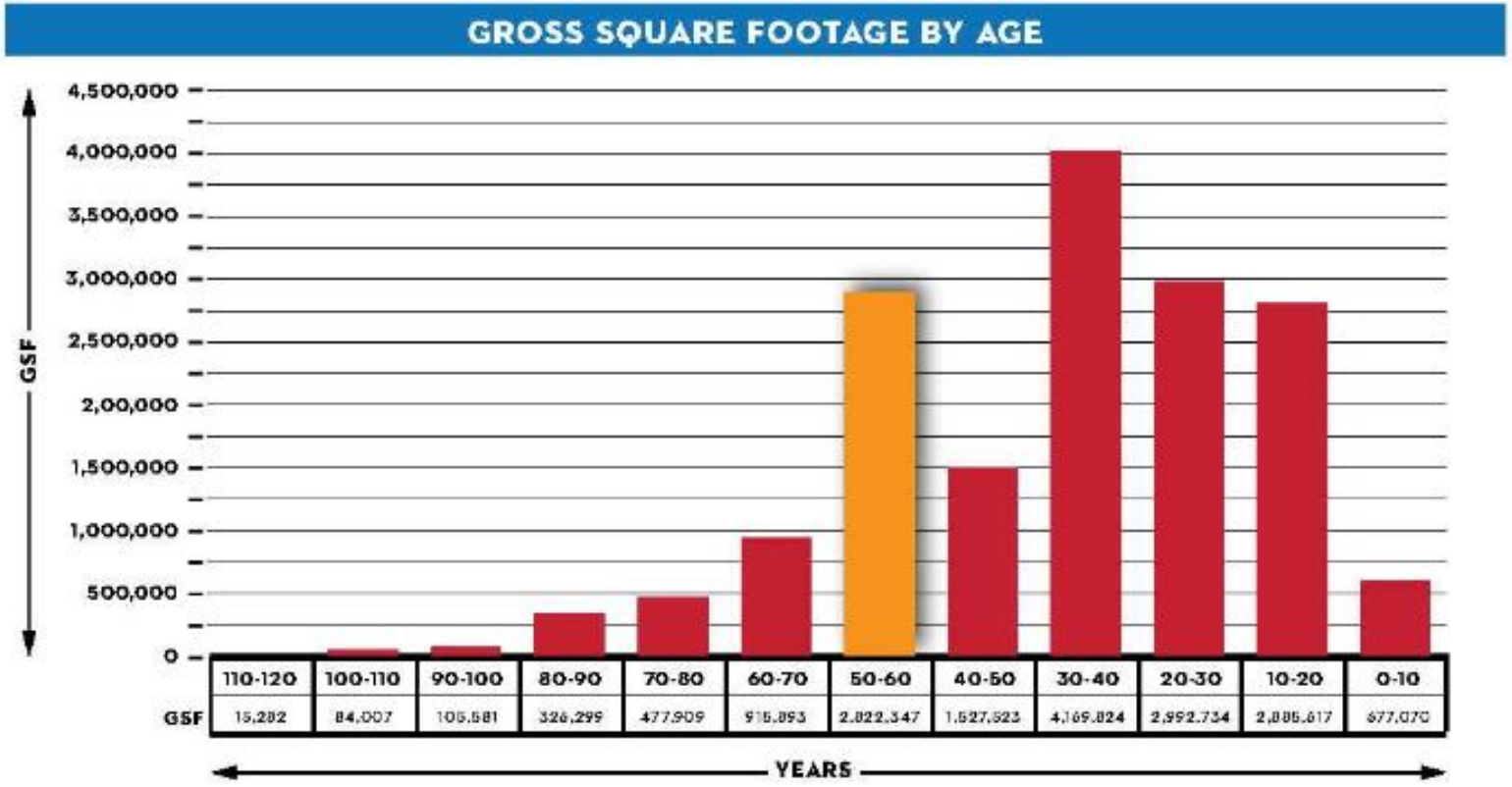
Campus-Wide Funding Needs

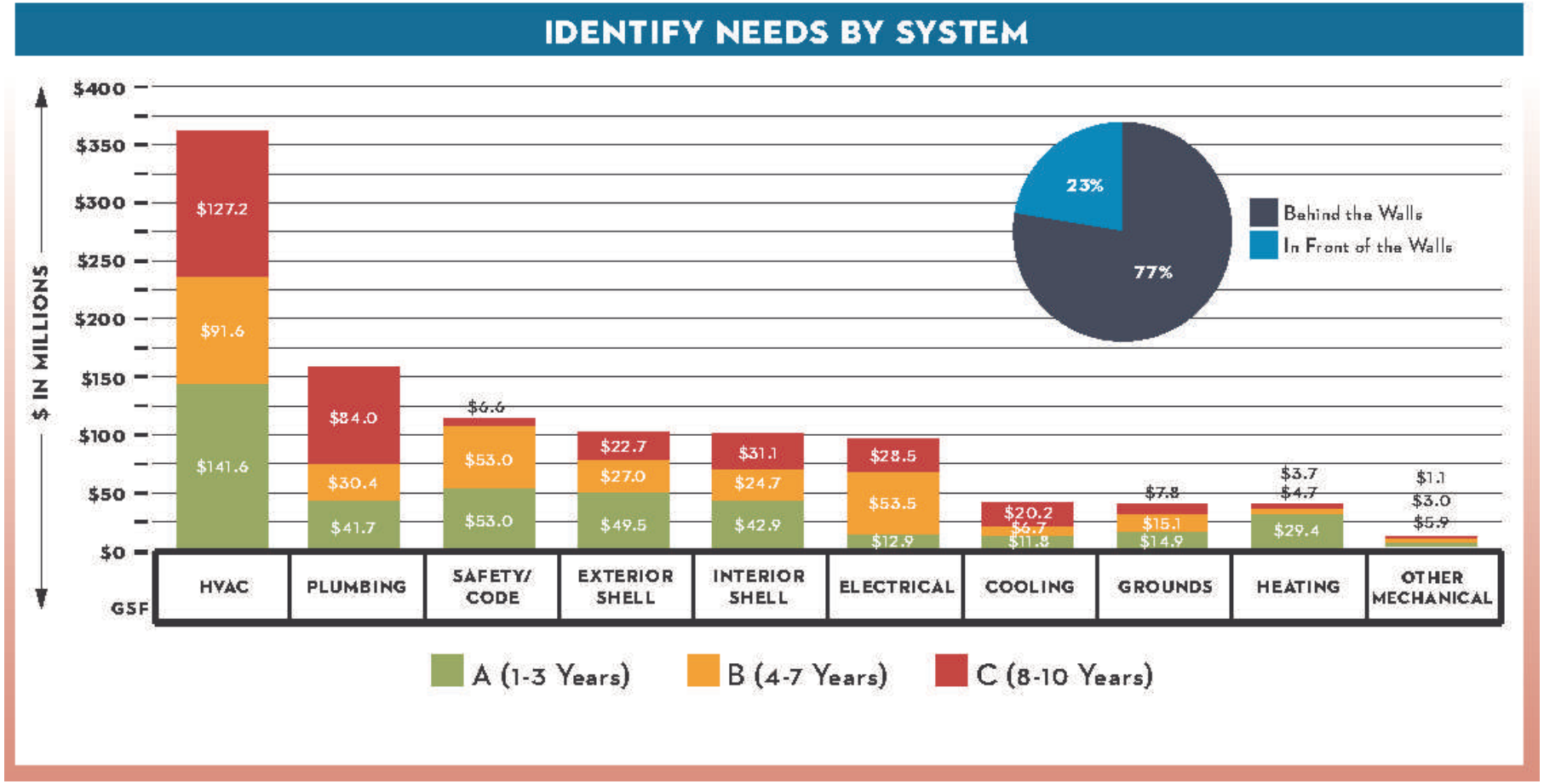


Campus-Wide Funding Needs



- In the absence of renewal, lab buildings from the 1950s and 1960s are becoming high risk
- Buildings from more recent decades will soon become the focus of tomorrow

Campus-Wide Funding Needs



Building Renewal "inside the walls" represents the most urgent and highest renewal needs and costs

Two Distinct Funding Matters

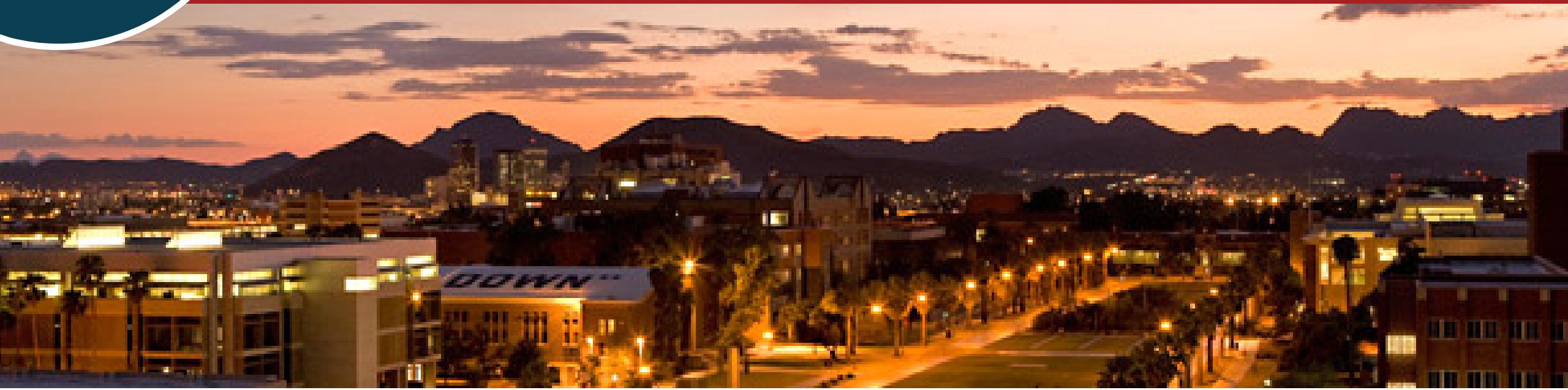
RECOVERING FROM THE PAST

- High level of campus growth in 1960's era
- Building renewal costs now on up rise
- Similar to impending social security crisis
- Funding paradigm must adapt to current campus needs

SYSTEMATIC PLANNING FOR THE FUTURE

- Mitigate issues of deferred maintenance moving forward

Resolution Strategies



DECREASING CURRENT DEMANDS

- Campus-wide space mining
- Space usage efficiency planning

INCREASING DEFERRED MAINTENANCE FUNDS

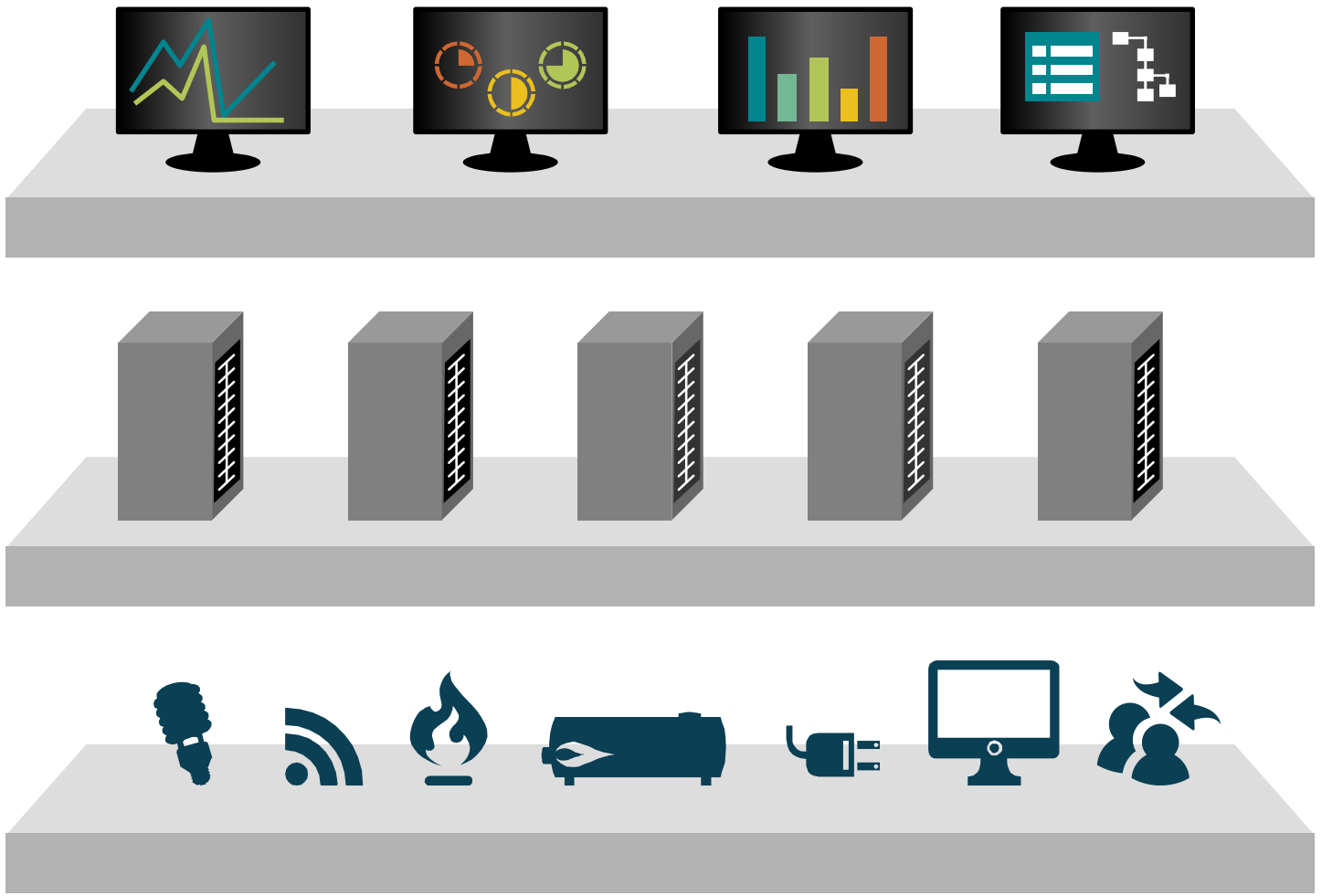
- Building users/college
- University level
- State level

Building Complexity

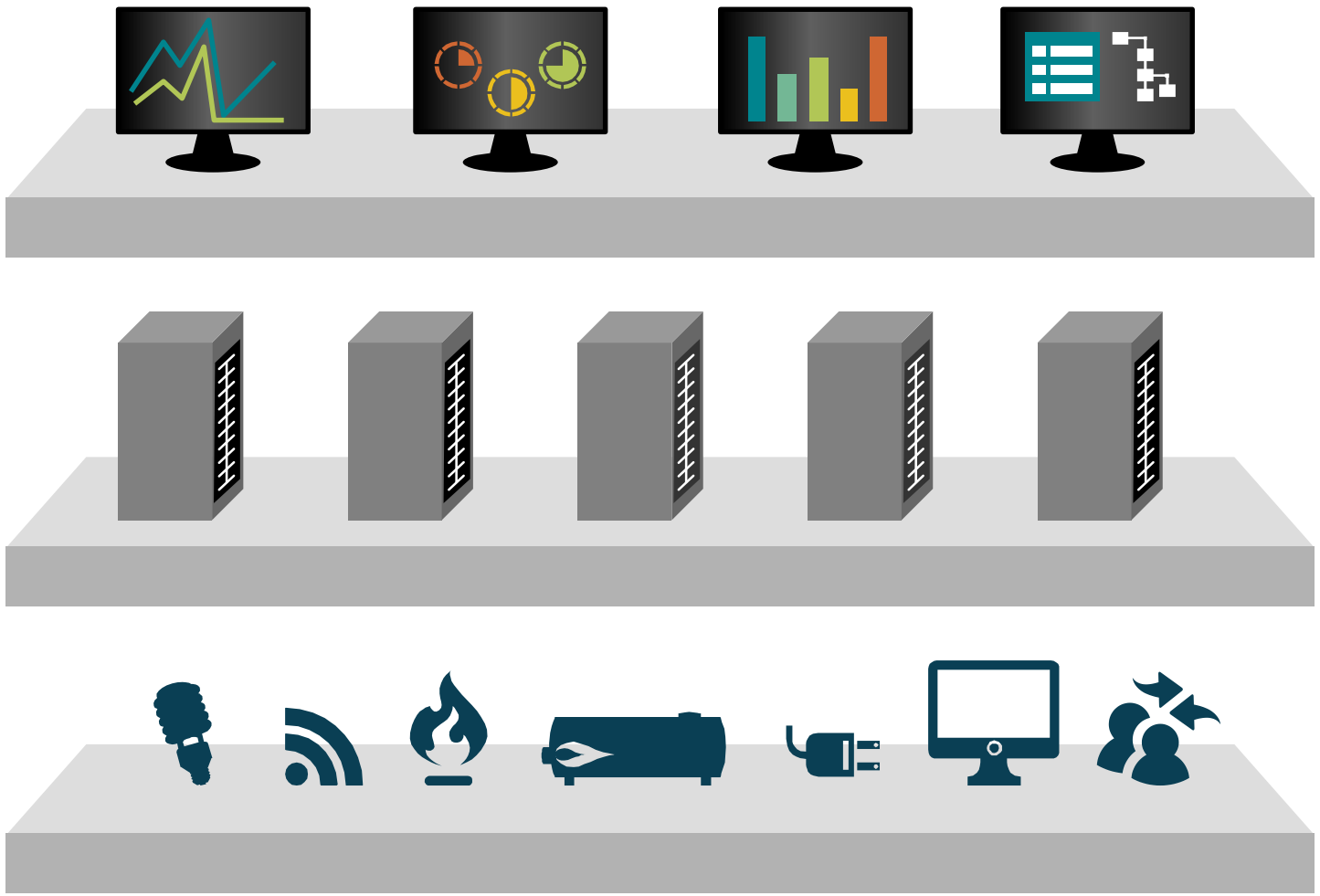
Facilities Change Over Time

Creative Re-Use

Too Much Data, Not Enough Answers



Gaps in the Information Mean Few Clear Answers



Turn Weakness to Strength

> *Facility assessments document, analyze, and benchmark the **current condition** of an organization's facility assets, and **make data actionable** by combining condition data with financial analysis to create a roadmap for smart, important investment*

-Attribution

Status Quo is Not an Option

Process Overview

Learn

Audit

Analyze

Report

Learn

Campus Needs	Assessment Type		
	Condition	Operational	Organizational
–Existing problems need planning & long term solutions in lieu of band-aids.	X	X	
–Recent capital projects have failed to meet expectations of efficiency and instead have created more headaches and disruptions.		X	
–Over/Understaffed with an aging workforce, non-technical capabilities and resistance to change/improvement.			X
–Pain points- aging facilities & shrinking dollars	X		
–Existing or Potential violations, grievances and liabilities are generating additional expense and poor customer interaction.			X
–Lack of process, procedure and protocol is creating a trunk full of one off's.			X
–Technology has become a burden instead of a blessing.		X	
–Customers are not expecting but demanding better service and support.	X	X	X
–Corrective work is increasing despite more equipment & system PM's.	X		
–Decision makers and stakeholders are not listening, believing or buying anything without an independent opinion or analysis- VALIDATION	X		X
–Transparency has created gaps in compliance that have know become serious issues	X		X
–Stakeholders want data, NOT emotion, to support decision making	X	X	
–Systems, equipment and technology have surpassed the current staff's skills	X	X	X

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Pre-Assessment Sample Interview Form

Facility Operational Assessments
Stakeholder Interview Short Form

Stakeholder_____ Date_____

Interviewee_____ Company_____

ROLE:

What is your role in the organization? How long?

Prior relevant experience?

What are your overall responsibilities?

What are your top commitments to the organization? Timing? Deliverables? Priority?

1.

2.

Is there a Facility Mission & Vision? How does it relate to the Mission of the Organization?

CHALLENGES:

What are the current problems/challenges you face with your role?

1.

2.

What do you need to be successful?

Is this achievable and can it be accomplished within schedule, scope and budget?

What are your expectations for delivery of services?

Who are you dependent on for completion of your responsibilities?

SUCCESSES:

How do you measure success?

What is the biggest obstacle to success?

GENERAL ROLES:

Who or whom do you want to emulate?

Is there an expectation to get there? Is there a scope, schedule, and budget to get there?

VISION OF FACILITY OPERATIONS:

Day One

5 Year

15 Year

SHORT AND LONG TERM PRIORITIES:

Short: 6-12 Months

Long: 2-5 Years

BIGGEST FEAR

PERCEPTIONS- HOW DO YOU WANT TO BE PERCEIVED?

MEASURES OF SUCCESS- Ranking? Top 3

Fiscal-
Operational-
Customer-
Community- Local, Global
Public-
Private-
Sustainability-

WHAT WILL BE YOUR LEGACY?

AUDIT

Then, we **head onsite**. We review architectural, structural, mechanical, energy, and electrical elements of the building.

Audit

Asset Management

Item	Existing	Proposed
Equipment Inventory	• Some equipment is inventoried • Institutional knowledge is not documented	• Mechanical assets are accurately inventoried, properly documented, and updated
Equipment Tagging 	• Few assets have barcodes, none have QR codes	• Staff will have the ability to scan equipment tags at the unit to pull up relevant information, maintenance plans, SOPS

Benefits: All equipment information stored and easily accessible; standards set in place moving forward

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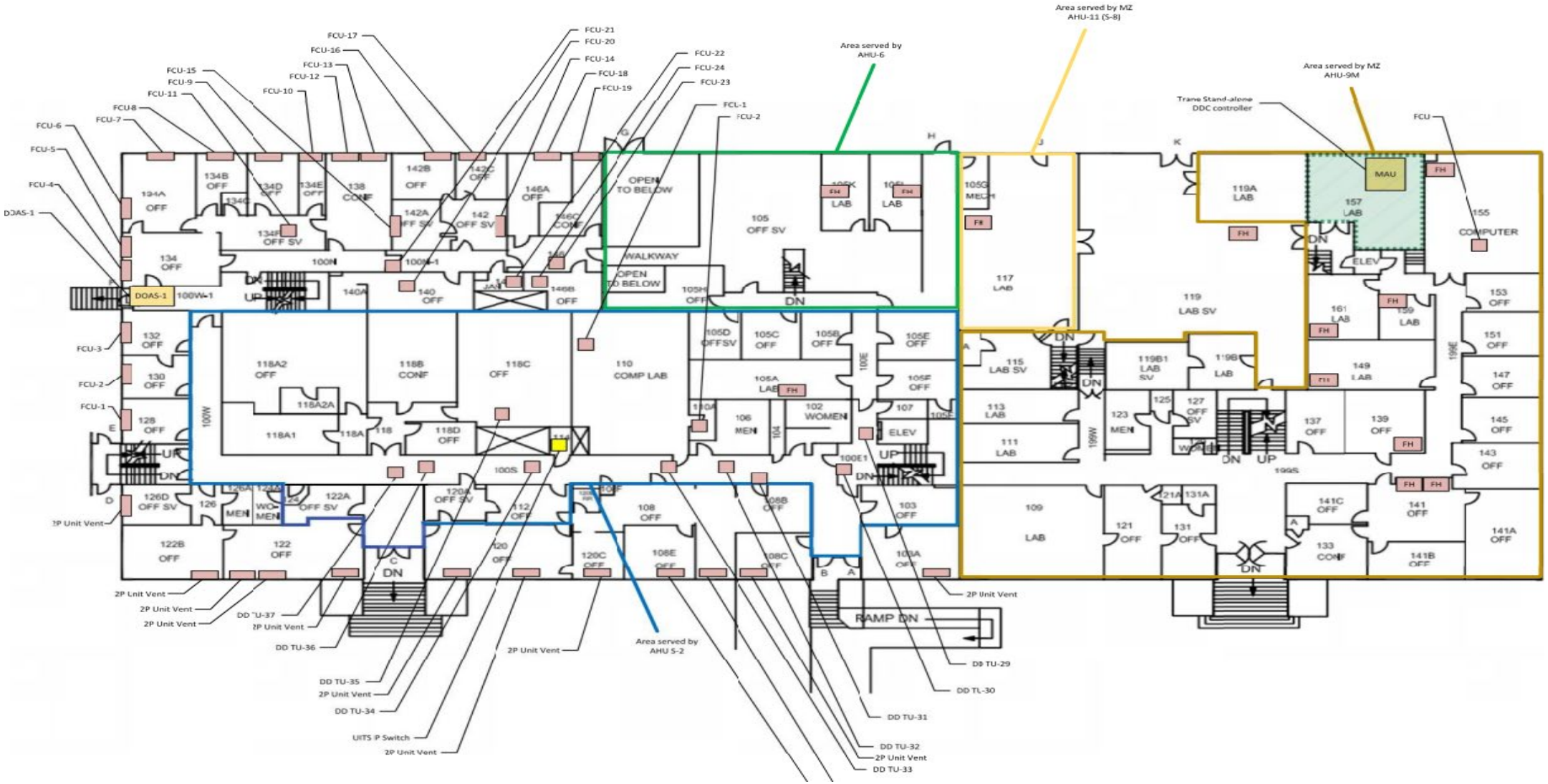
Analyze

Back at the office, we start to **crunch the data**. We build **construction-grade** repair and replacement cost estimates, and **score each asset** based on the criteria we set together.

Analyze


Area served by MZ AHU-11 (S-8)
Area served by AHU-6
Area served by MZ AHU-9M
Trane Stand-alone DDC controller
FCU
MAU
OPEN TO BELOW
WALKWAY
COMP LAB
COMPUTER
ELEV
RAMP DN
Area served by AHU S-2
DOAS-1
2P Unit Vent
DD TU-29
DD TL-30
DD TU-31
DD TU-32
DD TU-33
DD TU-34
DD TU-35
DD TU-36
DD TU-37
UITS IP Switch

Report

Must use **quantitative and qualitative** information about your facility to develop our FCA Visualization Tool and prepare a **detailed report** with information on each asset. You need the right tools to **budget for your facilities** based not only on equipment condition but also on how it affects **your business needs**.

Turn Data Into Answers

A best-in-class approach is:

A single source of facility data.

Filtered by criteria most important to you.

Accessible via a powerful and flexible tool.

Built to help you make decisions.

Score The Assets

Rule of Thumb: High Score = High Priority

Asset Condition
1-5

Observed condition of the asset where

Very Poor Condition	*5 Pts*
Poor Condition	*4 Pts*
Expected Condition	*3 Pts*
Good Condition	*2 Pts*
Great Condition	*1 Pt*

Energy Impact
1-5

Level of energy consumption from the asset

Very high impact	*5 Pts*
High impact	*4 Pts*
Moderate Impact	*3 Pts*
Mild Impact	*2 Pts*
Little/No Impact	*1 Pt*

Occupant Impact
1-5

Expected impact on using workspaces for business needs should the asset fail

Space is Unusable	*5 Pts*
High Impact	*4 Pts*
Moderate Impact	*3 Pts*
Mild Impact	*2 Pts*
Little or no Impact	*1 Pt*

Occupant Impact
1-5

Expected impact on using workspaces for business needs should the asset fail

Space is Unusable	*5 Pts*
High Impact	*4 Pts*
Moderate Impact	*3 Pts*
Mild Impact	*2 Pts*
Little or no Impact	*1 Pt*

Industry Average Life Remaining
Years

Years remaining before the asset is expected to fail – based on industry standards

Values are converted to a 5-point scale where

-1 years or less	*5 Pts*
0 to 5 years	*4 Pts*
6 to 10 years	*3 Pts*
11 to 19 years	*2 Pts*
20 years or more	*1 Pt*

Observed Life Remaining
Years

Years remaining before the asset is expected to fail – based on professional assessment

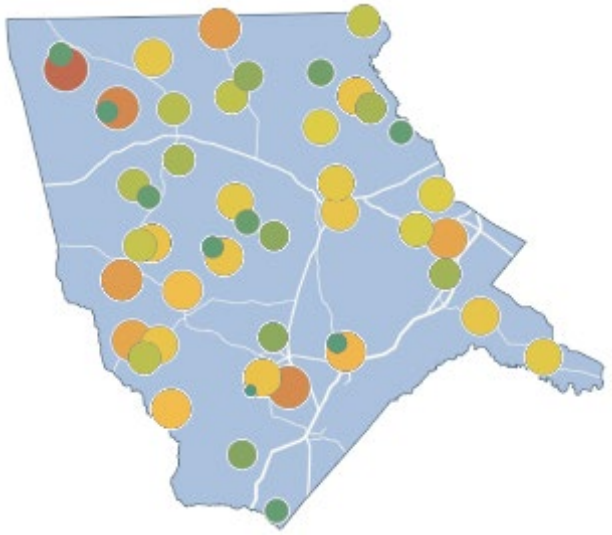
Values are converted to a 5-point scale where:

5 years or less	*5 Pts*
6 to 9 years	*4 Pts*
10 to 12 years	*3 Pts*
13 to 20 years	*2 Pts*
21 years or more	*1 Pt*

FCA Viz Tool

Facility condition assessment visualization tools empowers you to make data-driven investments in your facility

Visual tools to drive needs-based decision making with consideration to equipment life, replacement costs, occupancy impact, and energy usage.



Thank you! Questions?

Christopher M. Kopach, AVP, The University of Arizona; APPA President

Phillip Saieg, Regional Technical Director, McKinstry

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