1

APPA Credits Page

Credit(s) earned on completion of this course will be reported to American Institute of Architects (AIA) Continuing Education Session (CES) for AIA members.

Certificates of Completion for both AIA members and non-AIA members are available upon request.

This course is registered with AIA CES for continuing professional education. As such, it does not include content that may be deemed or construed to be an approval or endorsement by the AIA of any material of construction or any method or manner of handling, using, distributing, or dealing in any material or product.

Questions related to specific materials, methods, and services will be addressed at the conclusion of this presentation.

AIA Approved Continuing Education

2

2

Course Description

An **Integrated Capital Plan** sits at the intersection of capital investments and operational funding.

In this course, we will learn how to develop a capital project priority matrix employing total cost of ownership (TCO) and integrating operating and capital budgets to address deferred maintenance and capital renewal.

AIA Approved Continuing Education

3

3

Learning Objectives

- Assessing the state of facilities
- Understanding deferred maintenance/backlog
- Strategic approach to facilities renewal and reinvestment
- Integrated capital planning process
- Project priority matrix
- Total cost of ownership

AIA Approved Continuing Education

4

4

Penn State at a Glance

Students
UP= 48,201
CC = 23,838
All = 88,116

Land
UP= 11,249 acres
CC = 2,646 acres
All = 21,888 acres

Roads
UP = 119 miles
CC = 50.4 miles
All = 217.6 miles

Employees
Full-time = 20,794
Part-time = 13,810

Walkways
UP= 88.6 miles
CC = 54.1 miles
All = 157.5 miles

Buildings
UP= 971 at 20.3M GSF
CC = 622 at 7.8M GSF
All = 2,092 at 34.5M GSF

UP = University Park (Inc. Rock Springs Ag Area) *CC = Commonwealth Campuses* *All = UP + CC + Hershey Medical + Additional Locations*

5

5

Facilities Replacement Value Breakdown

6

6

Increasing E&G GSF

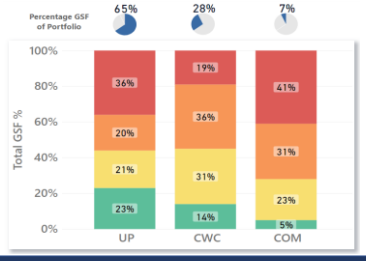
Impacts

- Energy Demand
- Carbon Footprint
- Cleaning Needs
- Maintenance Needs
- Renewal Needs

7

7

Original/Renewal Age of E&G Facilities



Buildings Over 50 Years
Lifecycles of major building components are past due. Failures are possible.
Highest Risk

Buildings 25-50 Years
Major envelope and mechanical lifecycles come due.
Higher Risk

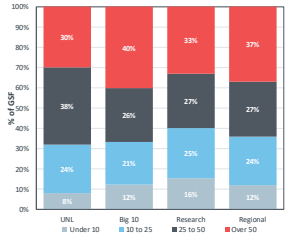
Buildings 10-25 Years
Short lifecycle needs; primarily space renewal.
Medium Risk

Buildings Under 10 Years
Little work.
"Honeymoon" period.
Low Risk

8

8

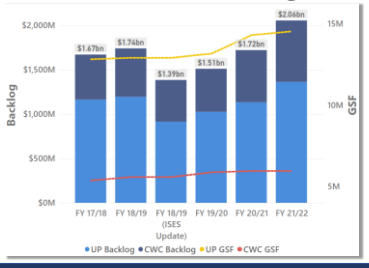
Peer Comparisons



9

9

Total Penn State E&G Backlog



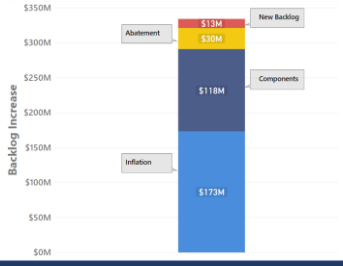
Backlog = **$2.06B**

$334M increase '21 to '22.

10

10

FY 21/22 Backlog Increase Details



- **Inflation = $173M**
  - 10.05% inflation applied in Jan. 2022
- **Components = $118M**
  - Existing components that aged into backlog this year
- **Abatement = $30M**
  - Added projects
- **New Backlog = $13M**
  - Newly inspected 208K GSF not previously recorded
- ***Mitigated Backlog Growth = $86M***
  - *Result of Capital Plan*

11

11

What does the backlog look like?

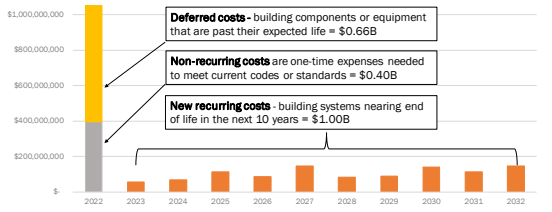
Examples of recent failures

12

12

Backlog

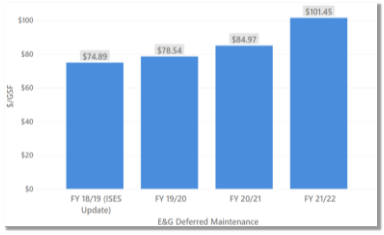
Non-recurring	$0.40B
Deferred	$0.66B
Next 10 years	$1.00B
	$2.06B



13

13

Deferred Maintenance Threshold – E&G Facilities



- Association of Public and Land Grant Universities (APLU)
- $100/GSF deferred maintenance threshold is associated with a greater likelihood of building systems failures – such as HVAC or electrical systems

14

14

Distribution of E&G Backlog (Total Portfolio)

Visual Notes

- Columns and data labels are 2022
- Dotted line is 2021 for comparison

15

15

Strategic Approach to Facilities Renewal

Routine Maintenance (Each campus) 1:1	Major Maintenance (UP and CC) 1:1	Systems Renewal 1:2	Capital Projects 1:5
• Preventive maintenance • Minor repairs (<$5,000) • Required investment to get to the expected life of systems and equipment	• Major repairs (>$5,000) • Equipment and system replacements • Repairs are required investments, but balanced with replacement investments	• Programmatic approach to improving facility condition that shares project resources across locations	• Includes functional improvements to the facilities to meet modern expectations
OpEx		CapEx	

16

16

Replacement Value Reinvestment Ratio

- $10.3B E&G Replacement Value
- 2.5% - industry standard for 40-Year Capital Replacement Cycle
- Doesn't address existing backlog or functional obsolescence, relation to mission, aesthetics, etc.

  - 2.5% → $258.0M annually → 40-year cycle
  - 2.0% → $206.0M annually → 50-year cycle

Remember: Not all dollars are the same based on Penn State empirical data.

- Routine Maintenance 1:1
- Major Maintenance 1:1
- Systems Renewal 1:2
- Capital Project 1:5

17

17

Current Annual E&G Investment

Routine Maintenance	= $38.0M	Op Ex
Major Maintenance	= $33.4M	
Systems Renewal ($35.0M @ 1:2)	= $17.5M	Cap Ex
Capital Projects ($293.4M @ 1:5)	= $58.7M	
	= $147.6M	

- 2.5% → $258.0M annually → 40-year cycle
- 2.0% → $206.0M annually → 50-year cycle
- 1.4% → $147.6M annually → 70-year cycle

Strict discipline to drive Systems Renewal and Capital closer to a 1:1 ratio — no new stuff/growth

18

18

Example FY23-25 Funding Request

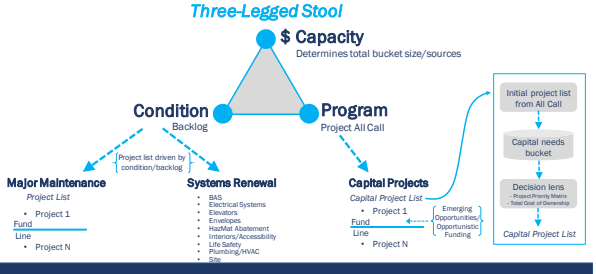
Plant Replacement Value (PRV)	= $5.3B
Current Deferred Maintenance	= $3.01B
Critical Maintenance ($26.45M @ 1:1)	= $26.45M
Systems Renewal ($60.28 @ 1:2)	= $30.14M
Capital Projects ($226.9M @ 1:5)	= $45.38M
	$101.97M

- 1.7% → $59.985M annually → 59-year cycle

19

19

Integrated Capital Planning Process



20

20

Private Capital Project Prioritization

Strategic Alignment

Does the project align with the vision, mission, and goals of the corporation and will it provide a competitive advantage.

Financial Performance

Expected return and profitability of investment compared to other investment options.

21

21

Private Capital Project Prioritization

Risk Profile

What uncertainty and variability of outcome is associated with the investment and how could this impact potential ROI.

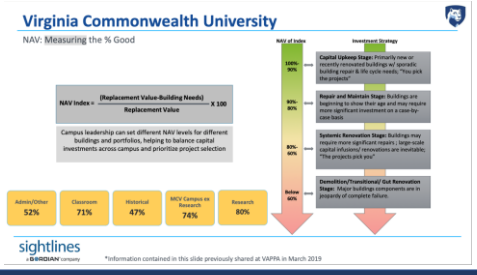
Portfolio Optimization

Interactions and trade offs among the projects available for investment and optimization of the corporate portfolio

22

22

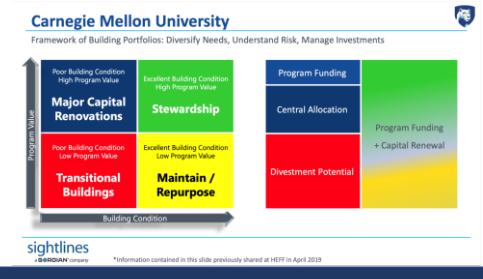
Sightlines Case Studies



23

23

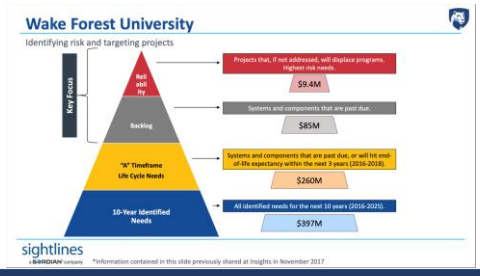
Sightlines Case Studies



24

24

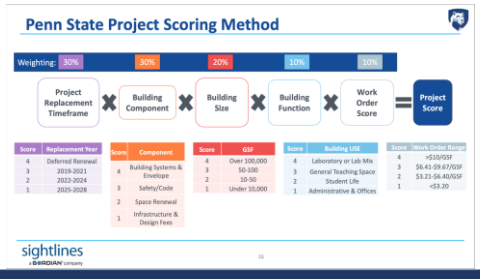
Sightlines Case Studies



25

25

Sightlines Case Studies



26

26

Project Priority Matrix – Category Definitions and Scoring

Learning Excellence	Research Excellence	Campus Community	Sustainability	Business Continuity
Reduction of Deferred Maintenance Backlog	Conformance with Master Plan	Alignment with Strategic Plan(s)	Safety/Code Compliance	Economic Opportunity, Community Outreach, Extension

27

27

Project Priority Matrix – Category Definitions and Scoring

Research Excellence

Project will provide the needed infrastructure, facility upgrades to research space, or facility space to support a rigorous program of research and creative accomplishment.

1 – Project will have a **minimal** impact on the research mission
3 – Project **moderately** supports the research mission
5 – **Primary focus** of the project is supporting the research mission

28

28

Project Priority Matrix – Category Definitions and Scoring

Campus Community

Project contributes to the improvement of aesthetics, quality or the functionality of the space with the primary drivers being student life, arts, engagement, inclusivity, athletic and/or recreational programs, or improvement in facility amenities for faculty and staff. These projects may also address issues of campus image and impact. Could include both interior and exterior space.

1 – Project contributes a **minimal improvement**
3 – Project contributes a **significant improvement**
5 – Project contributes an **exceptional improvement**

29

29

Project Priority Matrix – Category Definitions and Scoring

Sustainability

Project should meet general sustainable design and/or building requirements, which includes but is not limited to energy usage, carbon emission, waste streams, water conservation, or increases in efficiency.

1 – Likely to **meet minimum** OPP published sustainability design and performance requirements
3 – Likely to **exceed minimum** OPP published sustainability design and performance requirements
5 – Likely to **significantly exceed minimum** OPP published sustainability design and performance requirements

30

30

Project Priority Matrix – Category Definitions and Scoring

Business Continuity

Project contributes to an overall improvement in facility resiliency, risk mitigation, or continuity of operations due to a significant disruption in education, research, service or auxiliary functions.

1 – Project contributes a **minimal improvement**
3 – Project contributes a **moderate improvement**
5 – **Primary focus** of the project is improving business continuity

31

31

Project Priority Matrix – Category Definitions and Scoring

Reduction of Deferred Maintenance Backlog

Projects address outstanding maintenance, contribute to asset preservation or enhance the integrity of building systems, structure or campus, and contribute to an increase in the facility condition index and facility reliability.

1 – Addresses between **0-19%** of backlog
2 – Addresses between **20-39%** of backlog
3 – Addresses between **40-64%** of backlog
4 – Addresses between **65-89%** of backlog
5 – Addresses between **90-100%** of backlog

32

32

Project Priority Matrix – Category Definitions and Scoring

Conformance with the Master Plan

Project complies with the University, Campus, and/or Unit Level Master Plan and supports the goals and objectives of the University by anticipating and preparing for the future, extending the useful life of a facility noted as critical to the master plan or minimizes disruptions from unforeseen industry change.

1 – **Does not comply** with the master plan
3 – **Complies with a portion** of the master plan
5 – **Fully complies** with master plan

33

33

Project Priority Matrix – Category Definitions and Scoring

Alignment with Strategic Plan(s)

Project supports one or more foundations, thematic priorities, or supporting elements of the university, campus, and/or unit strategic plan(s).

1 – Supports few components of the Strategic Plan
3 – Supports some components of the Strategic Plan
5 – Supports many components of the Strategic Plan

34

34

Project Priority Matrix – Category Definitions and Scoring

Safety/Code Compliance

Project addresses safety and/or building code related requirements including but not limited to removal/abatement of hazardous materials and ADA accessibility and compliance.

1 – Project will **minimally address** safety/code requirements
3 – Project will **moderately address** safety/code requirements
5 – Project will **significantly address** safety/code requirements

35

35

Project Priority Matrix – Category Definitions and Scoring

Economic Opportunity, Community Outreach, Extension

Project allows for the realization of economic or other benefits resulting from but not limited to, public/private partnerships, community outreach/extension or other untapped sources of University/College revenue or economic advancement.

1 – Project contributes **minimal** economic or other benefits
3 – Project contributes **significant** economic or other benefits
5 – Project contributes **exceptional** economic or other benefits

36

36

Project Priority Matrix

24-28 Capital Plan Project Priority

Categories	Relative Weight
Learning Excellence	85.00
Research Excellence	90.00
Campus Community	50.00
Sustainability	65.00
Business Continuity	50.00
Reduction in Deferred Maintenance Backlog	80.00
Conformance with Master Plan	50.00
Alignment with Strategic Plans	50.00
Safety/Code Compliance	80.00
Economic Opportunity/Community Outreach/Extension	65.00

37

Project	Project Total Score
University Park	
Sackett Building Renovation (and Addition)	27.05
Palmer Museum of Art Repurposing	22
Carpenter Building Renovation	24
Boucke Building Renovation	19.1
Henderson Building Renovation	18.9
Eisenhower Auditorium Renovation	21.6
Hosler Building Renovation (and Addition)	28.9
Animal Diagnostic Laboratory Renovation	27.95
Old Main - Exterior Renewal	18.8
Commonwealth Campuses	
Physical Education Building Renovation	25.1
Smith Building Renovation (and Addition)	22.7
Academic Building	19.6
Reed Union Building Renovation (and Addition)	19.2

38

Individual Project Scores

Project	Learning Excellence	Research Excellence	Campus Community	Sustainability	Business Continuity	Reduction in Deferred Maintenance Backlog	Conformance with Master Plan	Alignment with Strategic Plans	Safety/Code Compliance	Economic Opportunity, Community Outreach, Extension	Total
UNIVERSITY PARK											
Sackett Building Reno and Addition	4	2	5	3	3	5	5	5	5	3	**27.05**
Palmer Museum of Art Repurposing	4	1	4	2	3	5	5	4	3	2	**22**
Carpenter Building Renovation	3	3	3	2	3	5	5	4	5	2	**24**
Boucke Building Renovation	3	1	4	2	3	3	5	5	3	1	**19.1**
Henderson Building Renovation	3	1	3	2	3	3	5	4	4	1	**18.9**
Eisenhower Auditorium Renovation	2	1	5	2	4	4	5	5	5	1	**21.6**
Hosler Building Reno and Addition	5	5	4	2	3	3	5	5	4	5	**28.9**
Animal Diagnostic Laboratory Renovation	2	5	2	3	4	4	5	5	5	5	**27.95**
Old Main - Exterior Renewal	1	1	5	2	5	3	5	5	3	1	**18.8**
COMMONWEALTH CAMPUSES											
Physical Education Building Renovation	3	1	4	2	5	5	5	5	5	3	**25.1**
Smith Building Reno and Addition	4	1	3	2	3	5	5	5	5	1	**22.7**
Academic Building	5	1	3	4	2	1	5	5	3	1	**19.6**
Reed Union Building Reno and Addition	3	1	4	2	3	2	5	5	3	2	**19.2**
Student Union - Student Success Center	3	1	4	2	5	5	5	5	5	3	**25.1**

39

Total Cost of Ownership Worksheet Overview

To Complete	Purpose of Data Collection	Responsible Party
Project Details	To gather general information related to project.	Project Management and Department
Initial Asset TCO Details	To capture capital costs associated with the project itself.	Project Management
O&M TCO Detail	To capture operating and maintenance costs associated with the lift of the project (up to 30 years).	Depends on facility type • E&G • CWC • Self-supporting
Programs #1, #2, #4 TCO Detail	To capture program-related costs associated with the life of the project (up to 30 years).	Department
Funding Detail	To capture the necessary funding to support costs identified in Initial Asset, O&M, and Programs Details.	Physical Plant, Corporate Controller, Budget Office, and Department

40

40

Summary

- Reinvestment in facilities is **crucial** to ensuring they retain value and meet the organizational mission.
- OpEx (1:1) and Systems Renewal programs (1:2) provide the **most condition improvement value** for each dollar spent.
- Integrated Capital Planning:
  - **Works in concert** with CapEx and OpEx.
  - Is **complicated** when areas/units act as independent entities.

41

41

This concludes The American Institute of Architects Continuing Education Systems Course

AIA Approved Continuing Education

42

42


June 2024
T. Mark Miller, P.E., MEM, M.ASCE
tmm6591@psu.edu
tmarkmiller1118@gmail.com

43