Turning Facilities Challenges into Sustainability Successes

Moderated by: Jeff Murphy
Panelists: Michelle Smith, Natalie Berland
Learning Objectives

Upon completion of this program you will be able to:

- Define and communicate national trends affecting higher education finances and facilities, which impact campus sustainability performance
- Align sustainability goals with sound facilities management and finance strategies
- Outline effective strategies for quantifying and maximizing the sustainability impacts of investments into campus facilities
Michelle Smith  
Green Building Coordinator  
The University of Vermont

Campus Profile:
- Public University with 13,000 students
- Nearly 300 buildings totaling over 5.8M gross square feet across a 466 acre campus
- Sightlines member since 2005, Sustainability Solutions pilot institution

Natalie Berland  
Manager of Sustainability  
Bentley University

Campus Profile:
- Private University with 5,600 students
- 49 buildings totaling over 1.7M gross square feet across a 163 acre campus
- Sightlines member since 2002, Sustainability Solutions member since 2008

Jeff Murphy  
Product Manager  
Sightlines

Sightlines Profile:
- 450 colleges, universities, and K-12 institutions across 44 states, DC and Canada
- Manage largest database of higher education facilities data – 1.3B GSF
- Have completed over 500 comprehensive GHG inventories and several Climate Action Plans
Typical GHG Profile for a 4 Year Institution

Focusing in on energy-related emissions

FY14 Emissions by Scope

**Scope 1** Direct Sources
- Stationary Combustion (Fossil Fuels and Biomass)
- Fleet Fuel
- Fugitive Emissions (Refrigerants and Agriculture)

**Scope 2** Upstream Sources
- Purchased Electricity
- Purchased Steam/Chilled Water

**Scope 3** Indirect Sources
- Daily Commuting (Faculty, Staff and Students)
- Outsourced Travel (Air and Ground Travel)
- Waste Products (Solid Waste and Wastewater)
- Paper Purchases
- Transmission & Distribution Losses

Approximately 60-80% of emissions are due to energy use in campus facilities.
The State of Facilities in Higher Ed

Facilities and Financial Officers face a series of challenges
The Root Cause of These Struggles

**Converging renewal cycles straining facilities organizations**

**Constructed Space Since 1880**

Both groups crossing major capital lifecycle thresholds:

- **Post-War**: “Catch-up” needs in aging facilities
- **Millennial**: “Keep-up” needs in newer, more complex buildings
The Root Cause of These Struggles

Converging renewal cycles straining facilities organizations

Constructed Space Since 1880

% of Total GSF Constructed

<table>
<thead>
<tr>
<th></th>
<th>Pre-War</th>
<th>Post-War</th>
<th>Modern</th>
<th>Millennial</th>
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<tbody>
<tr>
<td>National Avg.</td>
<td>15%</td>
<td>40%</td>
<td>20%</td>
<td>25%</td>
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<tr>
<td>UVM</td>
<td>26%</td>
<td>52%</td>
<td>8%</td>
<td>14%</td>
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<tr>
<td>Bentley</td>
<td>0%</td>
<td>41%</td>
<td>35%</td>
<td>25%</td>
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National Database

UVM

Bentley

**National Capital Implications of Existing Space**

*Increasing capital obligations to physical plant (fixed costs) moving forward*

**Total Database Need 1950-2050**

3-Year Moving Average Using ROPA+ Prediction

*Values are in 2013 dollars and do not include: inflation, modernization, grounds or utility infrastructure costs. Also assumes no new construction during this time period.*

*Current challenges will only grow as more buildings continue to cross major capital lifecycle thresholds.*

$205B of capital lifecycle needs within Sightlines database
Changing the Conversation on Campus

Grappling with same issues as CFOs, but using a different vocabulary

Avoid New Emissions
Reduce Usage
Replace GHG-Intensive Fuels
Balance/Offset Remaining GHGs

Conceptual framework for sustainability staff
Conceptual framework for CFOs and Facilities Directors

SPACE
Release the hidden value in balance sheets

CAPITAL $
Multiyear plans that align to mission and risk

OPERATIONS
Improve effectiveness and lower facilities overhead impact
National Progress on Utility Emissions

Achieved a 6% reduction since FY07

100% of gross utility GHG savings since FY07 have been from fuel switching by either the campus or regional utility provider.

Change in Gross National Utility GHGs by Portfolio*

FY2007 – FY2013

-3% Space utilization rates improved
+1% Gross energy usage has increased
-7% Less carbon-intensive fuel sources have been deployed

16,000,000
14,000,000
12,000,000
10,000,000
8,000,000
6,000,000
4,000,000
2,000,000
0

2007 SPACE (Avoidance) CAPITAL (Usage) OPERATIONS (GHG Intensity) 2013

6% Reduction since FY2007

*MTCDE *Includes 236 institutions, 1.07B GSF
Campus Case Stories
Facilities Challenges: UVM

- Diverse building construction eras
- Historic core campus surrounded by small houses
- Many “post-war” facilities reaching lifecycle thresholds
- Declining capital investments & growing backlog
- 11 LEED Certified buildings
UVM’s Progress on Utility Emissions

Achieved a 45% reduction in net utility emissions since FY07

Net Change in UVM’s Utility GHGs by Portfolio
FY2007 – FY2014

-4% reduction in Space (Avoidance)
-4% reduction in Capital (Usage)
-6% reduction in Operations (GHG Intensity)
-35% reduction in Neutralizing emissions via RECs

Space utilization rates have improved
Gross energy usage has decreased
Less carbon-intensive fuel sources have been deployed
Neutralizing emissions via RECs

45% Reduction since FY2007
Achieving Major Reductions in Utility Use

*Investments focused on core facilities needs, not just interiors*

### Energy Savings Relative to Growth

<table>
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<th>Gross Utility Use (MMBTU)</th>
<th>Campus GSF</th>
<th>Campus FTEs</th>
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<tr>
<td>-6%</td>
<td>7%</td>
<td>10%</td>
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### Mix of Spending in Existing Facilities

- **32%** Building Systems
- **16%** Envelope
- **22%** Utility Infrastructure
- **17%** Space Renewal
- **13%** Other
- **3%** Other

### Strategy:

Reinvest in existing space even as building new
- 60% of total capital to existing buildings
- Focus that reinvestment into mission-critical bldgs.
- Utility generation/distribution infrastructure
- Building mechanical/electrical systems
- Building envelopes

### Funding Mechanisms:

- Deferred Maintenance and Plant Improvement Funds
- Facility Renewal Reserve
- Revolving loan funds
- Utility rebates/incentives
- Bonds
Next Step Strategies at UVM

High-Need Core Buildings*

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<thead>
<tr>
<th>Science &amp; Engineering</th>
<th>Residential Life</th>
<th>Admin</th>
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<td>$250</td>
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High Need Core Building Avg.: $112/ GSF

Over the next 5 years UVM plans to replace or renovate half of the highest-need core buildings on campus.

New STEM facility – in design phase

*Estimated need as of FY12
UVM’s Recipe for Success

KEY FACILITIES STRATEGIES:

Focus on Existing Facilities:
- Development of diverse funding mechanisms for existing space
- Focused investment to address envelope, building system and utility infrastructure needs in mission-critical facilities

Building Replacements:
- Meeting emerging programmatic needs by replacing aging science and residential facilities
- Thereby addressing capital backlog, reducing facilities operating costs, energy use and risk while supporting institutional recruitment and retention efforts

SUSTAINABILITY SUCCESSES:
- Total energy use dropped 6% even as campus GSF and FTEs grew
- These energy savings allowed for purchase of RECs to balance 35% of utility emissions
- New facilities provide an opportunity for deploying advanced building technologies and green design features
- New facilities projected to reduce total energy use even though they are larger and more complex facilities
Facilities Challenges – Bentley

Facilities Challenges
65% of campus GSF built from 1970-1989
Majority of campus entering first major renewal cycle
10-Year facilities planning process raised questions about need for campus expansion
Strong Historic Space Discipline
Utilizing campus space more effectively than peers

Total Space Per User (FTE)  
FY2014

Initial Facilities Planning Questions:
Does Bentley’s recent enrollment growth mean we need more space?

Is the teaching space we have now the right type of space moving forward?

Peer Group: Babson College, Boston College, Champlain College, Fitchburg State University, Hampshire College, Siena College, Tufts University
Higher Room Utilization Than National Average

Many small classes but mostly large rooms

Bentley’s Classroom Utilization
MTWRF 9am-4pm

Room Capacity vs. Class Size

“Maybe we don’t need to build additional classroom buildings”
Michael J. Page, PhD
Provost and VP for Academic Affairs

National Database Average

Room Capacity
Class Size

0-25  26-30  31-35  36+
0%  2%  43%  27%  55%
Bentley’s Progress on Utility Emissions

Achieved a 70% reduction in net utility emissions since FY07

Net Change in Bentley’s Utility GHGs by Portfolio
FY2007 – FY2014

-22%

Space discipline has avoided emissions

-2%

Energy usage has decreased

-12%

Less carbon-intensive fuel sources have been deployed

-56%

Neutralizing emissions via RECs

70% Since FY2007

2007
SPACE (Avoidance)
CAPITAL (Usage)
OPERATIONS (GHG Intensity)
Balance/Offset
2014

MTCDE
Historically Low Energy User – Peers Now Closer Aligned

Immediate need represents key opportunity to again leap ahead of peers

**Energy Consumption**

<table>
<thead>
<tr>
<th>Year</th>
<th>Peers</th>
<th>Bentley</th>
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<tbody>
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**Historical Investment by System**

- Building Envelope: 63%
- Building Systems: 29%
- Space Renewal: 8%

**Immediate Needs by System**

- Building Envelope: 49%
- Building Systems: 45%
- Space Renewal: 6%

**Regional Energy Peer Group:** Babson College, Bryant University, Fitchburg State University, Olin College of Engineering, University of Hartford, University of New Haven, Worcester State University
Bentley’s Recipe for Success

**KEY FACILITIES STRATEGIES:**

**Effective Space Management:**
- Higher than average room utilization rates
- Opportunity to dramatically increase available classrooms without additional GSF

**Linkage Between Facilities and Sustainability**
- A culture of facilities stewardship that anticipates and addresses building needs
- Annual tracking and reporting connecting facilities investments and sustainability results

**Sustainability Successes:**
- Avoidance of nearly 22% of utility emissions
- Measured approach to campus expansion during master planning process
- Multi-year capital plan to upgrade critical building equipment, increase energy efficiency, reduce operating costs and utility-related emissions
- Effective advocates that have infused sustainability concepts into the decision making processes of senior leadership
FACILITIES CHALLENGES:

• Limited funding for capital investments
• Growing capital backlogs
• “Have” and “Have Not” dichotomy of facilities (post-war vs. Millennial)
• Operating budgets not keeping pace with inflation
  • Reactive operations “putting out fires” increasing facilities overhead costs
• Continuous calls on facilities to do more with less
• The approaching mountain of lifecycle need
SPACE (AVOIDANCE):

- Remove low-quality, non-core facilities
- Improve utilization rates to avoid new construction
- Energy-efficient and “green” design if building new
- Improve building scale with newer facilities
National Facilities Challenges → Sustainability Successes

**Capital/Usage**

- **Renovate/replace mission-critical facilities**
- **Target envelope, building system and utility infrastructure needs in core post-war/modern buildings to reduce risk**
- **Deploy advanced technologies to cut energy usage (geothermal, centralize utilities, heat recovery, etc.)**
- **Coordinate retro-commissioning in millennial bldgs. With first round of modernization upgrades**

**CAPITAL (USAGE):**

- **High-Need Core Buildings**
  - Science & Engineering
  - Residential Life
  - Admin
  - UVM Composite Backing: 55 $/GSF
  - High Need Core Building Avg.: 112 $/GSF

**Constructed Space Since 1880**

- Pre-War: 15%
- Post-War: 40%
- Modern: 20%
- Millennial: 25%

**Mix of Spending in Existing Facilities**

- Building Systems: 32%
- Envelope: 16%
- Utility Infrastructure: 17%
- Space Renewal: 13%
- Other: 22%

**Graphs and Charts**
OPERATIONS (Carbon-Intensity and Offsets):

- Diversify fuel mix with low carbon alternatives to stabilize and/or lower operating costs (fuel switching, PPAs, etc.)
- Utilize operational savings to fund offsets or otherwise balance/neutralize campus emissions
National Facilities Challenges → Sustainability Successes

A unified framework for facilities and sustainability

Conceptual framework for CFOs, Facilities Directors and Campus Sustainability Staff
Questions or Comments