Making Your Campus More Financially and Environmentally Sustainable through Grants, Incentives and Third-Party Financing
Who We Are

Steve Gehringer, Ursinus College

James Hayes, The Stone House Group
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Ursinus College

- 1,500 students from 31 states and 22 countries
- 170-acre suburban campus located 25 miles from downtown Philadelphia
- Residential, private, liberal arts college
- 11:1 Student – faculty ratio
- Ursinus is consistently ranked in the top tier of National Liberal Arts Colleges and was one of five schools designated an “Up and Coming” college by U.S. News & World Report.
THE STONE HOUSE GROUP

- 20 Years
- 300+ Clients
- 2 Offices
- 4 Countries
- 15+ States
- 15,807,400 SF commissioned
- 84 FCAs
- 83 LEED Projects
- 79 Energy Models
Our Higher Ed clients include:

- Gettysburg College
- Moravian College
- Dickinson
- Princeton University
- Lehigh University
- Muhlenberg College
- Pennsylvania State University
- Albright College
- Juniata College
- Saint Joseph's University
- Swarthmore College
- Haverford College
- Villanova University
- Ursinus College
Inputs

- Facilities Condition Assessment (FCA) Update
- RFQ/RFP for Master Planning Partners
- Space Inventory Study
- Energy Audit
- Utility Master Plan

Process

- Master Planning
  - Space Utilization Study
  - Future Program Requirements
  - Connection to downtown revitalization

Steering Committee recommendation to Board of Trustees Evaluation and Approval of Preferred Master Planning Option

Outputs

- Design Standards
- Preferred Facilities & Financial Master Plan Option
- Building Projects
- Timeline & Financial Plan

Adoption of Master Plan and Launch of Next Phase of Capital Campaign
SHG Approach to Energy Management

- View energy management from 4 main perspectives to ensure a comprehensive approach
- Find the balance between financial and environmental sustainability
Annual Main Meter Energy Costs by FY

Total Energy Spend: $1.1M

- Fuel Oil
- Natural Gas
- Electric

Year | Total Energy Spend | Fuel Oil | Natural Gas | Electric
---|--------------------|---------|-------------|--------
2014-15 | $1,100,000 | $300,000 | $200,000 | $600,000
2015-16 | $1,100,000 | $300,000 | $200,000 | $600,000
2016-17 | $1,100,000 | $300,000 | $200,000 | $600,000
Unit Cost of Fuels ($/MMBTU)

New electric contract started July 2017, and runs through June 2020

- Natural Gas: $5.88
- Fuel Oil: $16.44
- Electricity: $24.89

Years:
- FY 2017-18
- FY 2016/17
- FY 2015/16
- FY 2014/15

TBD for FY 2017-18
MBTU per GSF: Colleges and Universities

Surveyed Institutions:
- Babson College
- Bates College
- Dickinson College
- Gettysburg College
- Haverford College
- Moravian College
- Rochester Institute of Technology
- Rutgers University
- St. John’s College
- Swarthmore College
- University of Connecticut
- University of Pennsylvania
- Ursinus College

Average: 78
Energy $/GSF: Colleges and Universities

Surveyed Institutions:
- Babson College
- Bates College
- Dickinson College
- Gettysburg College
- Haverford College
- Moravian College
- Rochester Institute of Technology
- Rutgers University
- St. John’s College
- Swarthmore College
- University of Connecticut
- University of Pennsylvania
- Ursinus College

Ursinus 14/15: $1.36
Ursinus 16/17: $1.23
Ursinus 15/16: $1.22
Avg. $1.31
Upcoming Changes to Campus Energy Costs

- **IDC**: +$100k
- **BPS & BWC AC**: +$17k
- **Commons**: +$36k
- **New Chiller**: -$13k
- **Natural Gas Contract**: -$14k
- **Energy Projects**: -$210k
Utility Master Plan

Summary of Findings
Considered and NOT Recommended

- Monetizing heating and cooling plants by selling energy infrastructure
- Combined Heat and Power (micro-turbine and back-pressure turbine)
- Conversion from steam to hot water distribution
- Full decentralization of boilers
- Conversion from natural gas to biomass or biofuel
Campus Steam System

- Good condition + efficient operation = no major changes
- Recommendations:
  - Reduce outgoing steam pressure
  - Phased transition to decentralized domestic hot water systems with a summer boiler in the Central Boiler Plant to provide steam for re-heats
  - Replace the burner on Boiler #1 with a dual-fuel burner
# Campus Electric System Capacity and Description

- Local Utility Service from PECO, provided at 33,000 Volts

<table>
<thead>
<tr>
<th>Description</th>
<th>Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current limits of PECO peak demand contract:</td>
<td>2,592 kW</td>
</tr>
<tr>
<td>2016/17 Ursinus peak demand</td>
<td>2,310 kW</td>
</tr>
<tr>
<td>Projected 2019 peak with IDC, Commons, and a new chiller</td>
<td>2,700 kW</td>
</tr>
<tr>
<td>Capacity of College’s primary utility transformer</td>
<td>4,750 kW</td>
</tr>
<tr>
<td>(College distribution at 4,160 Volts)</td>
<td></td>
</tr>
<tr>
<td>Capacity of PECO’s metering equipment</td>
<td>4,100 kW</td>
</tr>
<tr>
<td>Ability to upgrade PECO’s CT’s to provide additional capacity</td>
<td></td>
</tr>
</tbody>
</table>
Campus Chilled Water System
Current & Future Capacity requirements

- Decision to add one (1) 750-ton chiller to the Chiller Plant now
- New chiller is 20% more efficient with part and full-load requirements
Energy Efficiency and Conservation Measures
Summary of Energy Efficiency Measures

- Building Automation System (BAS) upgrades, expansion, and optimization
- Complete campus lighting upgrades
- Perform Retro-Commissioning at several facilities
- Reduce steam pressure at Central Heating Plant
- Decentralize water heating during summer months
- Convert constant volume systems to VAV’s (Bakes, Thomas, Berman, etc)
- Create energy & temperature policies
- Install a new chiller at Central CHW Plant
<table>
<thead>
<tr>
<th>ITEM NUM</th>
<th>BUILDING</th>
<th>ENERGY SUB SYSTEM</th>
<th>TRADE</th>
<th>PROJECT DESCRIPTION</th>
<th>ECM COST</th>
<th>IMPACTED SAVINGS</th>
<th>EFF COST</th>
<th>EFF REDUCTION MOTU</th>
<th>RELIC REDUCTION MT CO2</th>
<th>ANNUAL EMISSIONS REDUCTION MT CO2</th>
<th>ANNUAL SAVINGS</th>
<th>PAYBACK PERIOD</th>
<th>ROI %</th>
<th>STATUS</th>
<th>NRE</th>
</tr>
</thead>
<tbody>
<tr>
<td>74</td>
<td>Heating</td>
<td>Generation</td>
<td>IH</td>
<td>Optimizes the steam plant operation.</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>1,987,204</td>
<td>105.7</td>
<td>$10,125</td>
<td>0.00</td>
<td>NA</td>
<td>Yes</td>
<td>Open</td>
<td>Yes</td>
</tr>
<tr>
<td>15</td>
<td>Berman</td>
<td>End Use</td>
<td>IH</td>
<td>Provides a setback schedule for AHU-1 (near entryway/waiting area), AHU-2 (front lobby) and AHU-4 outside non-critical areas. At a minimum, allow closure of the AHU-4 OA damper and AHU-5 OA damper during unoccupied hours.</td>
<td>$5,000</td>
<td>$1,500</td>
<td>$1,500</td>
<td>105,682</td>
<td>27.3</td>
<td>$1,781</td>
<td>0.06</td>
<td>1107%</td>
<td>Open</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>29</td>
<td>Campus</td>
<td>Distribution</td>
<td>IH</td>
<td>Reduces existing opportunities for HVAC optimization, particularly at AHUs providing ventilation air. Only a few schedules are identified as optimal. Savings will be maximized if rooms are provided with corresponding warm-up/down sequences.</td>
<td>$6,000</td>
<td>$600</td>
<td>$600</td>
<td>1,971,000</td>
<td>33.47</td>
<td>$4,605</td>
<td>0.11</td>
<td>93%</td>
<td>Open</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**Sample detail of Energy Capital Investment Plan**

- **Reduced steam pressure (currently 26 psi constant) and reset to lower values based on time (when bicycles are not in use).**
- **Identify the limiting factor related to steam pressure (may vary based on OA conditions/loads).**
- **Water conveyer at higher velocity.**
- **Increased steam pipe velocity and condensate pipe/pump association.**
- **Minimum piping requirements at the active boiler(s).**
- **Detailing factors associated with water tube boilers (may prompt pressure reset based on load), as applicable.**
- **Level of superficial inspection (if any) to prevent condensation in distribution systems.**

**SHO 05/05/18:** Shouting discussion questions capability at boiler to operate at reduced pressure. Opportunities to reduce pressure at the plant have been discussed. This will reduce energy losses associated with distribution and condensation.
## Energy Capital Investment Plan

<table>
<thead>
<tr>
<th>ITEM NUM</th>
<th>BUILDING</th>
<th>ENERGY SUB SYSTEM</th>
<th>TRADE</th>
<th>PROJECT DESCRIPTION</th>
<th>ECM COST</th>
<th>INCENTIVE SAVINGS</th>
<th>EFF. COST</th>
<th>N.O. REDUCT. METU</th>
<th>ELECT. REDUCT. MMM</th>
<th>ANNUAL EMISSIONS REDUCTION MT CO₂</th>
<th>ANNUAL SAVINGS</th>
<th>PAYBACK PERIOD</th>
<th>ROI%</th>
<th>STATUS</th>
<th>INCL</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>47</td>
<td>Campus</td>
<td>Distribution</td>
<td>ATC</td>
<td>Provide CO2 control at the identified AHRUs (breathing zone). Cycle AHRUs off when temperatures and CO2 concentration are acceptable at the breathing zone (reduce zone damper minimum to zero where terminal units apply).</td>
<td>$24,000</td>
<td>$2,533</td>
<td>$21,467</td>
<td>$21,600</td>
<td>$6,650</td>
<td>72.3</td>
<td>$7,675</td>
<td>2.73</td>
<td>37%</td>
<td>Open</td>
<td>Yes</td>
<td>NOTE: cost analysis excludes entities identified elsewhere as independent ECM (e.g., Gilman and Warren). Excluding noted buildings, 11 AHRUs (19 zones) and 192 equivalent meter HP remain. Incl. utility billing at any instance not yet implemented where zone CO2 sensors already exist. 512 per meter DCY incentive from PECO.</td>
</tr>
<tr>
<td>0</td>
<td>Athletics</td>
<td>Distribution</td>
<td>H</td>
<td>Install VAVs at AHU-1 and AHU-4 (coordinate with separate recommendations for usage of humidifiers/cooling). Operate fan speed based on the highest zone error (offset from setpoint).</td>
<td>$15,000</td>
<td>$2,654</td>
<td>$12,346</td>
<td>$8,712</td>
<td>9.0</td>
<td>$4,408</td>
<td>2.03</td>
<td>34%</td>
<td></td>
<td></td>
<td></td>
<td>Estimated (two) savings only. Project will require further analysis of feasibility related to savings and potential capital measures. 125 per HP YTD incentive from PECO.</td>
</tr>
<tr>
<td>19</td>
<td>Myrin</td>
<td>Distribution</td>
<td>H</td>
<td>Install CO2 sensors at enclosed building zones to control the OA damper at all points and VAV minimum at the basement and 2nd floor.</td>
<td>$7,500</td>
<td>$562</td>
<td>$5,938</td>
<td>$150,000</td>
<td>$5,280</td>
<td>25.8</td>
<td>$5,067</td>
<td>3.28</td>
<td>30%</td>
<td>Open</td>
<td>Yes</td>
<td>Ensure any make-up/pressurization requirements are maintained. Return air mass flow rate may be suitable for low open. Note: 50% DCY incentive from PECO.</td>
</tr>
<tr>
<td>6d</td>
<td>Chiller plant</td>
<td>Generation</td>
<td>H</td>
<td>Optimise the chiller plant operation.</td>
<td>$5,900</td>
<td>$60</td>
<td>$5,840</td>
<td>$11,700</td>
<td>2.8</td>
<td>$917</td>
<td>8.75</td>
<td>27%</td>
<td></td>
<td>Open</td>
<td>Yes</td>
<td>Use both cells regardless of number of chillers in operation. Control for an approach temperature rather than a constant condenser LVDT setpoint (set at 75). Lower the minimum condenser LVDT setpoint to the manufacturer's minimum limit. Improve chiller pump unloading (at low load, both pumps observed in operation at minimum speed). Review the bypass valve R/D loop control to reduce hunting (controls for evaporator and). Implement a chilled water reset based on building demand. Optimize chiller loading and unloading via fluid demand. Calibrate the flow meter (not accurate).</td>
</tr>
<tr>
<td>62</td>
<td>Campus</td>
<td>End Use</td>
<td>Misc</td>
<td>Complete &quot;ECM Ind&quot; items of the Operation and Control Recommendations.</td>
<td>$26,000</td>
<td>$1,750</td>
<td>$15,250</td>
<td>$100,000</td>
<td>20,000</td>
<td>16.3</td>
<td>$4,372</td>
<td>4.27</td>
<td>23%</td>
<td>Open</td>
<td>Yes</td>
<td>Savings are estimated only—measures generally apply to systems not operating per a defined basis.</td>
</tr>
<tr>
<td>109</td>
<td>Richter/ North</td>
<td>End Use</td>
<td>Dec</td>
<td>Retrofit building fixtures utilizing CTLs and linear fluorescent with LED.</td>
<td>$16,766</td>
<td>$4,453</td>
<td>$12,313</td>
<td>$3,952</td>
<td>9.2</td>
<td>$5,600</td>
<td>4.04</td>
<td>22%</td>
<td></td>
<td></td>
<td></td>
<td>Savings not estimated—measures generally apply to systems not operating per a defined basis.</td>
</tr>
<tr>
<td>4</td>
<td>Athletics</td>
<td>End Use</td>
<td>Dec</td>
<td>Replace/refit building lighting fixtures.</td>
<td>$200,974</td>
<td>$17,059</td>
<td>$223,022</td>
<td>$341,303</td>
<td>29.0</td>
<td>$35,694</td>
<td>5.16</td>
<td>19%</td>
<td></td>
<td>Open</td>
<td>Yes</td>
<td>Dust analyts per Greenleaf findings. Note savings are not linked to upgrade based on varying electricity unit costs. 1996-0427/ED: Fitness Center gymwali.</td>
</tr>
<tr>
<td>3</td>
<td>Campus</td>
<td>Distribution</td>
<td>Mech</td>
<td>Install radiant at building service entrance steam gate valves throughout.</td>
<td>$5,900</td>
<td>$5,900</td>
<td>$590</td>
<td>$199,458</td>
<td>119.9</td>
<td>$1,037</td>
<td>12.11</td>
<td>19%</td>
<td></td>
<td>Open</td>
<td>Yes</td>
<td>See Thermovix or Unitherm product lines or similar.</td>
</tr>
<tr>
<td>120</td>
<td>Warner</td>
<td>End Use</td>
<td>Misc</td>
<td>Upgrade lighting throughout facility to LED.</td>
<td>$35,000</td>
<td>$2,500</td>
<td>$35,000</td>
<td>$100,000</td>
<td>33.3</td>
<td>$16,100</td>
<td>5.02</td>
<td>17%</td>
<td></td>
<td>Open</td>
<td>Yes</td>
<td>Use LED and/or smoke detectors. Combine with pressure control for AC-2. UPDATE: Standing pilots may affect feasibility. 500 per HP YTD incentive from PECO. For interior exhaust HP (UFA#18; Cost adjusted (lowered) per updated information received).</td>
</tr>
<tr>
<td>122</td>
<td>Warner</td>
<td>End Use</td>
<td>Misc</td>
<td>Provide variable speed exhaust for the bake shop fan.</td>
<td>$5,000</td>
<td>$500</td>
<td>$5,000</td>
<td>$105,620</td>
<td>96.5</td>
<td>$599</td>
<td>6.32</td>
<td>15%</td>
<td></td>
<td>Open</td>
<td>Yes</td>
<td>Applies to dual-fuel (2x) boilers. Review boiler/burner capabilities with manufacturer as applicable.</td>
</tr>
<tr>
<td>76</td>
<td>Heating Plant</td>
<td>Generation</td>
<td>Mech</td>
<td>Provide O₂ trim control for boiler. B-2 (dual fuel) to maintain peak combustion efficiency during continuous stack measurement.</td>
<td>$35,000</td>
<td>$0</td>
<td>$35,000</td>
<td>$12,000</td>
<td>$27,503</td>
<td>$4,760</td>
<td>4.15</td>
<td>15%</td>
<td></td>
<td>Open</td>
<td>Yes</td>
<td>See lighting table summary for operating hours and values used. Favorable payback tied largely to areas with the greatest usage. 5% per screen in LED and 7% per linear fixture incentive from PECO.</td>
</tr>
<tr>
<td>83</td>
<td>Muzer</td>
<td>Distribution</td>
<td>Var</td>
<td>Insulate the boiler room heating and domestic hot water piping. Block the oven hearer to the exterior if not utilized.</td>
<td>$300</td>
<td>$41</td>
<td>$290</td>
<td>$14,000</td>
<td>112</td>
<td>$135</td>
<td>6.36</td>
<td>15%</td>
<td></td>
<td>Open</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>73</td>
<td>Facilities</td>
<td>End Use</td>
<td>Misc</td>
<td>Upgrade lighting throughout facility to LED.</td>
<td>$25,000</td>
<td>$100</td>
<td>$34,700</td>
<td>$100,000</td>
<td>33.3</td>
<td>$1,760</td>
<td>12.0</td>
<td>15%</td>
<td></td>
<td>Open</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>85</td>
<td>Muzer</td>
<td>End Use</td>
<td>Flac</td>
<td>Retrofit building fixtures utilizing CTLs and linear fluorescent with LEDs.</td>
<td>$2,350</td>
<td>$765</td>
<td>$1,584</td>
<td>$2,706</td>
<td>0.7</td>
<td>$210</td>
<td>6.71</td>
<td>15%</td>
<td></td>
<td>Open</td>
<td>Yes</td>
<td>See lighting table summary for operating hours and values used. Favorable payback tied largely to areas with the greatest usage. 5% per screen in LED and 7% per linear fixture incentive from PECO.</td>
</tr>
<tr>
<td>Building</td>
<td>Priority</td>
<td>Energy Impact</td>
<td>Issue</td>
<td>Updates</td>
<td>Status</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Chiller Plant</td>
<td>1.4 (3)</td>
<td>High</td>
<td>Review the condenser water conductivity. Displayed values were at alarm conditions.</td>
<td>Review condenser water conductivity.</td>
<td>Open</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Berman</td>
<td>1</td>
<td>High</td>
<td>Raise the AHU-4 dehumidification setpoint from 40% It appears this is maintaining the DAT at the low end of the reset (55 F) while all terminal units downstream demand heat (note type of reset not apparent to indicate the extent to which the DAT will increase).</td>
<td>Raise the dehumidification setpoint.</td>
<td>Open</td>
<td></td>
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</tr>
<tr>
<td>Berman</td>
<td>2</td>
<td>Low</td>
<td>Consider reviewing ventilation control at AHU-4 and sensor (CO2 and AFMS) calibration:</td>
<td>Rectify control</td>
<td>Open</td>
<td></td>
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<td></td>
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<td></td>
<td>• The BMS indicates a RA CO2 in excess of 1,000 while the OA damper remains fully open. This likely exceeds the design intent.</td>
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<tr>
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<td></td>
<td>• The OA cfm indicates a value averaging approximately 30 cfm (damper position 100% open) compared to a setpoint of approximately 300 cfm and a scheduled design of 900 cfm.</td>
<td></td>
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<td>• The AFMS input fluctuates rapidly between zero and 60 cfm.</td>
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</tr>
<tr>
<td>Berman</td>
<td>3</td>
<td></td>
<td>AHU-4 zone 1 displays a high humidity condition while indicating the lowest of the three duct sensors.</td>
<td>Investigate point.</td>
<td>Open</td>
<td></td>
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</tr>
</tbody>
</table>

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Sample Detail of BAS Control Recommendations
Provide demand-controlled ventilation

- Myrin Library
- Air handling unit ventilation rates are designed to maintain adequate ventilation during design occupancy levels. DCV sequencing through zone CO2 sensors enables reductions in ventilation air (and associated heating and cooling loads).
- This ECM can provide a rapid payback due to the large, open nature of the spaces.
Replace the track metal halide lighting with LEDs

- Replacing the current 1,500 W fixtures with LED fixtures (567 W each) will provide immediate energy savings. Additional savings will be realized through a reduced re-lamping frequency.

- Opportunities may also exist for bi-level lighting to provide safety while increasing output as needed. Lights currently operate all evenings.
Provide occupancy-based operation at the Field House

- Occupancy sensors are recommended at the field house to limit space lighting and index AHUs to a standby mode with relaxed setpoints and reduced fan energy.
- These control measures will be coupled with related components (eg daylight sensors for perimeter lights, CO2 sensors for ventilation savings).
Optimize VAV Control

- VAVs observed throughout use a staged method of heating in which airflow is increased when heating is required. While this can increase the VAV capacity, it also consumes a greater amount of energy input (related to heating, cooling and fan energy) per BTU of heat provided to the space.

- Optimized control can increase airflow only when this capacity is required or as needed to prevent stratification by supply air that is excessively warm.
## Energy Efficiency Measures Savings

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy Projects, Total Cost</td>
<td>$1,300,000</td>
</tr>
<tr>
<td>15% Electric Savings</td>
<td>($91,000)</td>
</tr>
<tr>
<td>25% Natural Gas Savings</td>
<td>($69,000)</td>
</tr>
<tr>
<td>Electric Procurement Savings (after 2020)</td>
<td>($50,000)</td>
</tr>
<tr>
<td>Estimated Annual Energy Savings</td>
<td>($210,000)</td>
</tr>
</tbody>
</table>
Financing Options that were quickly eliminated

ESCO / PPA / ESA
- High cost of implementation
- Burdensome contracting process
- High cost of on-going M&V
- Less flexibility to substitute projects
- Less ability to self-perform work

Energy Lease or Energy Projects Loan Identified as the preferred structure.
## Energy Financing Options (2017)

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ursinus College Self-Finance</td>
<td>Borrow from Unrestricted Reserves and Payback Energy Savings</td>
</tr>
<tr>
<td>Line of Credit, Existing Bank</td>
<td>Creates lack of alignment with sources and users</td>
</tr>
<tr>
<td>Energy Lending Firm # 1, Capital Lease</td>
<td>4.25% over 5 years</td>
</tr>
<tr>
<td>Energy Lending Firm #2, Energy Loan</td>
<td>9.43% over 7 years</td>
</tr>
<tr>
<td>Sustainable Energy Fund</td>
<td>4% over 5 years</td>
</tr>
<tr>
<td>Energy Lending Firm #3, Energy Loan</td>
<td>5.75% over 10 years</td>
</tr>
</tbody>
</table>
Borrowing from the SEF allows Ursinus to meet Bond Covenants

- Non-recourse financing
- Secured against equipment installed
  - Not borrowed against existing buildings or property
- Cash flow positive
- No prepayment penalty
- Preserves Ursinus Capital for other projects identified in the Campus Master Plan
Advantages to Financed Energy Project Implementation

- Modernizes Facilities & Optimizes Energy Performance With New Technology
- Reduces Cycle Maintenance with Upgraded Equipment
- Ability to complete energy projects in-house and with outside contractors
- Utilizes 3rd Party Energy Financing Preserves Capital Budget Ability to leverage Utility Incentives
Projects Completed to Date

**LED Lighting Upgrades:**
- Floy Lewis Bakes
- Bomberger
- Richter/North
- Musser
- BPS
- BWC
- Olin
- Facilities
- Kaleidoscope
- New Hall
- Off-Campus Houses

**HVAC / Controls:**
- Steam pipe insulation
- VFD Drives
- Boiler #1 Conversion to Gas

**Next Up:**
- RCx
- Chiller Plant Optimization
Measurement & Verification: Lighting

**Bomberger Entry Lobby**

The graph shows the energy usage pattern in the Bomberger Entry Lobby from 8/6/2018 to 7/6/2019. The x-axis represents the date and time, while the y-axis represents the kWh usage. The graph indicates fluctuations in energy consumption over the specified period.
Measurement & Verification: Lighting

Kaleidoscope Plaza Circuit #7

KWh's

8/6/2018 0:00 9/6/2018 0:00 10/6/2018 0:00 11/6/2018 0:00 12/6/2018 0:00 1/6/2019 0:00 2/6/2019 0:00 3/6/2019 0:00 4/6/2019 0:00 5/6/2019 0:00 6/6/2019 0:00 7/6/2019 0:00
Thank you! Questions?

Steve Gehringer, Ursinus College

James Hayes, THE STONE HOUSE GROUP
hayes@theshq.com  610-868-9600

Please visit THE STONE HOUSE GROUP’s booth in the Reception Gallery!