MBA SUSTAINABILITY

12-month accredited MBA emphasizing ethical management of financial, social, environmental and informational resources.

Advance best practices
Experience globalism
Solve real-world problems

Ignite your career
Master MBA essentials

CONSULTING CLIENTS
Conference
Allegheny County
Auberle
Bayer Material Science
Carnegie Museums of Pittsburg
A focus on developing...

**Sustainable Operations**

**Our Agenda**

**Demonstrated abilities for:**

1. Managing strategy and innovation
2. Build the business
3. Process improvement
4. Operational excellence

How to Green Your Business Operations
Partners in active learning

Pittsburgh Green Innovators
a collaborative for living, learning, and earning
Integrated Bottom Line Reporting  
- PPG Industries, Alcoa, UPMC

Zero Waste Initiatives  
- Westinghouse, Google/Parkhurst, Tsudis Chocolate

Ecological Footprint (LCA, EPD)  
- Alcoa, Heinz, UPMC, PPG, Eat’n Park, Medrad, Giant Eagle

Carbon/Green House Gas Emissions  
- Heinz, Westinghouse, FedEx, Eat’n Park, Tower Financial Group, CNX Gas

New Product Development & Marketing  
- Alcoa, Bayer, PNC, Medrad, Eat’n Park, eLoop, Evolve EA, Maryland Refractories, PA Environmental Council

Social Entrepreneurism  
- Phipps Conservatory, Idea Foundry, Venture Outdoors, Evive, Sustainable Pittsburgh, Idea Foundry

Supply Chain Management  
- FedEx, Auberle, Westinghouse, PNC, Green Building Alliance, Therm-O-Rock

Systemic Change Management  

Healthy & Productive Facilities  
- GE, Green Building Alliance, YWCA, Phipps Conservatory, UPMC

Tie theory to practice via Live Problem-solving
The 2030 Challenge: Economic Benefits

Green Building Alliance
Why 2030?

- Social and environmental value
- Economic value added
  - Cost benefits
  - Increased green jobs from construction
- Retrofit and sustainability trends
Influence Factors Behind Retrofits

- **Utility Cost Savings (energy bills, etc.):**
  - Some: 17%
  - Good Deal: 32%
  - Major: 43%

- **Market Differentiation:**
  - Some: 28%
  - Good Deal: 28%
  - Major: 17%

- **Employee/Occupant Satisfaction/Productivity:**
  - Some: 29%
  - Good Deal: 33%
  - Major: 9%

- **Utility Incentives:**
  - Some: 30%
  - Good Deal: 26%
  - Major: 11%

- **Improved Asset Value:**
  - Some: 33%
  - Good Deal: 22%
  - Major: 8%

- **Tax Incentives:**
  - Some: 22%
  - Good Deal: 16%
  - Major: 10%

Areas of Focus – Employment Estimates by Percentage for Each Retrofit Category

<table>
<thead>
<tr>
<th>EE Technology Group</th>
<th>Industry Composition in I-O Model (Direct Impacts)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lighting</strong></td>
<td>70% lighting fixture manufacturing, 30% installation</td>
</tr>
<tr>
<td><strong>HVAC</strong></td>
<td>24% air purification and ventilation equipment, 23% heating equipment, 23% air conditioning and refrigeration equipment, 30% installation</td>
</tr>
<tr>
<td><strong>Water Heating</strong></td>
<td>35% power boilers, 35% water heaters (except boilers), 30% installation</td>
</tr>
<tr>
<td><strong>Office Equipment</strong></td>
<td>28% photocopying equipment, 28% computer equipment, 7% telephone apparatus, 7% other communications equipment, 30% installation</td>
</tr>
<tr>
<td><strong>Envelope Improvements</strong></td>
<td>8% window manufacturing, 8% insulation, 2% roofing materials, 2% painting and coating materials, 80% installation</td>
</tr>
</tbody>
</table>

Jobs Created Per $1 Million Spent on Commercial Retrofits

<table>
<thead>
<tr>
<th>EE Technology Group</th>
<th>Direct Employment per $1 million</th>
<th>Indirect Employment per $1 million</th>
<th>Induced Employment per $1 million</th>
<th>Total Employment per $1 million</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lighting</strong></td>
<td>5.1</td>
<td>4.2</td>
<td>3.7</td>
<td>13.0</td>
</tr>
<tr>
<td><strong>HVAC</strong></td>
<td>5.3</td>
<td>4.2</td>
<td>3.8</td>
<td>13.3</td>
</tr>
<tr>
<td><strong>Motors &amp; Drives</strong></td>
<td>4.5</td>
<td>3.9</td>
<td>3.4</td>
<td>11.9</td>
</tr>
<tr>
<td><strong>Water Heating</strong></td>
<td>5.0</td>
<td>4.1</td>
<td>3.6</td>
<td>12.6</td>
</tr>
<tr>
<td><strong>Office Equipment</strong></td>
<td>3.8</td>
<td>3.7</td>
<td>3.0</td>
<td>10.5</td>
</tr>
<tr>
<td><strong>Environmental Controls</strong></td>
<td>5.0</td>
<td>4.3</td>
<td>3.7</td>
<td>13.0</td>
</tr>
<tr>
<td><strong>Envelope Improvements</strong></td>
<td>7.7</td>
<td>3.9</td>
<td>4.7</td>
<td>16.3</td>
</tr>
<tr>
<td><strong>Straight Average</strong></td>
<td>5.1</td>
<td>4.0</td>
<td>3.7</td>
<td>12.8</td>
</tr>
<tr>
<td><strong>Weighted Average</strong></td>
<td>5.7</td>
<td>4.1</td>
<td>3.9</td>
<td>13.7</td>
</tr>
</tbody>
</table>

## Technological Innovation: Supportive sustainable initiatives

Which of the following energy and environment management activities is your company currently investing in to support green initiatives?

<table>
<thead>
<tr>
<th>Activity</th>
<th>Achievers</th>
<th>Planners (n = 75)</th>
<th>Stragglers (n = 11)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improve facility energy efficiency</td>
<td>91%</td>
<td>75%</td>
<td></td>
</tr>
<tr>
<td>Improve equipment servicing and maintenance</td>
<td>45%</td>
<td>63%</td>
<td>77%</td>
</tr>
<tr>
<td>Improve space utilization (i.e., space optimization)</td>
<td>36%</td>
<td>63%</td>
<td>75%</td>
</tr>
<tr>
<td>Reduce solid waste</td>
<td>70%</td>
<td>61%</td>
<td></td>
</tr>
<tr>
<td>Improve manufacturing process performance</td>
<td>70%</td>
<td>64%</td>
<td></td>
</tr>
<tr>
<td>Reduce water consumption</td>
<td>68%</td>
<td>44%</td>
<td>49%</td>
</tr>
<tr>
<td>Improve hazardous inventory assessment or impact analysis</td>
<td>52%</td>
<td>49%</td>
<td></td>
</tr>
<tr>
<td>Reduce liquid waste</td>
<td>48%</td>
<td>48%</td>
<td></td>
</tr>
<tr>
<td>Publish sustainability report</td>
<td>35%</td>
<td>41%</td>
<td></td>
</tr>
<tr>
<td>Implement alternative or renewable energy sources</td>
<td>25%</td>
<td>41%</td>
<td></td>
</tr>
<tr>
<td>Track and manage greenhouse gas emissions</td>
<td>25%</td>
<td>19%</td>
<td></td>
</tr>
<tr>
<td>Engage in carbon trading initiatives</td>
<td>23%</td>
<td>9%</td>
<td></td>
</tr>
</tbody>
</table>

Source: IBM
## Master ROI Table

See for yourself and... spread the word. If you would like to reference this table on your website or forum, please feel free to link in or see our Share ROI Tables page, but do not just copy the tables without permission.

<table>
<thead>
<tr>
<th>GREEN 'Tune-Up'</th>
<th>Payback Time in Years</th>
<th>Added Cost</th>
<th>Annual SAVINGS</th>
<th>10 Year SAVINGS</th>
<th>Return on Investment (ROI):</th>
</tr>
</thead>
<tbody>
<tr>
<td>Programmable Thermostat</td>
<td>0.6</td>
<td>$115</td>
<td>$180</td>
<td>$1,800</td>
<td>156.5%</td>
</tr>
<tr>
<td>Standby Power Reduction</td>
<td>0.8</td>
<td>$20</td>
<td>$24</td>
<td>$240</td>
<td>120%</td>
</tr>
<tr>
<td>Compact Fluorescent Lighting</td>
<td>0.8</td>
<td>$60</td>
<td>$80</td>
<td>$800</td>
<td>133.3%</td>
</tr>
<tr>
<td>Hot Water Heater ‘Blanket’</td>
<td>0.8</td>
<td>$25</td>
<td>$30</td>
<td>$300</td>
<td>120%</td>
</tr>
</tbody>
</table>

### TOTAL SAVINGS and Average Payback / ROI

<table>
<thead>
<tr>
<th>Payback Time in Years</th>
<th>Added Cost</th>
<th>Annual SAVINGS</th>
<th>10 Year SAVINGS</th>
<th>Return on Investment (ROI):</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.2</td>
<td>$1,320</td>
<td>$1,136</td>
<td>$11,360</td>
<td>96.5%</td>
</tr>
</tbody>
</table>

See the Return on Investment rankings to help you decide...
Low-Cost Energy Efficiencies

Low / No-cost Operational Changes Could Double Energy Efficiency in Commercial Buildings

Retrofit vs. Operational Savings Potential Split

Half of Savings Potential Largely Ignored

Most Common Operational Savings
- HVAC Scheduling
  60% of sampled buildings were ready for occupancy an hour or more before people arrive and after they leave.
- Equipment Sequencing
  Over 60% of sampled buildings had equipment that was improperly sequenced, running less efficient equipment when not required.
- Simultaneous Heating & Cooling
  Many buildings use heating systems during 70+ degree outside temperatures, with cooling systems working in overdrive to compensate.

FirstFuel Sample Building Portfolio (60M SQFT)
51% of all energy efficiency savings in commercial buildings are achievable through low/no-cost operational improvements. The portfolio above represents $12M in operational savings potential, with a substantial return on investment.

Source: First Fuel Building Energy Analytics, Business Wire
SUSTAINABILITY EFFORTS IN PHYSICIAN’S SERVICES DIVISION
Physician’s Services Division

Manages over 450 offices & facilities

Community

- Diverse Workforce
- Leadership Tools
- Economic Development
- Community Social Responsibility

CUSTOMER

- Quality Care
- Premium Health Services
## Pilot Program

<table>
<thead>
<tr>
<th>Item</th>
<th>1 Facility</th>
<th>8 Facilities</th>
<th>25 Facilities</th>
<th>450 Facilities</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Smart Meter</strong></td>
<td>$500</td>
<td>$4,000</td>
<td>$12,500</td>
<td>$225,000</td>
</tr>
<tr>
<td><strong>Software</strong></td>
<td>1,500</td>
<td>1,500</td>
<td>1,500</td>
<td>1,500</td>
</tr>
<tr>
<td><strong>Lights</strong></td>
<td>4,725</td>
<td>37,800</td>
<td>118,125</td>
<td>2,126,250</td>
</tr>
<tr>
<td><strong>Auto Towel Dispenser</strong></td>
<td>80</td>
<td>1,280</td>
<td>4,000</td>
<td>72,000</td>
</tr>
<tr>
<td><strong>High Efficiency Flush</strong></td>
<td>250</td>
<td>4,000</td>
<td>12,500</td>
<td>225,000</td>
</tr>
<tr>
<td><strong>Light Sensor</strong></td>
<td>240</td>
<td>1,920</td>
<td>6,000</td>
<td>108,000</td>
</tr>
<tr>
<td><strong>Tile Carpeting</strong></td>
<td>2,250</td>
<td>18,000</td>
<td>56,250</td>
<td>1,012,500</td>
</tr>
<tr>
<td><strong>Eco Power Faucet</strong></td>
<td>825</td>
<td>13,200</td>
<td>41,250</td>
<td>742,500</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>$10,370</td>
<td>$81,700</td>
<td>$252,125</td>
<td>$4,512,750</td>
</tr>
</tbody>
</table>
## Simple Payback and ROI

<table>
<thead>
<tr>
<th>Project</th>
<th>Expected Saving</th>
<th>Simple Payback</th>
<th>ROI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lighting Retrofit</td>
<td>15%</td>
<td>6 months</td>
<td>200%</td>
</tr>
<tr>
<td>High Efficiency (Toilets, Paper Towel Dispensers, Faucets)</td>
<td>25%</td>
<td>4 years</td>
<td>25%</td>
</tr>
<tr>
<td>Full</td>
<td>30%</td>
<td>3.3 years</td>
<td>30.3%</td>
</tr>
</tbody>
</table>
## Net Present Value for Investment

<table>
<thead>
<tr>
<th></th>
<th>8 Facilities</th>
<th>25 Facilities</th>
<th>450 Facilities</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Initial Cost</strong></td>
<td>$81,700</td>
<td>$252,125</td>
<td>$4,512,750</td>
</tr>
<tr>
<td><strong>Tot Annual Energy Costs</strong></td>
<td>$444,067</td>
<td>$1,387,709</td>
<td>$25,058,730</td>
</tr>
<tr>
<td><strong>Savings</strong></td>
<td>30%</td>
<td>30%</td>
<td>30%</td>
</tr>
<tr>
<td><strong>Annual Savings</strong></td>
<td>$133,220</td>
<td>416312.7</td>
<td>$7,517,619</td>
</tr>
<tr>
<td><strong>Discount Rate</strong></td>
<td>3.86%</td>
<td>3.86%</td>
<td>3.86%</td>
</tr>
<tr>
<td><strong>Time Period (years)</strong></td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td><strong>NPV</strong></td>
<td>$494,619</td>
<td>$1,548,755</td>
<td>$28,005,380</td>
</tr>
</tbody>
</table>
Scorecard

- Methodology
  - Based on LEED Standards
    - Designed to:
      - Lower operating costs
      - Reduce Waste
      - Conserve Energy & Water
      - Be Healthier and Safer for Occupants
      - Reduce Greenhouse Gas Emissions
      - Qualify for Tax Incentives

- UPMC Scorecard 4.4.13.xlsb

http://new.usgbc.org/leed
## Facilities Scorecard

<table>
<thead>
<tr>
<th>Description</th>
<th>Yes/No</th>
<th>Possible Points</th>
<th>Bronze</th>
<th>Silver</th>
<th>Gold</th>
<th>Platinum</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Have daylight accessible to at least 50% of our occupants</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Provide shading devices or tinted windows to control sunlight</td>
<td>0</td>
<td><strong>Possible</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Ensure all our applicable interior lighting is CFL, LED or better</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Have common area lighting on automatic timers and occupancy sensors</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Use automatic controls, timers or a building automation system for our primary HVAC</td>
<td>1</td>
<td><strong>Possible points</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Have wrapped and/or insulated ductwork</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Prioritize purchasing paper, toner cartridges and other office supplies made from recycled content</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50. Have preferred parking for fuel-efficient vehicles and carpooling</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>51. Promote and/or incentivize carpooling and carsharing</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>52. Have on-site shower facilities</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>53. Have on-site bike storage</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>54. Completed facility renovations and additions that exceeded code requirements for energy efficiency</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Bronze: 20-24 / Silver: 25-29 / Gold: 30-39 / Platinum: 40-54**

**Current Score:** 32
**Possible score:** 54
**Percentage:** 59%
Dashboards

Overview

Benchmarks

Research

Recommendations

Timeline
Benefits of Scorecard

- Decrease energy costs
- Engage employees
- Communicate commitment to sustainability
- Identify internal benchmarks
Criteria for Success
An exploration of sustainable strategies for GE North American Headquarters

New design
Strategically aligned
Reliably implemented
Serves as a benchmark for other GE headquarters
Current Site Consumption

<table>
<thead>
<tr>
<th>Utility</th>
<th>Total Estimated Costs</th>
<th>Usage</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity*</td>
<td>$269,175.35</td>
<td>2,785,000</td>
<td>kWh</td>
</tr>
<tr>
<td>Gas</td>
<td>$12,523.66</td>
<td>1065</td>
<td>MCF</td>
</tr>
<tr>
<td>Water / Sewer</td>
<td>$8,954.76</td>
<td>662,000</td>
<td>Gallons</td>
</tr>
</tbody>
</table>

*Electricity costs do not account for missing statement for June 2013
Site Solar Analysis

- Existing site: 12 Acres
- Existing roof area: 67,064 sq.ft.
- Potential parking lot cover area: 108,129 sq.ft.
- Total potential PV coverage area: 175,193 sq.ft.
What could be...

rethinking the built and natural environment.
Existing Site HVAC Analysis

Existing building est.1976
• All existing HVAC equipment is original
• Existing GE space 2-40T HVAC units and 2-60T HVAC units
• 13 smaller electric HVAC units exist over former Comcast space
HVAC Alternative Strategies

- Passive Solar / Radiant heating
- Passive Cooling
- Zoned Heating and Cooling
- Phase Change Material
Passive Solar / Radiant Heating

**Systems**
- Flat Plate Collectors
- Evacuated Tube Collectors

**Benefits**
- Heating without fossil fuel use
- No carbon monoxide / dioxide emissions
- Ease of maintenance, and operation
- Free hot water year round
- Helps to regulate temperature swings
Passive Cooling Strategies

About 1/3 of the unwanted heat comes in through the roof

Roughly 40% of the unwanted heat comes in through windows

Window films are an effective, low-cost solution to reducing direct solar heat gain while allowing natural light into the space

Operable windows and automated controls allow for buildings to self regulate temperature and optimize HVAC use
Zoned Heating and Cooling

**Duct-less mini split units**

- Air condition / heat each room individually
- Each zone independently controlled
- Allows option for only rooms in use to be heated or cooled
- Easier to cycle / regulate building temperature
- Existing ductwork systems naturally incur a loss of conditioned air, sometimes up to 30%
Project Scopes: Energy efficiency

- Lighting/day
- Passive ventilation
- Power
- Rainwater reuse
Measuring Outcomes: Lighting upgrades

• Estimated cost: $161,700

• **Savings from recovered wages (10-15%)**:
  – $257,000 - $385,500/year

• **ROI**: 159 – 238%

• **Payback Period**: 1.3– 1.8 years
Energy Dashboards

Benefits

• Reduce energy usage
• Conserve natural resources
• Culture of sustainability
• Reduces operating costs
• Historical performance data
• Improve LEED ratings
• Monitor the performance of green technology
### GE’s Assets/Core Competencies

<table>
<thead>
<tr>
<th>Implementation/Time Frame</th>
<th>High</th>
<th>Medium</th>
<th>Low</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Short</strong></td>
<td>Energy efficient appliances</td>
<td>Interior layout modifications and upgrade interior materials</td>
<td>Solar window films</td>
</tr>
<tr>
<td></td>
<td>• Lighting</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Automation</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Open windows</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Medium</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><em><em>InSight</em>: Knowledge Management Solution</em>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Long</strong></td>
<td>Renewable energy</td>
<td>Passive heating and cooling technology</td>
<td>Trombe wall</td>
</tr>
</tbody>
</table>

GE/McKinsey Matrix
Systems Solutions for an Innovative Workplace
Disengagement is expensive, costing $450 to $550 billion annually. According to Gallup in 2013, 70% of employees are disengaged!
**Action Plan:** Leverage systems for sustainable workplace improvement

- **Greenery**
  - Bring the outside inside

- **Lighting**
  - Work smarter, not brighter

- **Wellness Programs**
  - Shape-up Health Ahead

- **Employee Engagement**
  - Game the system
  - Create a Green Team
Benchmark: Firms save big with wellness programs

IBM saved $190 million in health care costs through wellness programs in 2009 (Mercola, 2013)

- Pays employees to take online wellness courses
- Mandates online health assessment for new employees
- Helps with healthy eating options, tracking, and goals
**Finding:** Wellness programs boost workplace morale and profitability

- **Program participants save employers 20% in insurance costs**
  - Mercola, 2013

- **Exercise enhances employee performance**
  - American College of Sports Medicine, 2005

- **Top 100 companies promote comprehensive health initiatives**
  - Great Place to Work, 2013

---

**Employee Wellness**

In 2013, the number of the **100 Best Workplaces** that...

- **55** Offer incentives
  - The average reward is $450. The largest reward is $2350

- **33** Defray health premiums

- **73** Provide on-site fitness centers

- **28** Offer family gym access

- **63** Subsidize off-site fitness

- IMAGE: Great Place to Work
Partners in active learning

Pittsburgh Green Innovators
a collaborative for living, learning, and earning

MARYLAND REFRACTORIES CO.
WE CAN PROCESS YOUR REJECTS
Our charge as operations managers

Boost Bottom Lines...

... for prosperity today & tomorrow

1. Inspire innovation – systems & design thinking for responsible change
2. Build business – competitive advantage
3. Streamline systems – process improvement
4. Cut costs – operational excellence

Dr. Robert Sroufe
Murrin Chair of Global Competitiveness
MBA Sustainability Program
sroufer@duq.edu
(412) 396-1909
Transformational learning is a tool of mutual benefit to both potential project partners and the Donahue Graduate School of Business. It is a combination of cutting-edge research, enlightened faculty leadership, community participation, and savvy MBAs.

**Mission:** To use the challenges facing project partners as opportunities to integrate real-world problem solving into our curriculum while collaborating with decision-makers to research and uncover new forms of value. The OTL demonstrates how Duquesne's stakeholder-centered philosophy, research, award-winning faculty, graduate business students, and action learning combine to deliver Integrated Business Lessons to organizations and the surrounding community.