Collected Carbon Emission Sources at Millersville

All expressed at Metric Tons of Carbon Dioxide Equivalent (MTCDE)

<table>
<thead>
<tr>
<th>Scope 1 – Direct</th>
<th>Scope 2 – Upstream</th>
<th>Scope 3 – Indirect</th>
</tr>
</thead>
<tbody>
<tr>
<td>On-Campus Stationary Combustion (Oil, Natural Gas, Propane)</td>
<td>Purchased Electricity</td>
<td>Faculty/Staff/Student Commuting</td>
</tr>
<tr>
<td>Vehicle Fleet</td>
<td></td>
<td>Directly Financed Travel</td>
</tr>
<tr>
<td>Fertilizer</td>
<td></td>
<td>Study Abroad Travel</td>
</tr>
<tr>
<td>Refrigerants</td>
<td></td>
<td>Solid Waste (Incinerated &amp; Landfill)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Wastewater</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Paper</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Transmission &amp; Distribution Loses</td>
</tr>
</tbody>
</table>

Increasingly Difficult to Control and/or Mitigate
Gross Emissions: FY05-FY14

While emissions have risen in recent years, they are still below 2005 values despite the increase to campus GSF.

Longitudinal Gross Emissions by Scope

Scope excludes garages
Scope 2 Driven by Reduced Electric Consumption

Electric consumption has decreased by 19% since 2003, driving the change in scope 2.
Energy Consumption vs Total Degree Days

Consumption trended with degree days since FY12 and is consistently below PASSHE.
Emissions from Fossil and Electric

Total emissions from utilities have reduced 10% since 2005

Gross Emissions from Utility Sources

<table>
<thead>
<tr>
<th>Year</th>
<th>MTCDE</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>25,000</td>
</tr>
<tr>
<td>2006</td>
<td>24,000</td>
</tr>
<tr>
<td>2007</td>
<td>23,000</td>
</tr>
<tr>
<td>2008</td>
<td>22,000</td>
</tr>
<tr>
<td>2009</td>
<td>21,000</td>
</tr>
<tr>
<td>2010</td>
<td>20,000</td>
</tr>
<tr>
<td>2011</td>
<td>19,000</td>
</tr>
<tr>
<td>2012</td>
<td>18,000</td>
</tr>
<tr>
<td>2013</td>
<td>17,000</td>
</tr>
<tr>
<td>2014</td>
<td>16,000</td>
</tr>
</tbody>
</table>

Scope 1 - Fossil Only
Scope 2

Buildings Added to Gas List

<table>
<thead>
<tr>
<th>Building</th>
<th>MTCDE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caputo Hall</td>
<td>92,414</td>
</tr>
<tr>
<td>Lyle Hall</td>
<td>45,713</td>
</tr>
<tr>
<td>McNairy Library</td>
<td>117,161</td>
</tr>
</tbody>
</table>
Fossil is a Less Carbon Intense Utility

Fossil Change

Electricity Change

Change in Consumption since 2005

Change in Carbon since 2005
Fuel Switching is Beneficial from Cost Perspective

Millersville is paying $8.40 less per MMBTU of fossil than electric

![Fossil & Electric Unit Cost Graph]
Unit Cost vs PASSHE

Millersville pays $5.38 more per MMBTU of fossil than PASSHE Average

FY14 Unit Cost

- Chart ordered by tech rating
- Millersville fossil price affected by the decentralization of utilities and the volume purchased
Commuting Drives Scope 3 Emissions

New dorm in FY15 could bring some of these commuter students on campus

Scope 3 Detail

30% increase in commuting emissions from 2011 to 2014
### Commuting Increase Driven by Trip Distance

<table>
<thead>
<tr>
<th>Fiscal Year</th>
<th># of Commuters</th>
<th>Bike (%)</th>
<th>Drive Alone (%)</th>
<th>Carpool (%)</th>
<th>Bus (%)</th>
<th>Average Driving Trip Distance</th>
<th>Total MTCDE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2011</td>
<td>5,232</td>
<td>8%</td>
<td>79%</td>
<td>0%</td>
<td>13%</td>
<td>8 miles</td>
<td>4,559</td>
</tr>
<tr>
<td>2014</td>
<td>4,107</td>
<td>9%</td>
<td>75%</td>
<td>0%</td>
<td>16%</td>
<td>16 miles</td>
<td>6,053</td>
</tr>
</tbody>
</table>

**Student Miles**

**Faculty & Staff Miles**

**FY11**

**FY14**
Bringing it All Together
Gross Emissions by Space and Students

Gross Emissions (per 1,000 GSF)

Gross Emissions (per Student)
Net Emissions Compared to Sustainability Peers

Net emissions per user are consistent with peer average, but higher per square foot

Sustainability Peers

<table>
<thead>
<tr>
<th>Babson College</th>
<th>Bentley University</th>
<th>Fitchburg State University</th>
<th>Loyola University Maryland</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>The Richard Stockton College of New Jersey</td>
<td>College Union</td>
<td>The University of Dayton</td>
</tr>
</tbody>
</table>
Reduction Progress
Carbon Profile and Mitigation Hierarchy

Hierarchy prioritizes areas of focus

Carbon Mitigation Portfolios:
1. Reduce Activity (Efficiency)
   - Reducing an existing level of activity
   - Example: Fewer BTUs and kWh consumed; fewer miles traveled

2. Replace Carbon Intensity (“Greening”)
   - Lessening the carbon intensity of activities
   - Example: Fuel switching (oil → natural gas; solar power); commuting mode mix (drive alone → carpool)

3. Offset Remaining Sources
   - Utilizing carbon offsets to neutralize emissions
   - Example: RECs; sequestration; retail offsets
Carbon Mitigation Portfolio: FY05 vs. FY14

Using more sustainable resources is driving the reduction in net emissions despite an increase to total resources used.

Change in GHGs by Portfolio

Net Emissions Decrease 5%
FY14 Increase in Activity Driven by Commuting

Measuring activity relates to the consumption of carbon emitting resources

Carbon Mitigation Profile: Activity

Increased Activity

Activity Portfolio:

- Increased commuting distances is driving the increase to the “commuting” category.
- Use of fossil fuels, a cleaner alternative to electricity, is driving the decrease in the “utilities” category.
Fuel Switching Reduces Utility Intensity

Measuring intensity relates to the carbon output of resources used

Carbon Mitigation Profile: Intensity

Intensity Portfolio:

- Consuming less oil in favor of more natural gas is driving the decrease to the “utilities” category.
- Greener modes of transportation are driving the decrease in the “commuting” category.
Concluding Comments on Sustainability

Reduction in Emissions since 2005
- Since 2005, campus space and population have increased, but gross emissions have reduced.

Emission reductions are driven by decreased dependence on electricity
- Decreasing utility consumption is the most effective means of reducing carbon output.
- Fossil is not only cheaper, but also has a lower carbon impact.

Commuting Impact
- The increase in carbon activity and intensity is the result of longer commuting distances for students.
- Adding new dorm space in FY15 could bring some of those students on campus and reduce the average commuting distance.
Questions & Comments