Meeting Summary
November 20, 2015

Council Members Present:
Carlo Colella, Vice President for Administration and Finance (Chair)
Linda Clement, Vice President for Student Affairs
Cindy Hale, Associate Vice President, Office of the Provost
Eric Wachsman, Professor, Materials Science and Engineering, and Director, Energy Research Center
Scott Lupin, Associate Director, Environmental Safety, and Director, Office of Sustainability
Mary-Ann Ibeziako, Director, Department of Engineering and Energy
David Barks, Assistant Director of Systems Architecture, Division of IT
Steve Cohan, Professor of Practice, Plant Science and Landscape Architecture
Samantha Bingaman, Undergraduate Student, Environmental Science and Policy
Todd Ross McGarvey, Graduate Student, Public Policy

Meeting start time: 9:00am

Meeting Highlights

Welcome and Review of October 16, 2015 Meeting Minutes
Carlo Colella welcomed the Council members and called the meeting to order.

University Sustainability Fund Projects
Samantha Bingaman presented five University Sustainability Fund projects to the Council for review:

Living Wall in University Libraries
This grant will support the design and construction of a living or “green” wall in McKeldin Library. Installation of a green wall will do much to enhance the overall air quality and aesthetics in the Libraries in addition to potentially having a positive effect on overall energy efficiency. The administration of the Libraries is interested in ongoing aesthetic and functional improvements to library spaces on campus. The Libraries will match funding and handle maintenance costs. The Council voted to approve the request for $30,000.

Clarice LED and Water Filling Station Project
In an effort to minimize waste in their facility, The Clarice wants to install additional water filling stations in the building. The student subcommittee approved funding for filling stations but not for LED fixtures. The Fund will not cover maintenance for the stations. The Clarice will cover all other costs. The Council voted to approve the request for $5,000.

Shower Meters to Reduce Water Consumption
Team Shower Power, a group of College Park Scholars (ETE) students, plans to install shower meters in the residential hall bathrooms that would collect data on students’ water consumption use. The Council voted to approve the request for $4,260.
Transforming Student Culture through Green Housing
The Department of Resident Life and the Department of Fraternity and Sorority Life wish to develop and launch new Green Room and Green Chapter programs to grow the culture of sustainable living for residential student populations. The Fund would cover the costs to pilot a full-time staff position shared by the Office of Sustainability, Resident Life and Fraternity and Sorority Life for two years. The Council voted to approve the request for $112,458.

Trash-College Park Scholars Theme
Trash: The Problem of Waste in Our Lives and World is a project of education and outreach being undertaken this academic year by College Park Scholars. Scholars has requested funding to assist with their programs, events and outreach as a part of their trash education project. The Council voted to approve the request for $7,500.

Energy Initiatives Update
Mary-Ann Ibeziako, Director, Department of Engineering and Energy, presented an update on a consultant study of the campus central energy system. The update included an Overview of the Current Systems; Condition Assessment Summary; Proposed Infrastructure Recommendations; Comparison of Central vs. District Approach; Risks of Large Biomass System; Recommendations and Next Steps. See Appendix A for full report.

Climate Action Plan Update (CAP 2.0)
Mark Stewart, Senior Project Manager, Office of Sustainability, presented an update on the progress of a revised campus Climate Action Plan. The update included a breakdown of the revised Waste Strategies chapter. Highlights of strategies included: Reduce Solid Waste Generation; Recycle Appropriate Solid Waste and Compost Appropriate Organic Waste; Target Goals: Individual Recycling Rates 60% by 2020, 65% by 2025; Education and Outreach to Promote Waste Reduction, Recycling and Composting; Divert Solid Waste from Landfill; Maintain at least a 75% institutional diversion rate. See Appendix B for report.

Mark also informed The Council that the Carbon Offset Report would be ready to be reviewed by the December meeting.

Adjourn: 10:30am
Campus Energy Initiatives Update
RMF Study of the Combined Heat and Power Plant
Agenda

- Introduction
- Overview of Current System
- Condition Assessment Summary
- Carbon Reduction for Recommendation
- Comparison of District vs Central Renewable Sourcing
- Recommendations
- Next Steps
Introduction

- Current Contract with GDF Suez will end by Fiscal year 2019. A understanding of the existing system is required for the university to determine how to develop infrastructure for the future.
Overview of Current System

GDF Suez maintains and operates the following systems:

- Heating generation system
- Heating Distribution
- Partial Cooling generation system (SCUB IV only)
- Electric Generation
- Electric Distribution

Campus Energy Use

Heating and distribution losses includes a nominal 80% boiler eff.
Condition Assessment Summary

- **Steam Distribution System**
  - Steam and condensate piping systems are in poor condition
  - The majority of 120 manholes require repairs
  - The current conditions are causing a 30% loss in heating energy

- **Steam and Electric Generation**
  - Existing Cogeneration System avoids $11 million in electric costs and 6,000 tons per year in equivalent CO$_2$ emissions.
  - Capital renewal required for Generation Systems within 5 years
  - Electrical distribution system is in good condition

- **Chilled Water Generation**
  - 7% of the campus energy load is for air conditioning
  - 70% of existing chillers will exceed average life within 10 years
  - Future development (2023) increase cooling load 25%
<table>
<thead>
<tr>
<th>Proposed Infrastructure Recommendations</th>
<th>Anticipated Reduction in eCO₂ Emissions*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enhanced Cogeneration System</td>
<td>11,500 tpy</td>
</tr>
<tr>
<td>Implement Hot Water District in lieu in steam pipe replacements</td>
<td>17,000 tpy</td>
</tr>
<tr>
<td>Incorporate high efficiency chilled water system for unit replacements</td>
<td>2,500 tpy</td>
</tr>
<tr>
<td>Dedicate a Hot Water District for service by renewable energy sources</td>
<td>6,500 tpy</td>
</tr>
<tr>
<td>Implement load optimization system and strategy deploy assets when cost effective</td>
<td>~4,000 tpy</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>47,000 tpy</strong></td>
</tr>
</tbody>
</table>

Note: Reductions based upon year 2023 projections (223,000 tpy) which include a 25% load increase, continued use of existing equipment and no steam piping repairs.
# Comparison of Central vs District Approach

<table>
<thead>
<tr>
<th></th>
<th><strong>Existing Energy Plant</strong></th>
<th><strong>District</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Heating Medium</td>
<td>Steam (350 F)</td>
<td>Hot Water (150 F-180 F)</td>
</tr>
<tr>
<td>Type</td>
<td>Fuel Burning (including Biomass)</td>
<td>Fuel Burning (including Biomass)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Solar</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fuel Cells</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Geothermal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>New Hot Water Technologies</td>
</tr>
<tr>
<td>Fuel Storage</td>
<td>Limited</td>
<td>Varying</td>
</tr>
<tr>
<td>Scalability</td>
<td>Predominately Large Scale</td>
<td><strong>Small to Large Scale</strong></td>
</tr>
<tr>
<td>Life Cycle Costs</td>
<td>High first costs and commitment</td>
<td>Can implement with <strong>less risk</strong> / greater opportunity for <strong>lower LCC</strong></td>
</tr>
</tbody>
</table>
Risks of Large Biomass System

- Large footprint compared to other technologies
- Large storage capacity required (limited space at existing Energy Plant)
- Requires more energy to produce steam (less efficient)
- Labor and maintenance intensive
- Requires trucks on campus (4 to 5 per day) for fuel delivery
- Large and long term fuel source has not been identified
Recommendation Campus Wide

- REPLACE. & UPGRADE OF EX. COGEN. SYSTEM: $134M
- STEAM PIPING UPGRADES: $75M
- NEW (2) HOT WATER DISTRICTS: $20M
- OPTIMIZATION OF CHILLED WATER SCUBS: $60M
- RENEWABLE ENERGY SYSTEM: $10M
- DEMAND RESPONSE CONTROL AND RATING: $20M

TOTAL: $319M
Next Steps

➢ Complete study
➢ Financial model
➢ Develop concepts for renewable energy with potential funding from financial savings from cogeneration enhancements
Emissions from solid waste decreased from 21,105 tons of CO2e in 2005 to 1,178 tons of CO2e in 2014, and currently account for approximately 0.44% of the university’s carbon footprint.

Because of the carbon benefits of composting, which avoided or sequestered 979 tons of CO2e in 2014, solid waste as a greenhouse gas source is near carbon neutrality already.
Campus Waste Diversion Rate (includes C&D waste)

- 2004: 22%
- 2005: 25%
- 2006: 46%
- 2007: 55%
- 2008: 46%
- 2009: 57%
- 2010: 63%
- 2011: 64%
- 2012: 76%
- 2013: 78%
- 2014: 89%

Calendar Year

Individual Recycling Rate

- 2004: 17%
- 2005: 23%
- 2006: 36%
- 2007: 41%
- 2008: 41%
- 2009: 35%
- 2010: 41%
- 2011: 48%
- 2012: 52%
- 2013: 55%
- 2014: 56%

Calendar Year
Tons of Solid Waste from Campus  
(excluding recycled C&D waste and other non-MRA Materials)

Tons of other Recycled Waste  
(mostly C&D waste)
Tons of Compost Collected
excluding sod and soil

- 2010: 200 tons (Campus Barn)
- 2011: 800 tons (Landscaping)
- 2012: 1,200 tons (Dining Halls)
- 2013: 1,600 tons (Campus Barn)
- 2014: 1,800 tons (Landscaping)

Legend:
- Brown: Campus Barn
- Purple: Landscaping
- Blue: Dining Halls
- Green: Stamp
Draft Strategy: Reduce Solid Waste Generation

*Target: Reduce total solid waste (except C&D waste) by 1% per person per year*

Emission Reduction: 48 MT-CO2e in 2020 and 94 MT-CO2e in 2025

Implementation Cost: $0

Savings: $3,500 per year

NPV: $48.89/MT-CO2e
Draft Strategy: Recycle Appropriate Solid Waste and Compost Appropriate Organic Waste

Target: Individual combined compost and recycling rates of 60% by 2020 and 65% by 2025

- Emission Reduction: 138 MT-CO2e in 2020 and 317 MT-CO2e in 2025 *

- Implementation Cost: $500,000 per year

- Savings: $9,420 per year

NPV: - $2,829/MT-CO2e *

Draft Section of CAP 2.0: Solid Waste
The Carbon Footprints of Products: kg CO2e

<table>
<thead>
<tr>
<th>Product</th>
<th>CO2e</th>
<th>Disposal</th>
<th>Use</th>
<th>Distribution</th>
<th>Manufacture</th>
<th>Material</th>
<th>Sport Bag</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toilet Paper</td>
<td>2.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jeans</td>
<td>10.8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shampoo</td>
<td>16.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sports Bag</td>
<td>35.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: All figures are kilograms of carbon dioxide equivalents (kg CO2e). The products included are a 10 pack of toilet papers rolls, a pair of jeans washed 70 times, a shampoo bottle used for 60 showers and a sports bag. Use emissions rely on the assumptions used in the calculation and can therefore vary greatly.

If we accounted for the lifecycle impact of products instead of just the carbon footprint associated with disposal, then the carbon impact of recycling and composting would be much, much larger.
Draft Strategy: Education and Outreach to Promote Waste Reduction, Recycling, and Composting

Target: Reach 4,000 students through education and outreach initiatives by 2020

Emission Reduction: N/A. Education and outreach activities contribute to achieving other strategies

Implementation Cost: $2,000 upfront

Savings: N/A. Contributes to other strategies

NPV: N/A
Draft Strategy: Divert Waste from Landfill

Target: Maintain an institutional diversion rate of 75% or above every year

Emission Reduction: No additional reduction

Implementation Cost: $0 additional cost

Savings: $0 additional savings

NPV: N/A
## UMD Solid Waste Carbon Footprint

<table>
<thead>
<tr>
<th>Year</th>
<th>MT-CO2e</th>
<th>Reduction since 2005</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>21,105 MT-CO2e</td>
<td>94%</td>
</tr>
<tr>
<td>2014</td>
<td>1,178 MT-CO2e</td>
<td>95%</td>
</tr>
<tr>
<td>2020</td>
<td>992 MT-CO2e</td>
<td>96%</td>
</tr>
<tr>
<td>2025</td>
<td>767 MT-CO2e</td>
<td>96%</td>
</tr>
</tbody>
</table>