Energy Efficiency on Campus

Real-World Data

MONTCLAIR STATE UNIVERSITY

APPA/PCAPPA/BayAPPA 2017: Annual Conference and Exhibition

July 21, 2017

MEET YOUR PRESENTERS

Shawn Connolly
Montclair State University
Vice President for University Facilities
connollys@montclair.edu
www.montclair.edu/facilities

MONTCLAIR STATE UNIVERSITY
UNIVERSITY FACILITIES

Marc R. Parette, AIA, PP, LEED AP
Parette Somjen Architects, LLC
Principal
mparette@planetpsa.com
www.planetpsa.com

PARETTE SOMJEN ARCHITECTS

APPA/PCAPPA/BayAPPA 2017: Annual Conference and Exhibition

BEST PRACTICES

The Eastern Regional Association of Physical Plant Administrators (ERAPPA) is a Registered Provider with the American Institute of Architects Continuing Education Systems. Credit earned on completion of this program will be reported to CES Records for AIA members. Certificates of Completion for non-AIA members are available on request.

This program is registered with the AIA/CES for continuing professional education. As such, it does not include content that may be deemed or construed to be an approval or endorsement by the AIA of any material of construction or any method or manner of handling, using, distributing, or dealing in any material or product. Questions related to specific materials, methods, and services will be addressed at the conclusion of this presentation.

LEARNING OBJECTIVES

Upon completion of this program you will be able to:

1. Assess the benefits of implementing sustainable energy projects on your campus in renovation and new construction.
2. Compare potential funding models and forecast cost savings
3. Gauge performance and predict outcomes after the "construction dust" settles and systems are brought on line.
4. Evaluate how a systems approach can strengthen campus resilience and reliability.

APPA/PCAPPA/BayAPPA 2017: Annual Conference and Exhibition

AGENDA

- Energy Efficiency for Existing Construction
  - Proper Planning
  - Budget Approach
  - Energy Conservation Methods
  - Energy Savings Improvement Program (ESIP)
- MSU Facilities Overview (video)
- Energy Efficiency for New Construction
  - Commitment to Green Buildings
  - Center for Environmental Life Sciences | A Case Study
  - Solar on Campus
  - Co-Generation | Tri-Generation
  - Micro-grid Technology

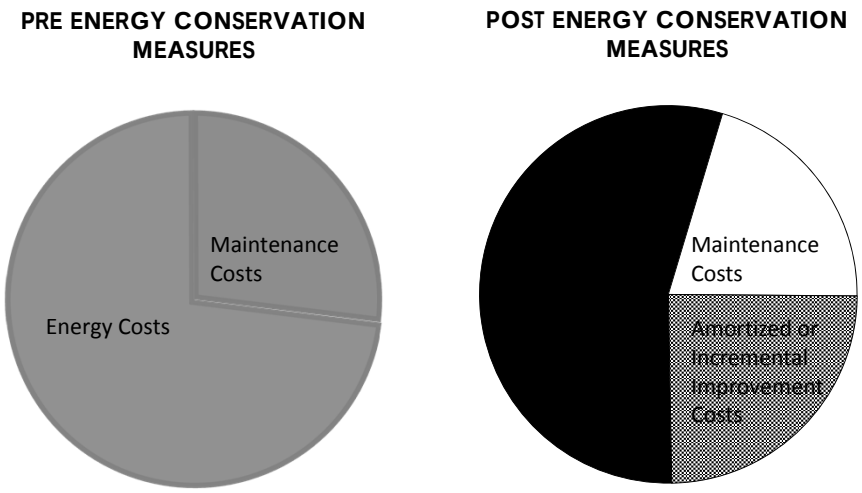
APPA/PCAPPA/BayAPPA 2017: Annual Conference and Exhibition

EXISTING BUILDINGS

- Impact of good planning:
  - Improve productivity
  - Reduced Consumption
  - Saving Time
  - Upfront cost vs. long term investment
- Building envelope improvements for savings:
  - Tighter building envelope
  - Increased insulation values
- Energy improvements:
  - Campus-wide vs. individualized Boilers / Tri-Gen / Co-Gen
- Renewables:
  - Wind / Solar / Geothermal / Tidal

APPA/PCAPPA/BayAPPA 2017: Annual Conference and Exhibition

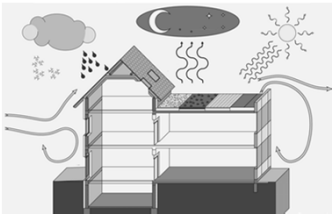
BUDGET APPROACH

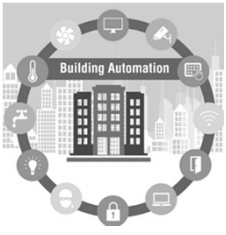


APPA/PCAPPA/BayAPPA 2017: Annual Conference and Exhibition

ENERGY CONSERVATION MEASURES (ECM'S)

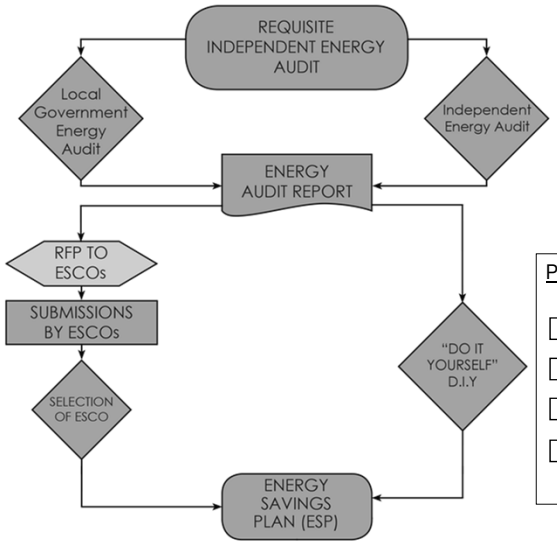
- New LED Lighting Fixtures (Interior and Exterior)
- Building Envelope Improvements
- Boiler/HVAC Improvements
- Introduce/Increase Renewable Energy
- Building Automation System Upgrades





APPA/PCAPPA/BayAPPA 2017: Annual Conference and Exhibition

ENERGY SAVINGS IMPROVEMENT PROGRAM (ESIP)



- Third Party Contractor
- D.I.Y.
- Hybrid

PLAYERS:

- ☐ THIRD PARTY
- ☐ ARCHITECT
- ☐ ENERGY SERVICE CO. (ESCO)
- ☐ INSTITUTION (OWNER)

APPA/PCAPPA/BayAPPA 2017: Annual Conference and Exhibition

LESSONS LEARNED

- Thoroughly prequalify ESCOs and 3rd Parties (Align goals and experience)
- Establish Baselines and Quantify Goals
- Insist on guarantees of 3+ years
- Be Conservative - rebates and support programs may not be guaranteed or awarded
- Identify the impact of outside forces: Regulatory Oversight, Procurement Requirements, etc.
- Don't reduce Utility Budget in your model

APPA/PCAPPA/BayAPPA 2017: Annual Conference and Exhibition

ENERGY SAVINGS PLANS

Check your Federal, State and Utility Company Incentive Plans.

CLICK TO EDIT MASTER TITLE STYLE

Click to edit Master title style

CLICK TO EDIT MASTER TITLE STYLE

Click to edit Master title style

MONTCLAIR STATE UNIVERSITY

GREEN BUILDINGS AT MSU

2000 – 2005
University Hall
(LEED Sliver)
330,000 SF | $80 Mil.

2003 – 2007
Student Rec Center
(Designed to LEED)
78,000 SF | $28 Mil.

2006 – 2009
Cali School of Music
(LEED Silver)
56,500 SF | $36 Mil.

2009 – 2015
School of Business
(LEED Silver)
144,000 SF | $46 Mil.

2009 – 2015
Center for Environmental Life Sciences
(LEED Gold)
115,000 SF | $39 Mil.

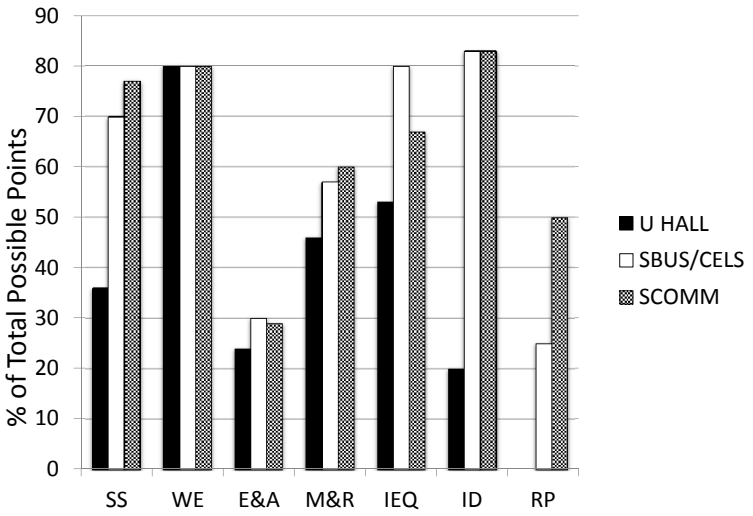
2012 – Present
School of Communication
(LEED Sliver Pending)
330,000 SF | $80 Mil.

2012 – 2013
Solar Field / Co-Gen
(Details to follow)

ON THE HORIZON
College Hall
(Will seek LEED Certification)
125,000 SF | $65.5 Mil.

APPA/PCAPPA/BayAPPA 2017: Annual Conference and Exhibition

TRENDS IN ACHIEVING LEED POINTS



APPA/PCAPPA/BayAPPA 2017: Annual Conference and Exhibition

CELS: CASE STUDY

Center for Environmental and Life Sciences (CELS)

- Overview
- Design and MEP
- Seeking LEED Certification
  - Challenges regarding LEED certification
  - Lessons Learned

APPA/PCAPPA/BayAPPA 2017: Annual Conference and Exhibition

CELS: WHAT WENT WELL?

- **Highlights**
  - Sustainable Sites
  - Indoor Air Quality
  - Innovation
  - Carbon Neutral Building
  - Enhanced Commissioning
  - Increased Ventilation
  - Sustainable Landscaping

APPA/PCAPPA/BayAPPA 2017: Annual Conference and Exhibition

CELS: LESSONS LEARNED

- **Lessons Learned: Design**
  - Thermal Envelop and Daylighting
  - Sustainable/Local Materials
  - Specifications and Submittals
  - Independent LEED Consultant

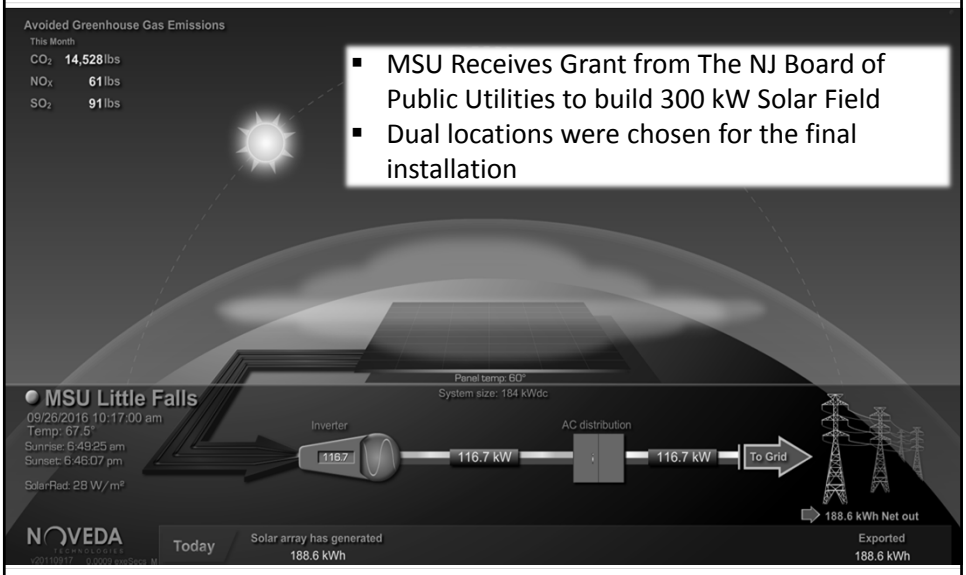
APPA/PCAPPA/BayAPPA 2017: Annual Conference and Exhibition

CELS: LESSONS LEARNED

- **Lessons Learned: Construction**
  - Performance-Based Payments
  - Accountability / Reporting
  - Monthly Reports
    - ✓ Construction Waste Management
    - ✓ Erosion Sediment Control Measures
    - ✓ Materials Tracking
    - ✓ Indoor Air Quality
- **Post Construction**
  - Measurement and Verification

APPA/PCAPPA/BayAPPA 2017: Annual Conference and Exhibition

SOLAR POWER AT MSU



- MSU Receives Grant from The NJ Board of Public Utilities to build 300 kW Solar Field
- Dual locations were chosen for the final installation

APPA/PCAPPA/BayAPPA 2017: Annual Conference and Exhibition

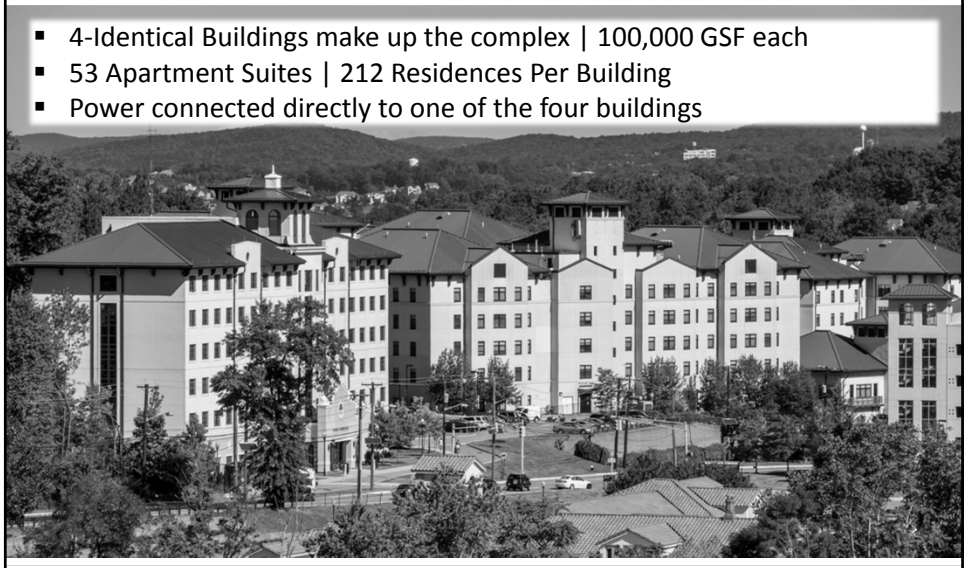
SOLAR PARKING STRUCTURE

- 184 kWDC system Installed on MSU Main Campus in Little Falls NJ
- System Installed as Parking structure on the former Ward Trucking Property.

APPA/PCAPPA/BayAPPA 2017: Annual Conference and Exhibition

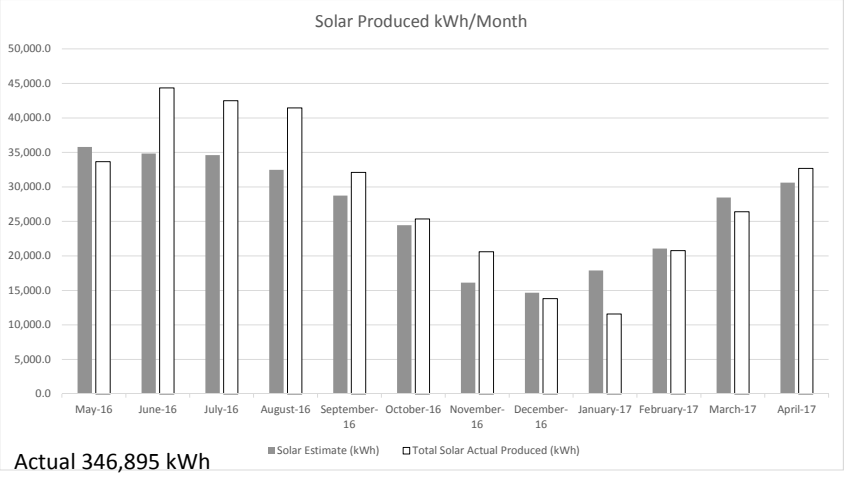
VILLAGE OF LITTLE FALLS RESIDENCE HALLS

- 4-Identical Buildings make up the complex | 100,000 GSF each
- 53 Apartment Suites | 212 Residences Per Building
- Power connected directly to one of the four buildings



APPA/PCAPPA/BayAPPA 2017: Annual Conference and Exhibition

ANNUAL SOLAR PRODUCTION



Actual 346,895 kWh
Estimate 319,775kWh

APPA/PCAPPA/BayAPPA 2017: Annual Conference and Exhibition

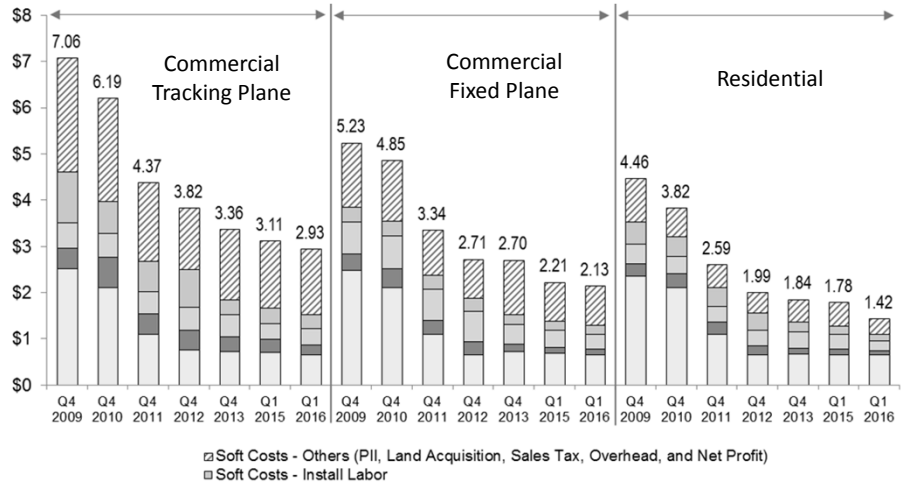
SOLAR FINANCIALS

Year	Total Solar Produced (kWh)	SREC Generated	SREC Sales	Avoided Energy Savings	Power Exported to the Grid (kWh)	Export Cost Avoided	Total Profit*
2015	320,636	320.6	$67,173.24	$57,714.48	26,975.00	$3,989.84	$128,877.56
2016	346,895	346.8	$73,368.29	$62,441.10	60,896.00	$10,365.53	$146,174.92
Average/ year	333,765	333.7	$70,270.77	$60,077.79	43,935.50	$7,177.69	$137,526.24

- *Profit = Cost Avoided + SREC Revenue
- Cost of investment without grant $1,480,045
- ROI = 45.3% for a 20 Year project
- Simple Payback = Cost of Investment / Profit = 10.76 years

APPA/PCAPPA/BayAPPA 2017: Annual Conference and Exhibition

NATIONAL SOLAR DATA



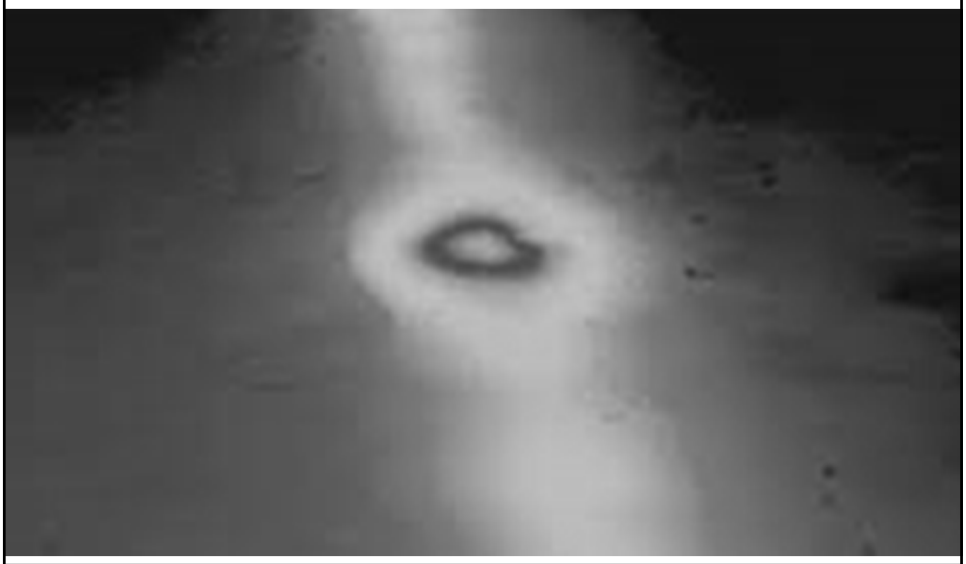
NREL PV system Cost benchmark summary

APPA/PCAPPA/BayAPPA 2017: Annual Conference and Exhibition

CO-GEN FACTS

APPA/PCAPPA/BayAPPA 2017: Annual Conference and Exhibition

THERMAL IMAGE OF BURIED STEAM LINE



FINANCIAL ANALYSIS OF OPTIONS

Option	**Initial Cost**	**Annual Operating Cost**	**NPV of 20 Year life Cycle Cost**
Option 1- Replace in-kind	$58,308,688.00	$8,222,189.00	$222,752,468.00
Option 2- New Expanded Plant	$72,162,000.00	$6,944,834.00	$211,058,680.00
Option 3 Decentralize	$38,664,527.00	$12,398,342.00	$286,631,367.00

PUBLIC PRIVATE PARTNERSHIP (P3) INITIATIVE

APPA/PCAPPA/BayAPPA 2017: Annual Conference and Exhibition

NEW TRI-GEN FACILITY

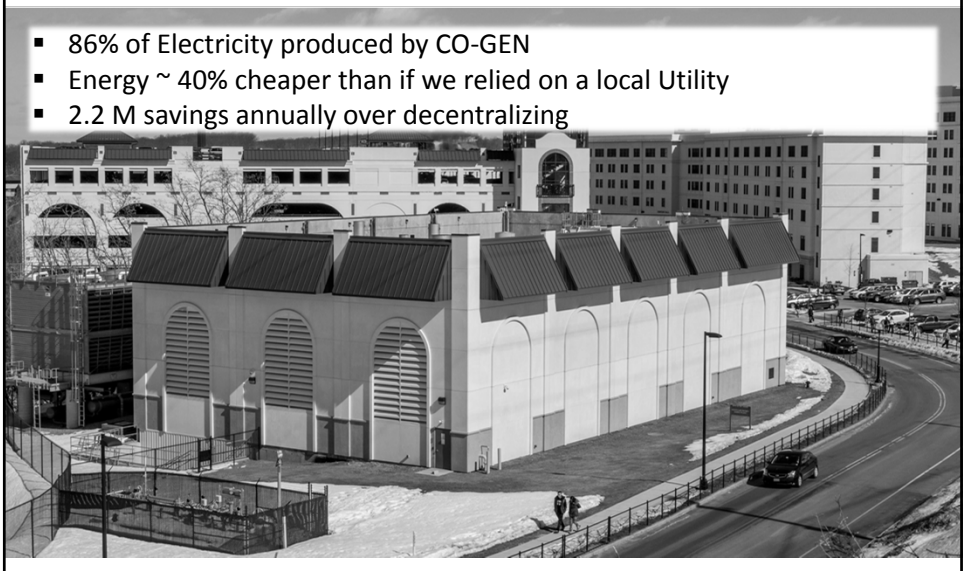
APPA/PCAPPA/BayAPPA 2017: Annual Conference and Exhibition

STEAM & CHILLED WATER DISTRIBUTION

APPA/PCAPPA/BayAPPA 2017: Annual Conference and Exhibition

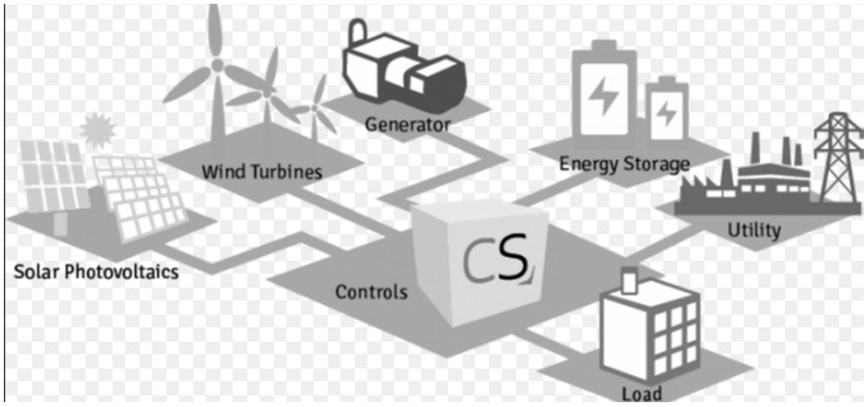
FINANCIAL OUTLOOK

- 86% of Electricity produced by CO-GEN
- Energy ~ 40% cheaper than if we relied on a local Utility
- 2.2 M savings annually over decentralizing



APPA/PCAPPA/BayAPPA 2017: Annual Conference and Exhibition

MONTCLAIR STATE UNIVERSITY MICROGRID



APPA/PCAPPA/BayAPPA 2017: Annual Conference and Exhibition

MONTCLAIR STATE UNIVERSITY MICROGRID

APPA/PCAPPA/BayAPPA 2017: Annual Conference and Exhibition

This concludes the American Institute of Architects Continuing Education Systems Program

QUESTIONS?

Shawn Connolly
Montclair State University
Vice President for University Facilities
connollys@montclair.edu
www.montclair.edu/facilities

MONTCLAIR STATE UNIVERSITY
UNIVERSITY FACILITIES

Marc R. Parette, AIA, PP, LEED AP
Parette Somjen Architects, LLC
Principal
mparette@planetpsa.com
www.planetpsa.com

PARETTE SOMJEN
ARCHITECTS

APPA/PCAPPA/BayAPPA 2017: Annual Conference and Exhibition