Financing for solar deployment on university campuses

Shivani Mathur, Eric O'Shaughnessy, Nicole Harman, and Eric Rehm

April 27, 2017
• Participants are joined in listen-only mode.

• Use the Q&A panel to ask questions during the webinar. We will hold all questions until after all speakers have presented.

• Slides from today’s webinar will be shared later this week with all registered attendees.

• If you have technical difficulties with the webinar, contact the GoToWebinars Help Desk at 888.259.3826 for assistance.
With funding from the Department of Energy’s SunShot Initiative, NREL is providing technical support to higher education institutions to deploy solar.
Webinar Plan

• Solar Deployment in Universities: Update 2017
  Eric O'Shaughnessy, National Renewable Energy Laboratory

• Investing in Clean Energy: Campuses and Endowments
  – Nicole Harman, Intentional Endowments Network

• Higher Education Solar Investment:
  Building A Financial Model for Success
  – Eric Rehm, Midwest Renewable Energy Association
About 400 universities and colleges have adopted solar with about 710 MW of installed capacity*

* This installed capacity includes collaborative projects where universities do not own the entire system
Based on data from: AASHE, BNEF, SN
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University PV Adoption

2008

System Size
- <100 kW
- 100kW-1MW
- >1MW

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University PV Adoption

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Schools in California have installed over 260 MW

Led by Arizona State University and the University of Arizona, schools in AZ have installed over 70 MW

Massachusetts leads the northeast with over 100 MW installed
• About 55% of adopters are universities, and 45% are colleges
• Universities account for about 81% of installed capacity
• Universities tend to deploy larger systems:
  o Median university system = 66 kW, median college system = 36 kW
• The average system is around 1 MW, or around 70 kW at the median
• Universities began deploying larger systems around 2010: average system size for systems installed after 2010 is 1.7 MW
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Investing in Clean Energy: Campuses and Endowments

Nicole Harman, Program Associate
Intentional Endowments Network
nicole@intentionalendowments.org
The Intentional Endowments Network (IEN)

Non-Profit Peer Learning Network with Facilitated Cross-Sector Collaboration

Higher Education Endowments
- Presidents
- CFOs
- Trustees
- Students
- Alumni
- Donors
- Faculty
- Staff
- Managers
- Consultants

- Investment Firms
- Peer Networking
- Other Institutional Investors

Resource Exchange

Non-Profits & Advocacy Organizations
Thought Leadership
Associations & Networks
Education & Training
Conferences & Gatherings
IEN Working Groups

- Meet regularly to advance key strategies in support of the Network's goals

- Shareholder Engagement
- Fiduciary Duty & Policy
- Trustee Peer-Networking
- Student-Managed Investment Funds
- Investing in Clean Energy

http://www.intentionalandowments.org/working_groups
Investing in Clean Energy Working Group

Identifying and sharing strategies for colleges and universities to invest in energy efficiency and renewable energy through campus operations and their endowments

- Chair: Chris O’Brien, Director of Higher Education Programs, Altenex; Lecturer and former Director of Sustainability, American University
- John Chaimanis, Managing Director, Kendall Sustainable Infrastructure
- Daniel Dixon, Director, Office of Sustainability, University of Maine
- Kevin Brennan, Principal, Equilibrium Capital
- Alex Bernhardt, Head of Responsible Investment, US Mercer
- Jenny Heeter, Senior Energy Analyst, NREL
- Bracken Hendricks, CEO, Urban Ingenuity
- Nick Hylla, Executive Director, Midwest Renewable Energy Association
- Ken Locklin, Director, Impax Asset Management
- Michele Madia, Director of Education and Partnerships, Second Nature
- Erik Melang, Senior Managing Director, Clean Energy Advisors
- Mark Orlowski, Executive Director, Sustainable Endowments Institute
- Liesel Schwarz, Sustainability Director, Villanova University
- Dave Wallace, Managing Director, Investments, Pomona College
Investing in Clean Energy: Campuses and Endowments White Paper

- Designed to encourage conversation about the financial and societal benefits of clean energy investments higher education can make
- **Both** as a customer through campus operations and an institutional investor through their endowments.
- Explores the current opportunities and barriers to such investments.

http://www.intentionalendowments.org/clean_energy_white_paper
The Climate Is Still In Trouble

Global power emissions will remain far too high to prevent excessive warming...

...and clean-energy investment will fall short by $5.3 trillion

Source: Bloomberg, 2016
Clean Energy Investment Opportunities and Capital Needs

Source: Bloomberg, 2015
Annual Investments in Clean Energy to Reach 2°C Goal:

- Goal by 2030: Additional $1 Trillion/Year
- Goal by 2020: Additional $500 Billion/Year
- 2015: $329 Billion

2015 Global Investment in Clean Energy (Source: Bloomberg New Energy Finance)

Source: Ceres, 2014
Investing in Clean Energy: What are the Options?

- Direct Ownership / Asset Acquisition
- Asset Leasing
- Power Purchase Agreement (PPA)
- Green Revolving Funds (GRFs)
- Purchasing “Unbundled” Renewable Energy Certificates (RECs)
- Public Market Investments
- Private Market Venture Investments
Direct Ownership / Asset Acquisition
Power Purchase Agreement (PPA)
Green Revolving Funds (GRFs)
Barriers & Solutions

- Concerns about the financial performance of such investments
- Lack of peer examples to follow
- Challenges in organizational communication among decision-makers within institutions
- Market regulations
- Lack of suitably structured investment opportunities for endowments
- Tax law
- Lack of familiarity with these strategies
Financial Performance: Direct Ownership

- A university may consider direct ownership in order to offset procuring power from their utility or retail electric provider.

- Such a strategy could average 5% - 15% or higher savings off of electric bills. The ownership structure of such an asset is important when considering owning, as there are tax benefits of ownership which may be complicated for a non-profit institution. The amount of dollars that can be invested through this strategy may be constrained by the energy needs or the physical space available for such an installation.
Established Green Revolving Funds (GRFs) report a median annual return on investment (ROI) of 28%.

North Central College: Committed $1.8 million of endowment funds to their GRF. First project was a 539 kW solar array with a 250 kW energy storage system (2014).

Caltech: GRF manages $8 million within the endowment, with an average ROI of 33% (2009).

These examples suggest that GRFs can significantly outperform average endowment investment returns while maintaining strong returns over longer periods of time.
Peer Examples
Peer Example: Luther College

Luther College Wind Turbine

[Image of wind turbine and solar panels]

[Image of group of people standing in front of solar panels]
Peer Example: American University & George Washington University

A partnership involving GW, American University, the George Washington University Hospital and Duke Energy Renewables will enable GW to derive more than half its electricity from solar energy.
Peer Example: University of Vermont, Boston University, & Weber State University
THANK YOU!

Nicole Harman, Program Associate
Intentional Endowments Network
nicole@intentionalendowments.org

http://www.intentionalendowments.org/clean_energy_white_paper
Higher Education Solar Investment
Building A Financial Model for Success

Eric Rehm, Solar Finance Manager
Midwest Renewable Energy Association
MREA History & Mission
• Founded in 1990
• 3,000 members
• Renewable energy education demonstration

Office Locations
• Custer, WI
• Milwaukee, WI
• St. Paul, MN

Our Work
• Annual Energy Fair
• Accredited Certificate Training
• Midwest Grow Solar Partnership
• The Solar Endowment
• PV Technical & Financial Assistance
Purpose
• Collaboration in pursuit of solar PV investment strategies
• Development of project roadmaps and case studies
• Student training in solar PV design, installation, and financing.

Resources
• Solarendowment.org
• MREA PV Training Courses

Partners
• Second Nature
• University of Minnesota Energy Transition Lab
• Purdue University Applied Energy Lab
• Illinois State University Center for Renewable Energy
• University of Wisconsin Stevens Point
Strategic Approaches to Carbon Neutrality on College Campuses

**College Administration Initiatives**
- Purchase carbon emission offset credits
- Direct ownership using capital investment funds
- Debt financing leveraging bonding, leases or loans
- Power purchase agreements.

**Foundation Supported Initiatives**
- Alumni and business project management expertise
- Establish taxable entities to leverage ITC & asset depreciation.

**Student Supported Initiatives**
- Student bodies vote to self-impose nominal ‘green’ fees for use in renewable energy investment
- Green revolving loan funds are used to finance on-campus renewable energy
- As loans are repaid new loans are issued.
Colby College – Climate Action Plan
• Signatory to Carbon Commitment – May 2008
• Established a goal to attain carbon neutrality by 2015
• Achieved carbon neutrality by April 2013

Existing Capital Project
• Location: Schair-Swenson-Watson Alumni Center
• System Size: 26kW
• SRECs: Colby College retains
• Expected ROI: $15 - $20k over 13 - 15 years

Power Purchase Agreement Project
• PPA selected for large-scale solar
• Summer 2015 – RFP solicitation
• NRG selected for development
• System Size: 1.865 MW
• System Production: 16% of campus load
• Land Lease: 27 – 30 years
• SRECs: Colby College retains
Wake Technical Community College - Climate Action Plan
• Signatory to the Carbon Commitment - April 2010
• Established a goal to attain carbon neutrality by 2050

Wake Tech Foundation
• Alumni, local business leaders, and individuals invested time and resources
• Created Wake Tech Innovations, a subsidiary of the Foundation

Foundation Donation & Procurement Strategy
• Procurement: Leveraged management expertise and foundation donations
• Installation: 389kW solar PV array atop the Public Safety Education Campus
• Incentives: Progress Energy’s SunSense Program - $.18/kWh bill credits and other upfront rebates
• Carbon Emissions Reductions: Under North Carolina RPS, after 5 years RECs may be purchased and receive carbon reduction credits
Luther College - Climate Action Plan
• Signatory of Carbon Commitment - June 2007
• Carbon neutrality by 2030 with a 70% target by 2020 (2003-04 baseline)

Internal Capacity Building to Scale Solar Investments
• Began with small, low-risk PV projects; before pursuing large-scale systems
• Develop energy, real estate and procurement team expertise to achieve successful outcomes

Solar PV Development Strategies Using Donations & Third Parties
• Sustainability House - 3.78kW (Single Anonymous Donor)
• Shirley Baker Commons - 20kW (Multiple Donors, Grants & Rebates)
• President’s House - 5.3kW (Multiple Donors, & Utility Rebates)
• Baker Village Residence - 280kW (Third-Party 7 Year Lease)
• Preus Library & Regents Center - 822kW (Third-Party PPA - 10 year term)
Appalachian State University - Climate Action Plan
• Signatory of the Carbon Commitment – April 2008
• Currently 7% of ASU energy is powered by renewable generation

Appalachian State University Renewable Energy Initiative (ASUREI)
• Student body 83% approval
• Green fee $10 per student per semester
• Fund accrues approximately $170,000 annually & $670,000 in total

ASUREI Fund Projects
• Biofuel Facility: 2kW installed in 2007
• E3 House System: 3kW installed in 2010 w/ battery storage
• State Farm Solar Research Facility: 8kW installed in 2011
• Blackburn Vonnoy Farm House: 7kW installed in 2012
A Solar Finance Tool for Institutions

Purpose & Objectives
- SolarProjectBuilder.org
- Educate users about solar PV financing principles
- Users input solar project site assumptions
- Access exportable PDF and CSV of financial model
  - Direct Ownership
  - Debt Financing
  - Power Purchase Agreements
  - Operating Lease

Target Markets
- Universities, Colleges, and Associated Endowments & Foundations
- Local Units of Government
- Hospitals Networks

Sponsors & Development Partners
- US Department of Energy - Solar Market Pathway Program Administrator
- Midwest Renewable Energy Association - DOE Grant Recipient
- Sustainable Capital Advisor - Financial Simulator Development Advisor
- Future Web Studio - Website Design
Solar Finance Simulator
An Overview in Brief

**Step One:** input project site assumptions

<table>
<thead>
<tr>
<th>Form inputs</th>
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</thead>
<tbody>
<tr>
<td>System</td>
</tr>
<tr>
<td>Incentives</td>
</tr>
<tr>
<td>Operating &amp; Return Assumptions</td>
</tr>
<tr>
<td>Tax Assumptions</td>
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</tbody>
</table>

**Step Two:** review output graphs

Summary: Direct Ownership – Taxable

<table>
<thead>
<tr>
<th>Inputs</th>
<th>Returns</th>
</tr>
</thead>
<tbody>
<tr>
<td>System Size (kW) 350,000 W</td>
<td>Initial Capital Cost ($): $1,090,000</td>
</tr>
<tr>
<td>System Term (years): 30 years</td>
<td>Avoided Electricity Cost ($): $3,270,466</td>
</tr>
<tr>
<td>Energy Production Value ($/kWh): $0.15</td>
<td>Operating Expenses ($): $(478,465)</td>
</tr>
<tr>
<td>Energy Rate Escalator: 3.00 %</td>
<td>Federal Taxes ($): $(679,760)</td>
</tr>
</tbody>
</table>

**Step Three:** Export and print PDF and CSV files
Question & Answer Period
(Presentations will be posted online in a few days.)
Thank you!