

Colby College: Developing a Diverse Solar & Carbon Neutrality Strategy

Solar on Campus

At higher education institutions, the consumption of purchased electricity represents an indirect source of greenhouse gas emissions and is a central component to lowering campus carbon footprints and meeting climate commitments. Strategies for lowering emissions from electricity include energy conservation, energy efficiency, and purchasing renewable energy through on- or off-site projects. Solar photovoltaic (PV) systems have been popular and practical for on-site campus installations as campuses typically have large and consistent daytime electrical loads, access to potential roof sites, and may have large undeveloped areas of land. According to the US Department of Energy, installed project costs have fallen by more than 50% since 2009 and can provide institutions with strong financial returns.

On-site solar projects can also provide benefits to an institution beyond potential cost savings and greenhouse gas reductions. Benefits of on-site solar include applied learning opportunities, research, resiliency if incorporating battery storage, demand response cost reductions, community support through local jobs, and investment diversification. On-site solar projects are a highly visible demonstration of sustainability commitments and can attract new student audience and engage alumni and donors.

In some cases, institutions may not be able to retain ownership of carbon reduction claims through Renewable Energy Credits (RECS). Even in these cases, the value of the project outweighs the carbon reduction potential. The reasons an institution may develop PV on-site may include fulfillment of their educational mission, strategic priorities, and climate action plans. Often starting off by developing a small to mid-sized on-site project has encouraged institutions to update their Climate Action Plan to include larger on-site projects or off-site renewable energy purchases. Even the installation of small to mid-size projects on-site can encourage an institution to update its Climate Action Plan and invest in larger on-site projects or off-site renewable energy purchases.

Benefits of Solar Energy on Campus

- ▶ GHG Reduction
- ▶ Cost Savings
- ▶ Research Opportunities
- ▶ Educational Experiences
- ▶ Resilience with Battery Back Up
- ▶ Donor & Community Engagement

"It will diversify the College's energy supply, it adds 2.5 million kilowatt hours of renewable electricity to Maine annually, it creates another campus 'living laboratory' offering research opportunities to students and faculty, and it serves as another visible sign of Colby's commitment to sustainability."

- Doug Terp
'84, Vice President for Administration
and Chief Financial Officer

Financial Decisions: Direct Purchase or a Power Purchase Agreement

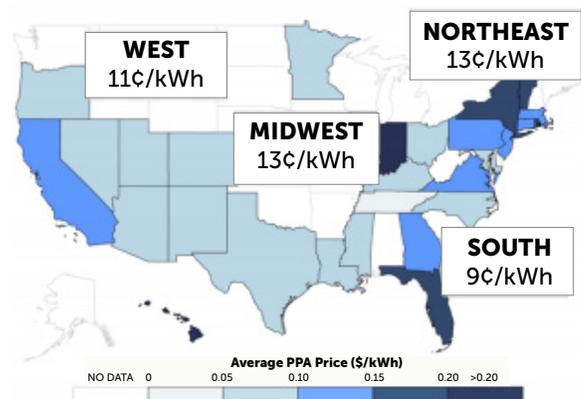
When choosing to install solar on campus, one of the key decisions is the financing method. A college can choose to self-finance using cash or grants. In some cases, a donor may choose to sponsor a solar project outright or as part of a new building expense. A smaller solar array may have a payback period of over 5- 20 years, which may be longer than some internal policies for energy investments using operating funds. Larger solar arrays require more significant upfront cost but may have a better payback. When significant operating or donor funds are not available, an institution can look for outside financing, including loans from commercial banks, credit unions, and community development financial institutions. An institution can also include program-related investments from their own endowment funds.

Current federal tax incentives can provide a significant advantage to tax-paying entities owning solar, amounting to about 30% of solar project costs. Given this opportunity, many tax-exempt institutions look for a third party owner of the system. This results in an arrangement called a Power Purchase Agreement (PPAs).

In a PPA, an institution buys power at a negotiated rate (\$/kWh) for a specified term without taking ownership of the system. Typically, the price per kWh is below the current electrical price, or may have a fixed escalator at a rate lower than fossil fuel energy prices are expected to rise. This fixed price allows better budget planning and hedges against unforeseen expenses. In a PPA, the project developer or owner is responsible for all permitting, installation, maintenance, and decommissioning. Many schools create a Request For Proposal (RFP) to solicit competitive PPA bids according to their various needs and goals. According to the National Renewable Energy Lab (NREL), solar power purchase agreements have facilitated over 100 megawatts (MW) of solar deployment on campuses around the country as of 2016. However, since not every state allows tax-exempt entities to indirectly benefit from tax credits through a lower PPA price than their utility may offer, it is best to check the Database of State Incentives for Renewables & Efficiency for updated information on PPA policies.

Carbon Reduction Claims

When renewable energy projects generate power, each MWh is assigned a Renewable Energy Certificate (REC) which represents the environmental attributes of the project. RECs have helped drive development of renewable energy through their use in various state renewable energy portfolio standards and through the voluntary purchase market. In order to claim to be using solar power and count the renewable attributes towards an annual greenhouse gas reporting, the institution must receive and retain the associated RECs from the project. If a signatory wants to use their purchase towards their Climate Leadership Commitment goals, they will need to retain ownership of the RECs. However, a developer may request ownership of RECs because they improve the project's economics, depending on the market. In this instance, a university can negotiate for REC ownership in the future (typically after 5 years) or find less expensive RECs to match their production. Even in the case of direct purchase, the RECs may hold more value being sold in a local market versus retaining them in the short term. In these cases the institution will forgo any carbon claim on the project in the short term, viewing the educational experience and expected energy savings dollars as adequately valuable. Institutions may then look for alternative methods of short-term carbon reduction. In some cases, the electrical price savings from the project could be used to invest in additional renewable or efficiency projects on campus through revolving or capital funds.



Average offtaker rates for systems between 100kW and 5 MW, by state and region in 2015. Regional figures based on non-weighted state averages. Data are representative sample. Source: Mercatus

Colby College: Achieving Carbon Neutrality and Supporting Clean Energy

Colby College is a private liberal arts college in Waterville, Maine, with 2,039 students. A Carbon Commitment signatory since May 2008, the school achieved carbon neutrality in April 2013 – two years ahead of their 2015 goal. A longtime leader in the environmental field, the College has generated about 10% of its electricity through cogeneration at its steam plant since the 1990's. Colby also committed to sourcing all of its electricity from certified renewable sources in 2003. Colby is the conference champion in the EPA's College and University Green Power Challenge for its role in creating a market for purchasing green power in the state.

Colby achieved carbon neutrality in 2013 by implementing a diverse strategy of efforts including over 12 LEED-certified buildings on campus, two of which use geothermal systems. The college uses sustainably harvested wood biomass instead of oil as its primary fuel for heat and hot water. Colby spends about \$50,000 annually on carbon offsets, partially funded by the savings accrued from converting to biomass. The offsets cover the difficult-to-avoid emissions such as travel and commuting. While the purchase of offsets will pay for carbon reduction projects elsewhere, Colby's goal is that future reductions in emissions on campus should decrease the school's reliance on offsets over time.

Pursuing Solar Investments on Campus

In April 2015, Colby installed a small PV array on the Schair-Swenson-Watson Alumni Center (SSWAC) with an annual production of around 32,000 kWh per year. The Alumni Center is LEED certified and is electronically heated and cooled through the use of geothermal heat pumps. This electric output will provide 10-15% of the alumni center's annual energy consumption. A real time monitor shows the production of the system.

The SSWAC site's potential was first identified and evaluated by Dan Chiniara '13 as part of an environmental studies senior research project in 2012. The student focused on identifying roofs on campus that would be appropriate for solar installations and worked with a local solar developer to both learn the process and vet previous work. The student's findings were confirmed through a competitive bid process with local solar developers for this project.

Too small to be of interest to PPA developers, the project was funded by Colby through general facilities funds. The Facilities Department has an energy management reduction project focused on maintaining energy consumption on campus over the next seven years inclusive of growth; this project was part of the first year. The project budget combines quick and longer-term payback projects to ensure a diversity of projects and not just low- or no-cost payback projects. The simple payback period for all projects combined averages to be about 5-7 years.

This project has provided opportunities for the college maintenance staff to understand the same technology and to investigate and successfully build support for larger projects. The success of this small-scale project illustrated the potential for Colby to create a competitive RFP for a larger project

Schair-Swenson-Watson Alumni Center Solar Project

Completed: 2015

Capacity (KWh): 26

Annual Production (KWh): 32,000

Cost: \$.26/watt

Expected Return on Investment: Approximately \$15,000-\$20,000 over 13-15 years

Funding Method: Capital Funding

Owner: Colby College

Retaining Project RECs: Yes

Colby College Large Scale Solar Project

Completed: In Planning Stages

Capacity (KWh): 1,900

Annual Production (KWh): 2,500,000

Cost: Owned by NRG

Expected Return on Investment: NA

Funding Method: NRG Energy

Owner: NRG Energy

Retaining Project RECs: Yes



*Photo courtesy of Colby College

"Our first project, Schair-Swenson-Watson Alumni Center, confirmed that, once they're installed, these things just sit up there and work for us. The only real difference in that installation and the one we're doing now is the scale."

*-Kevin Bright,
Colby's Sustainability Coordinator*

Colby is currently in the final implementation stages of a project consisting of 5,505 solar panels on nine acres of land, which would increase solar capacity on campus greatly. Sized at 1.9 MW, it is expected to produce 2.5 million kWh of electricity each year. This is expected to fulfill approximately 16% of the College's electricity needs. NRG Energy will build and own the project on land leased from Colby. Colby has then entered into a 27-year power PPA to purchase the electricity at a fixed rate. This arrangement provides modest cost savings compared to the school's current energy prices and also acts as a hedge against future energy price increases. Colby is building an underground electric line to feed electricity produced by the panels into the campus's electrical grid.

Colby is retaining the RECs as part of the PPA for its duration - 27 years with a 3-year extension. This will support Colby's current REC / offset strategy and carbon neutrality achievement moving forward. As part of the RFP process and PPA agreement, Colby requested a robust, web-based, real-time monitoring system be installed for academic use. The intention is for this data to be used for student research projects moving forward. Colby's yearly CO2 reduction will be close to 87 tons of MTCDE for scope 2 reductions, taking into account transmission and distribution losses and RECs purchased before the project.

For more information on going solar at your campus visit:

solarendowment.org

For more information on Second Nature and the Climate Leadership Network visit:

secondnature.org

Or contact: commitments@secondnature.org