

Building a Business Model for a Climate Neutral Campus

Summary by David Gottesman

Panelists

Leith Sharp, *Director, Green Campus Initiative, Harvard University**

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THE UNIVERSITY: A GOOD PLATFORM FOR MODELING SUSTAINABILITY

Rob Pratt opened the session by explaining why university campuses are ideal platforms for energy efficiency and alternative energy initiatives: they are large energy users, boast mobilized administrators and students, maintain stable finances (endowments) and have consistent thermal and AC loads.

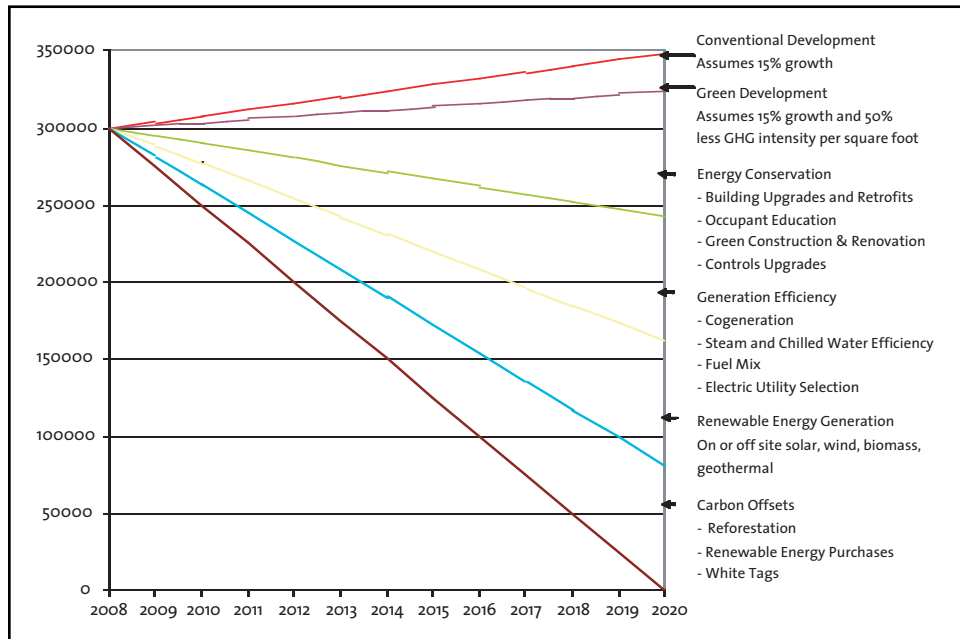
Universities' three main options for reducing energy use include energy efficiency implementation, improving distributed generation and shifting peak load. Campuses can pursue energy efficiency by installing new lighting technologies, a vastly underutilized approach; improving distributed generation by taking advantage of renewable energy, which becomes cheaper by the day, and by installing combined heat and power systems (co-generation); and shifting peak load by employing demand response techniques like rescheduling large loads to off-peak hours.

Pratt next explained some of the numerous mechanisms currently available for funding energy efficiency and renewable energy programs. The states of Massachusetts, Connecticut and Rhode Island have clean energy funds, for example. In some regions, Sun Edison offers customers a "Solar Power and Service Agreement," which is based on local photovoltaic tax rebates and other incentives. Of notable importance is the forward capacity market, a \$5 billion program of Independent System Operators (ISO) New England. This arrangement creates a ratepayer fee structure to pay electricity generators to address capacity concerns, which allows entities like campuses to act as aggregators in the market.

HARVARD'S BUSINESS MODEL FOR SUSTAINABILITY

Leith Sharp introduced her presentation on a business model for a cost neutral and climate neutral campus by explaining that Harvard's GHG emissions have increased by 45 percent since 1990, due mostly to expansion. This problem is further compounded by the university's plan to grow an *additional* 50 – 60 percent in the coming years. To resolve this pressing issue, Sharp proposed a six-pronged solution comprised of energy conservation, improved generation efficiency, renewable energy, carbon offsets, green construction/development and organizational change.

Figure 1 Methods for reaching campus climate neutrality (in metric tons of CO₂ Equivalent)



Energy Conservation

Energy conservation can reduce existing building energy consumption by 30 – 50 percent and may be attained by several means. Harvard's green renovations meet or exceed LEED standards by diverting waste, employing daylight and occupant-sensing fluorescent lighting, using icynene foam for insulation, employing bamboo flooring, and so on.

Additionally, the use of low VOC adhesives and sealants improves the indoor environment and therefore occupant productivity. The university has been able to carry out these green renovations at no added cost. The secret behind this achievement has been to build the in-house capacity to transfer project lessons and innovations from one project to the next, so that design processes are streamlined for optimal results and cost-effectiveness. Overall, green renovations result in energy reductions of 20 – 40 percent and translate to a payback in 0-10 years (the payback is

even sooner if one includes the number of sick days employees do not take because of improved air quality). These savings can be captured and invested in renewable energy.

Upgrades are another important element of energy conservation. The Harvard Green Campus Loan Fund, a \$12 million source of interest-free capital, has been used for many facility upgrades with paybacks in fewer than five years. The fund itself is a viable and sustainable investment, since its average return on investments has been 35 percent – a performance better than even that of Harvard’s celebrated endowment. Sharp argued that current accounting systems sabotage good business practices because they focus only on acquisition costs and do not provide rewards for savings over the lifetime of a product or project. Instead, life cycle costing should be evaluated in purchasing decisions. For example, debts to Harvard’s Green Campus Loan Fund can be repaid by the savings derived from the increased efficiency of the electricity, water and heating systems that the loan has financed.

Control systems and continuous commissioning can also reduce utility consumption by 15 - 45 percent. Dormitory rooms in Harvard Business School have been outfitted with occupancy sensors that are integrated with the building management systems, which allows for individual fan coil unit setback (i.e., the system turns off when no one is in the room). This project saves about \$25,000 annually. Large-scale savings can also come from control-driven changes in laboratories, as these facilities tend to be some of the largest energy users on campus.

Lastly, occupant education programs at Harvard can generate reductions in utility consumption by five to ten percent (for electricity, the savings are as high as 20percent). Residential Green Living initiatives consist of one paid student for every 200 – 400 residents to educate their peers about alternative behaviors to reduce personal impacts. Over the course of a year, these efforts cost \$250,000 but save over \$400,000.

Improved Generation Efficiency

Cogeneration and geothermal power have proved effective on the Harvard campus. The Business School’s Shad Hall, for example, is heated with the waste heat from electricity production, at a savings of approximately \$70,000 per annum. Investing in this technology resulted in a simple payback of only 2.7 years.

The proper sizing of utility systems is another target. Conventional systems are sized for 100 percent of the peak load plus a “safety factor” of an additional 20 - 30 percent as well as a “start up factor” of another 20 - 50 percent. These oversized mechanical plants can be avoided by sizing facilities properly, which saves 10 to 50 percent in energy costs.

In the realm of improved generation efficiency, it is also worth mentioning efforts at streamlining distribution and optimizing metering and billing.

All the initiatives discussed up to this point save money for institutions. These funds can be invested in the following areas in order to achieve climate neutrality without any net fiscal impact.

Renewable Energy

The price of renewable energy, including wind, photovoltaics (PV), geothermal, solar thermal and biomass, has decreased substantially in the last 25 years. It is expected that prices will continue to fall in the coming decade. Therefore, even though it will cost money to invest in these energy sources, that amount is continuously decreasing.

Carbon Offsets

As effective as the aforementioned programs have been and will continue to be, given the current growth plans of most universities, it will be impossible to achieve carbon neutrality without purchasing carbon offsets. Popular options include renewable energy certificates, white tags and reforestation. In 2006, Harvard purchased 22,000 MWh of renewable energy certificates, which represented seven percent of the campus' electricity load.

Green Construction/Development

This aspect can either cost or save money, depending on the particulars of the project. For example, the master plan for a green expansion of Harvard's campus calls for LEED-certified buildings, the use of renewable energy and increased generation efficiency, among other approaches. If successful, this project will result in 80 percent fewer GHG emissions than a conventional campus produces.

Organizational Change

Sharp acknowledged that grassroots efforts by Harvard's building managers, facilities staff and project managers have been able to provide the confidence and capacity needed to form a base for green campus initiatives and that the university's top level leadership – its President, Provost, Deans and VP's – has used its authority to legitimize and prioritize green projects. She argued, however, that those in upper middle management, including second level deans, associate VP's, CFO's and COO's, are the most difficult to reach. Moreover, since they are the ones who control the university's capital approval systems as well as its Finance and Accounting divisions, a green business model must appeal to these gatekeepers who can “make or break” such initiatives. To that end, it is important to demonstrate the financial benefits associated with campus sustainability.

The Harvard Green Campus Initiative costs \$1.3 million annually, but saves the university \$6 million each year. It functions much like a consulting agency: 20 percent of its funding comes from central administration, while the remaining 80 percent comes from direct fees for service agreements paid by university clients (e.g. – Harvard Real Estate Services, Harvard Law School, Harvard Business School). All of these customers have enjoyed paybacks within five years.

Sharp also called for building- or school-level pilots in order to prove the value of conservation savings as a funding source for renewable energy; leveraging other universities' initiatives; instituting life cycle costing across campus; institutionalizing financial connections between capital, operating, utility systems costs, renewable energy investments and carbon offsets; and institutionalizing performance and

investment requirements for buildings, generation and distribution systems, and investing these savings into renewable energy development and carbon offsets.

Discussion

Regarding alternatives to green loan funds, Sharp commented that the loan fund is a transitional strategy. Long term efforts must incorporate life cycle costing, as only this method will reveal the true cost of a purchase. She reiterated that the “separation between building and operating is costing us a lot of money!” Pratt indicated that a new source of financing was available in New England through ISO-NE’s \$5 billion Forward Capacity Market (FCM) program. Intended to insure that the region does not run out of power, \$1 billion per year in incentives are provided both for new generation as well as demand-side management solutions. Because the FCM can make available new money for efficiency, it allows for innovative financing techniques to increase the leverage and reach of energy efficiency implementation.

Figure 2 Climate Neutrality Balance Sheet

THE CLIMATE NEUTRAL EQUATION	
Energy Conservation	+\$
+ Improved Generation Efficiency	+\$
+ Renewable Energy	-\$
+ Carbon Offsets	-\$
+ Green Construction Development	+/--\$
= Climate Neutral	= Cost Neutral

One participant expressed concern about the cost neutral approach, claiming that some people feel that “what doesn’t cost anything isn’t worth anything.” Sharp agreed that there might be some potential for skepticism of cost-free solutions, but maintained that at Harvard, it has been necessary to propose “highly rational business oriented arguments.” Even if the university is willing to pay for green initiatives that lack sound financial models, her office gains more credibility by offering a fiscally advantageous proposal.

The topic turned to the level of scrutiny with which green proposals and purported savings are often met on campuses. Sharp explained that “a disproportionate amount of scrutiny lands on us. We are in-house and when we offer a calculation we really do get scrutinized; our data are good as a result.” Her office’s energy models provide a clear cost differentiation; what is not included in their audits, however, is how green projects have affected management in cost-saving ways. Hence, she claimed, her figures are conservative.

Concerning actual project supervision, Sharp lamented that departments planning new buildings or renovations did not always contact her office early enough in their project development stages. Until this kind of coordination becomes mandatory, her office will continue fostering relationships with Harvard's schools and departments to learn about and attempt to influence their plans.