Chapter 1: Strategies for Identifying, Evaluating, and Funding Sustainability Projects

Well-designed sustainability initiatives incorporate financial analysis from their inception. Business officers can make valuable contributions to sustainability initiatives at an early stage, by identifying and analyzing the economics of proposed projects. By becoming involved at the beginning, business officers can also help shape projects that attract sufficient and competitive sources of funding. This chapter outlines strategies for business officers who are helping with the identification of opportunities, analysis of project economics, and pursuit of project funding.

Identifying Opportunities

CONSERVATION

Conservation projects, which reduce resource consumption through behavioral change, can generate the highest economic returns within the broader category of sustainability investments. Simple acts such as reducing lighting and heating when facilities are not in use cost a college or university little and can yield significant savings. Conservation is not cost free, as institutions must educate and otherwise motivate community members to change their behaviors.

Many conservation programs begin as student-led initiatives, and organizers may ask university officials to commit funding and moral authority to the program. On its Web site, the Association for the Advancement of Sustainability in Higher Education (AASHE) provides links to energy conservation policies that more than 50 colleges and universities have adopted as part of their broader efforts to increase conservation on their campuses.[1]

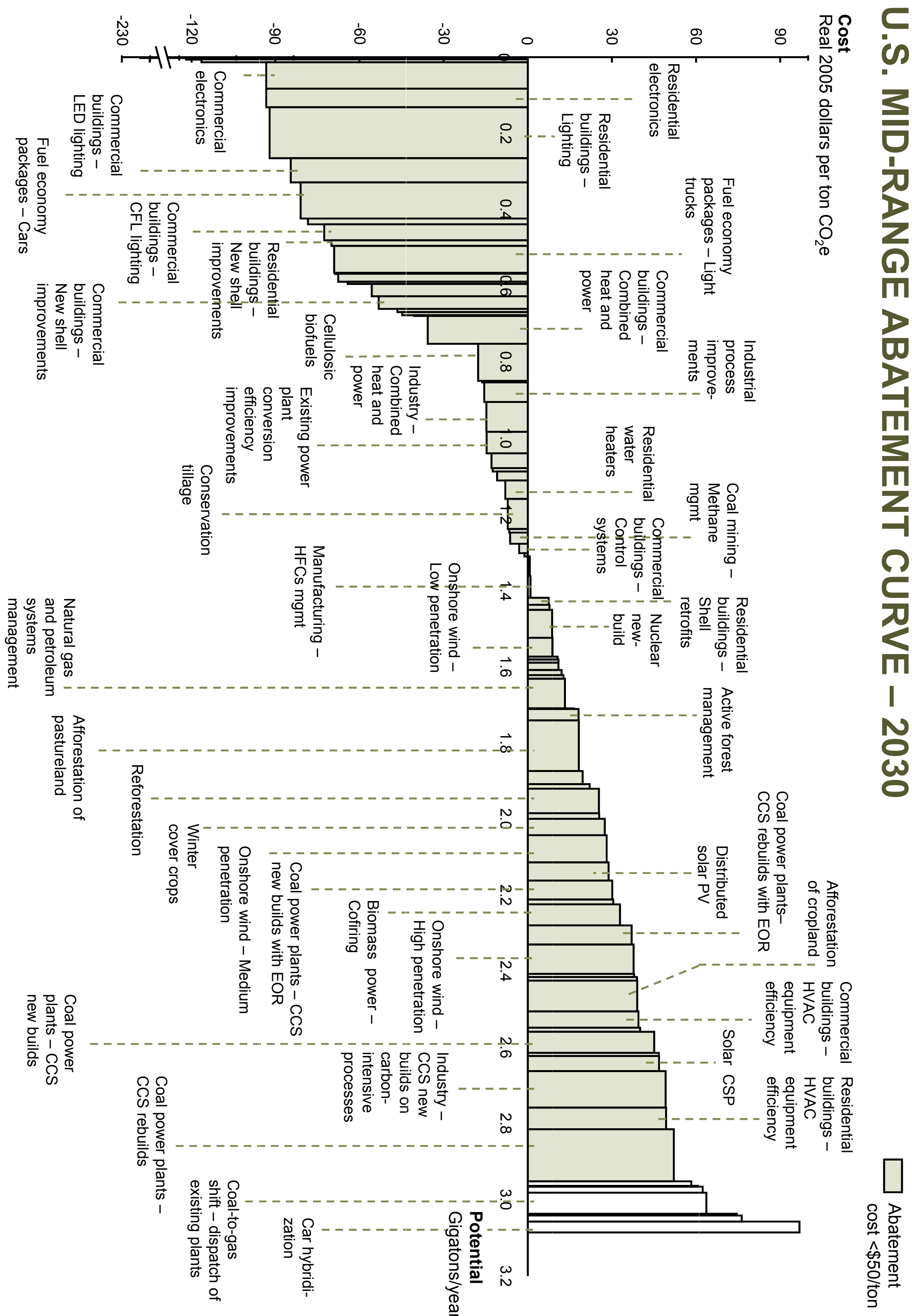
> **McKinsey and Company report that almost 40 percent of greenhouse gas abatement could be achieved through investments with positive economic returns. Investment in compact fluorescent lights (CFL), building control systems, and other energy efficiency measures rank among the most profitable.**

EFFICIENCY

Energy efficiency is defined as the delivery of equivalent services (lumens of light, therms of heat, etc.) with lower inputs (kWh of electricity, Btu of fuel, etc.), as opposed to energy conservation that focuses on decreasing services and associated energy use when those services are not needed (e.g. lumens and kWh in empty classrooms). The economic returns of energy efficiency investments depend on the condition of facilities where interventions occur. Average returns on efficiency rank highly compared with other sustainability investments, often second only to energy conservation.

In a well-publicized study, McKinsey and Company reported that almost 40 percent of greenhouse gas abatement could be achieved through investments that generate positive economic returns over their lifetime. Investment in compact fluorescent lights (CFL), building control systems, and other energy efficiency measures rank among the most profitable.[2]

Figure 1-1



U.S. MID-RANGE ABATEMENT CURVE – 2030
Cost
Real 2005 dollars per ton CO2e
90
60
30
0
-30
-60
-90
-120
-230
Abatement cost <$50/ton
Potential
Gigatons/year
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
2.0
2.2
2.4
2.6
2.8
3.0
3.2
Residential electronics
Commercial electronics
Residential buildings – Lighting
Commercial buildings – LED lighting
Fuel economy packages – Light trucks
Fuel economy packages – Cars
Commercial buildings – CFL lighting
Commercial buildings – Combined heat and power
Residential buildings – New shell improvements
Commercial buildings – New shell improvements
Industrial process improvements
Cellulosic biofuels
Industry – Combined heat and power
Existing power plant conversion efficiency improvements
Residential water heaters
Coal mining – Methane mgmt
Conservation tillage
Commercial buildings – Control systems
Residential buildings – Shell retrofits
Nuclear new-build
Onshore wind – Low penetration
Manufacturing – HFCs mgmt
Natural gas and petroleum systems management
Active forest management
Afforestation of pastureland
Reforestation
Coal power plants– CCS rebuilds with EOR
Distributed solar PV
Winter cover crops
Onshore wind – Medium penetration
Coal power plants – CCS new builds with EOR
Afforestation of cropland
Biomass power – Cofiring
Onshore wind – High penetration
Commercial buildings – HVAC equipment efficiency
Solar CSP
Industry – CCS new builds on carbon-intensive processes
Coal power plants – CCS new builds
Residential buildings – HVAC equipment efficiency
Coal power plants – CCS rebuilds
Coal-to-gas shift – dispatch of existing plants
Car hybridization

As long-term owner occupiers of large facilities, colleges and universities can benefit from efficiency investments more easily than commercial real estate owners and others who face myriad barriers to efficiency investments. U.S. and Canadian institutions have capitalized on efficiency opportunities, pursuing such projects as installing occupancy sensors and new heating and air conditioning systems; signing energy services performance contracts; completing building retrofits; and implementing energy conservation campaigns.[3]

Colleges and universities can find a wealth of resources and information available at the federal, state, and local levels to assist in improving energy management in facilities. State energy offices, utilities, nonprofit organizations, and associations can also provide information. The DOE/EPA Energy Star program provides free, downloadable information geared specifically for higher education institutions, including:

- Portfolio Manager, an online tool that compares a building's energy performance to similar buildings nationwide. By benchmarking a group of buildings, administrators and energy managers can prioritize projects based on the highest potential for energy and costs savings. (http://www.energystar.gov/index.cfm?c=evaluate_performance.bus_portfoliomanager)
- Cash Flow Opportunity (CFO) Calculator, which quantifies the cost of delaying the installation of energy-efficiency projects. The CFO's spreadsheet illustrates that installing a project often results in net positive cash flow with no capital outlay through the use of financing. (http://www.energystar.gov/index.cfm?c=assess_value.financial_tools)
- Computer power management software that can save up to $100 per year per monitor and computer by installing centralizing monitor and power management on all campus computers. (http://www.energystar.gov/index.cfm?c=power_mgt.pr_power_management)

OPERATIONS AND MAINTENANCE

O&M Savings Due to Lower Maintenance Equipment. While institutions focus on energy savings and generation as the primary source of returns from their sustainability investments, they often find ancillary savings from reduced maintenance requirements augments source of returns. Light-emitting diodes (LEDs) stand out as energy-reducing equipment that lower both energy consumption and O&M requirements because they last more than three times longer than fluorescent tubes and 30 times longer than incandescent bulbs.[4] Naturally, longer-lasting and more reliable equipment reduces the number of times maintenance crews need to replace the equipment, cutting down on O&M expenses.

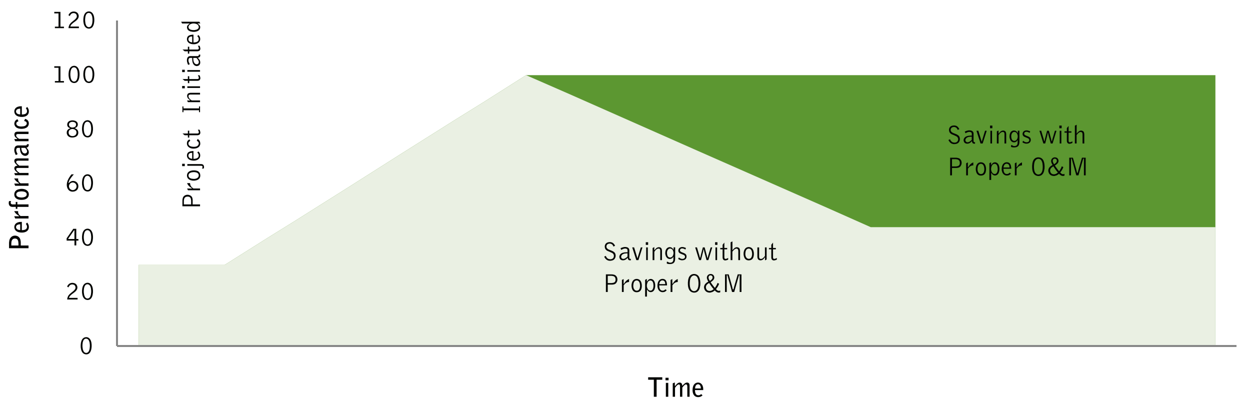
O&M as Savings-Sustaining Investment. After an institution has implemented a renewable generation, energy efficiency, or other sustainability project, it must operate and maintain the facilities to the standards established at project initiation. To the extent the institution falls short of these O&M standards, performance of the facilities tend to "drift" to less rigorous standards of control over time. The continual investment in O&M has highly positive returns, as those investments are central to realizing the positive cash flows and environmental benefits promised by the project. Frequently, institutions contract for O&M services from energy services companies (ESCOs) and other third-party companies who may be able to achieve higher performance from an institution's facilities than the institution could achieve on its own.

Institutions can save significant money by studying their utility bills for inaccuracies and opportunities to employ load shifting to avoid ratchet fees and other charges.

The chart below represents performance of a building over time and reveals the important role O&M plays in preventing degradation of energy savings from efficiency projects.

Figure 1-2

Building Performance Curve



UTILITY BILL MANAGEMENT

Components of a Utility Bill. Institutions can minimize peak demand and better control utility bills by understanding and responding strategically to utility rate structures. Utilities' Web sites and account managers often outline rate structures, which are categorized by rate class (including residential, commercial, and industrial) and service class, a rate class subcategory that determines which tariff applies to the customer.

As institutions are relatively large customers, utilities often deliver electricity to an institution's substation and then route the electricity to individual buildings with their own submeters. Utilities provide institutions with the following information on their utility bill:

- Meter readings record units of energy consumed during recent and current periods.
- Customer charges are levied monthly as a fixed, rate-class specific administrative charge.
- Demand or peak demand charges record maximum load in kilowatts consumed during specific times. Due to customer grievances about high peak demand charges, some utilities have integrated peak load and ratchet charges into broader charges.
- Energy charges translate kilowatt hours (kWh) of monthly consumption into a monetary charge billed in various forms:
  - Flat rate charges hold the price per kWh constant regardless of the volume or time the power is consumed.
  - Block rate charges vary the price per kWh according to the volume consumed, typically decreasing per kWh prices for larger blocks of consumption.
  - Time of use or time of day rates vary kWh prices based on when the kWh is consumed.
  - Time of year rates vary kWh prices according to season, peaking in summer (normally June to October) and decreasing in winter (November to May).
  - Some utilities report charges according to three activity-based categories: generation, transmission, and distribution.
- Fuel adjustment charges compensate utilities for increases in fuel costs since the utility last developed its tariff rate structure. Fuel adjustment charges vary considerably as a percentage of overall billing charges, but often contribute significantly to institutions' electricity costs. If fuel prices decrease after tariff rates are set, customers can benefit from fuel adjustment charges which appear as a credit on their overall utility bill. As gas and oil prices have exhibited greater volatility than competing types of fuel, utilities that

generate power using natural gas and oil tend to levy the greatest fuel adjustment charges.

- System benefit charges (SBC) or public benefit funds represent a small charge that utilities levy to gather a pool of funds for investment in energy efficiency or other energy programs. These charges vary considerably in scale and structure across utilities and states.

Some utilities include a final charge that can constitute a large portion of a customer's total bill:

- Ratchet charges or demand ratchets require customers to pay a percentage (generally more than 50 percent and up to 100 percent) of consumption during specific peak hours (e.g. the 15-minutes of greatest demand) for 12 months or some other extended period. While an institution must pay a higher ratchet charge if its consumption increases above the level for which the ratchet was set, it cannot decrease its ratchet charge through less consumption until the ratchet period (e.g. 12 months) expires. While utilities justify ratchet charges according to peak demand's impact on their need to invest in additional capacity, many customers feel ratchet charges are highly punitive and make great efforts to reduce peak load in order to minimize these charges.[5]

Load Shifting. Often, institutions can reduce their electricity bills significantly in the absence of major decreases in total consumption by smoothing their consumption away from high peak periods. Peak load is the maximum load in kilowatts that a facility or group of facilities (if master metered) uses over a specified time period, often 15-30 minutes. Peak load impacts electric rates significantly because peak load determines the rate payer's demand charge. Depending on the nature of the local utility's demand charge, an institution may see a single spike in peak usage trigger a ratchet charge that can increase the rates the institution pays on all electricity consumption for a full 6-12 months. Institutions often can avoid these punitive charges by managing load strategically and smoothing consumption across time as much as possible.

Many utilities offer programs and incentives aimed at peak load management in order to reduce their need to invest in additional generating capacity. For example, some utilities pay customers to implement load curtailment when the utility is straining to meet high demand and finds itself at risk of creating brownouts or blackouts. Those utilities with the least spare capacity tend to offer the most generous incentives.[6]

Auditing. Industry data suggest about 1 percent of utility bills contain mistakes due to malfunctioning meters, rate class discrepancies, and administrative errors. Institutions can detect these mistakes through analysis on their own or through a company that specializes in utility bill and rate structure analysis. By analyzing utility bills and ensuring they are in the most beneficial rate class, institutions can avoid overcharges by their local utility company.

Companies that conduct such analyses on behalf of institutions often charge a percentage of any refund the institution receives from its utility as a result of the company's analysis. To the extent the company finds no mistakes, the company usually charges an institution nothing or a relatively nominal service fee.[7]

ENERGY GENERATION

Institutions realize economic returns by investing in wind, solar, geothermal, and other renewable energy generating facilities that they own and operate or, alternatively, buy power from as a non-owner. When institutions retain ownership of renewable facilities they develop, they can realize returns by directly supplying energy they otherwise would have bought from their local utility and, to the extent the facility generates sufficient output, by selling excess output on commercial terms. Often, institutions opt not to own their own facilities but instead contract for output from a third-party-owned facility. In the third-party model, institutions realize economic gains by contracting for energy supplies at prices that are lower than those they would pay for energy bought from their local utility.

Analyzing Project Economics

LIFE-CYCLE COST ANALYSIS

Institutions frequently conduct separate analyses of capital budgets and operating budgets, focusing on one-time investment costs when allocating capital budgets and recurring income and expenses when allocating operating budgets. If an institution does not consider potential capital investments' recurring operating costs as part of its capital budgeting process, it tends to invest in projects with low upfront costs that sometimes yield lower economic returns over their lifetimes than those available through investments with higher upfront costs but lower recurring operating costs. Business officers can use life-cycle cost analysis (LCCA) to bridge the disconnect between capital and operating budgets and, in doing so, make more informed decisions about which projects promise optimal returns over the installed lifetime of the equipment or facility in question.

LCCA is particularly relevant for analyzing sustainability investments, as many sustainability projects require higher upfront capital investments while promising greater life-cycle returns because the projects reduce energy consumption, maintenance hours, and other expenditures. Business officers can apply the basic LCCA approach using any metric that incorporates a project's net income and expenses over the project's lifetime. This publication outlines net present value, payback, return on investment, and internal rate of return as several common metrics that use LCCA.

PAYBACK ANALYSIS

One common and relatively basic metric for measuring the economic returns of a project is to calculate the period of time required for the investment to pay for itself. When conducting payback analyses, business officers should be sure to factor into their economic returns not only the headline source of returns (energy savings for efficiency projects, decreased energy prices or increased generation revenues for renewable power projects, etc.), but also operational cost savings and other "ancillary" sources of project returns.

Business officers can use payback analysis as an easy starting point for comparing projects that compete for funding. Payback is particularly relevant when an institution is interested in identifying projects that return capital in time for the institution to meet other obligations it has scheduled simultaneously.

Payback analysis is not truly a form of life-cycle cost analysis because it measures a project's economic potential only to the point at which the project pays for itself and not until the end of the project's useful life. Nonetheless, payback analysis does incorporate operating cash flows that a project generates beyond its initial funding and, in this respect, accomplishes LCCA's goal of unifying the capital/operating budget analysis process.

While payback analysis offers a helpful starting point for analysis, business officers should integrate other metrics outlined in this guide into their capital allocation process to address some of these shortfalls of payback analysis.

Simple Payback. The most basic form of payback analysis determines a project's "simple payback," factoring all project-related cash flows except for financing into the analysis. Business officers use simple payback as a relatively straightforward metric for comparing projects that compete for a single source of funds or whose funding has yet to be determined. Naturally, business officers should not use simple payback as the primary determinant of their investment decisions as simple payback doesn't include the cost of capital, which often contributes significantly to the project's overall economics.

Table 1-1 shows simple paybacks for two potential investments—a high performance HVAC system that costs $100,000 and saves the institution $20,000 per year in energy costs and a standard HVAC system that costs $80,000 and saves the institution $15,000 per year in energy costs. While savings from the high performance HVAC pays for the initial investment in five years, the standard HVAC pays for itself in 5.3 years. This example shows that some sustainability projects that cost more initially pay for themselves more quickly than their less expensive alternatives.

Table 1-1

Simple Payback Examples

	Option A—High Performance HVAC				Option B—Standard HVAC			
Year	Capital Cost	Energy Savings	Annual Cash Flow	Cumulative Cash Flow	Capital Cost	Energy Savings	Annual Cash Flow	Cumulative Cash Flow
1	$(100,000)	$ 20,000	$(80,000)	$(80,000)	$(80,000)	$15,000	$(65,000)	$(65,000)
2	-	20,000	20,000	(60,000)	-	15,000	15,000	(50,000)
3	-	20,000	20,000	(40,000)	-	15,000	15,000	(35,000)
4	-	20,000	20,000	(20,000)	-	15,000	15,000	(20,000)
5	-	20,000	20,000	-	-	15,000	15,000	(5,000)
6		20,000	20,000	20,000	-	15,000	15,000	10,000

Payback with Financing. As capital costs often represent a significant portion of total project outlays, business officers should factor such costs into their payback analysis both to compare alternative sources of funding and to compare projects once funding plans are set.

Table 1-2 shows paybacks for the same two potential investments outlined on page 8, but the table includes the cost of financing each investment with a seven-year lease purchase agreement bearing a 6 percent interest rate. While savings from the high performance HVAC pays for the initial investment in 11.14 years, the standard HVAC pays for itself slightly slower in 11.88 years. This example shows that financing costs impact projects' economic returns significantly and are an important component of any payback analysis.

Table 1-2

Payback with Financing Examples

	Option A—High Performance HVAC					Option B—Standard HVAC				
Year	Capital Cost	Energy Savings	Financing Costs	Annual Cash Flow	Cumulative Cash Flow	Capital Cost	Energy Savings	Financing Costs	Annual Cash Flow	Cumulative Cash Flow
1	$(100,000)	$20,000	$(17,530)	$(97,530)	$(97,530)	$(80,000)	$15,000	$(14,024)	$(79,024)	$(79,024)
2	-	20,000	(17,530)	2,470	(95,061)	-	15,000	(14,024)	976	(78,048)
3	-	20,000	(17,530)	2,470	(92,591)	-	15,000	(14,024)	976	(77,073)
4	-	20,000	(17,530)	2,470	(90,121)	-	15,000	(14,024)	976	(76,097)
5	-	20,000	(17,530)	2,470	(87,651)	-	15,000	(14,024)	976	(75,121)
6	-	20,000	(17,530)	2,470	(85,182)	-	15,000	(14,024)	976	(74,145)
7	-	20,000	(17,530)	2,470	(82,712)	-	15,000	(14,024)	976	(73,169)
8	-	20,000	-	20,000	(62,712)	-	15,000	-	15,000	(58,169)
9	-	20,000	-	20,000	(42,712)	-	15,000	-	15,000	(43,169)
10	-	20,000	-	20,000	(22,712)	-	15,000	-	15,000	(28,169)
11	-	20,000	-	20,000	(2,712)	-	15,000	-	15,000	(13,169)
12	-	20,000	-	20,000	17,288	-	15,000	-	15,000	1,831
	6%—Interest Rate on Lease Purchase Agreement $1,461—Monthly Payment on Lease Purchase Agreement $17,530—Annual Payment on Lease Purchase Agreement					6%—Interest Rate on Lease Purchase Agreement $1,169—Monthly Payment on Lease Purchase Agreement $14,024—Annual Payment on Lease Purchase Agreement				

RETURN ON INVESTMENT

While simple payback incorporates a project's cash flows only to the point the project becomes profitable, a business officer can determine the project's total profitability by measuring its return on investment (ROI). ROI [occasionally called the Savings to Investment Ratio (SIR) when applied to energy efficiency projects] measures a project's profitability by dividing the project's positive cash flows by its investment costs. Business officers can measure ROI over the project's full useful life or a shorter period.

Frequently, business officers rank projects according to their ROIs to determine which projects they will fund. Table 1-3 represents data available to an institution considering $10,000 of investment in projects ranked according to their ROIs. By ranking the projects according to ROI, the institution can see that it should fund the first three projects even though the remaining two projects also would yield attractive returns. The first three projects would generate cumulative net savings of $56,000 and a maximum amount of savings for each dollar invested.[8]

Table 1-3

Return on Investment Analysis

	Initial Cost	Total Savings (project life)	ROI	Net Savings	Cumulative Investment	Cumulative Net Savings
Controls Adjustment for Residence Hall	$2,000	$20,000	10.0	$18,000	$2,000	$18,000
Run-time Schedule Adjustment for Student Center	2,000	15,000	7.5	13,000	4,000	31,000
Irrigation Controls for Quad Space	5,000	30,000	6.0	25,000	9,000	56,000
Refrigeration Replacement for Cafeteria	3,000	15,000	5.0	12,000	12,000	68,000
Pickup Truck Conversion from Diesel to Vegetable Oil	500	1,000	2.0	500	12,500	68,500

Source: Environmental Health & Engineering, Profiting through Campus Sustainability: Financial Tools and Strategies, (Needham, MA), p. 4.

NET PRESENT VALUE

An institution can measure the profit potential or cost of a sustainability project, expressed in today's dollars, by calculating a project's net present value (NPV). NPV analysis is a valuable tool because it allows an institution to value a project based on not only the scale of the project's cash flows, but also on the timing of those cash flows. An institution measures a project's NPV by summing the discounted value of all cash flows—positive and negative—associated with the project. The institution frequently chooses as its discount rate the rate at which the institution might borrow money to fund the project.

A business officer can use NPV analysis to help decide between mutually exclusive projects. Consider, for example, an institution that plans to install only one of the following systems: a high performance heating, ventilating and air-conditioning (HVAC) system that costs $100,000 to install and $7,500 per year to operate, or a standard efficiency HVAC system that costs $80,000 to install and $10,000 per year to operate. Using the institution's incremental borrowing rate of 6 percent as the discount rate, the institution would find the NPV of the high performance system over a 20-year period suggests a cost of $180,364, while the NPV of the standard system suggests a cost of $190,171 (see Table 1-4). By following the principles of LCCA in determining the two projects' NPVs, the institution finds that while it could save $20,000 at the time of purchase by buying the standard system, that same system would cost the institution $9,807 more than the high performance system over the system's 20-year life. Clearly, the institution should invest in the high performance system as the option that will generate the highest returns over its lifecycle.

Table 1-4

Net Present Value Examples

Year	Option A—High Performance HVAC Capital Cost	Operating Cost	Annual Cash Flow	Cumulative Cash Flow	Option B—Standard HVAC Capital Cost	Operating Cost	Annual Cash Flow	Cumulative Cash Flow
1	$(100,000)	$(7,500)	$(107,500)	$(107,500)	$(80,000)	$(10,000)	$(90,000)	(90,000)
2	-	(7,500)	(7,500)	(115,000)	-	(10,000)	(10,000)	(100,000)
3	-	(7,500)	(7,500)	(122,500)	-	(10,000)	(10,000)	(110,000)
4	-	(7,500)	(7,500)	(130,000)	-	(10,000)	(10,000)	(120,000)
5	-	(7,500)	(7,500)	(137,500)	-	(10,000)	(10,000)	(130,000)
6	-	(7,500)	(7,500)	(145,000)	-	(10,000)	(10,000)	(140,000)
7	-	(7,500)	(7,500)	(152,500)	-	(10,000)	(10,000)	(150,000)
8	-	(7,500)	(7,500)	(160,000)	-	(10,000)	(10,000)	(160,000)
9	-	(7,500)	(7,500)	(167,500)	-	(10,000)	(10,000)	(170,000)
10	-	(7,500)	(7,500)	(175,000)	-	(10,000)	(10,000)	(180,000)
11	-	(7,500)	(7,500)	(182,500)	-	(10,000)	(10,000)	(190,000)
12	-	(7,500)	(7,500)	(190,000)	-	(10,000)	(10,000)	(200,000)
13	-	(7,500)	(7,500)	(197,500)	-	(10,000)	(10,000)	(210,000)
14	-	(7,500)	(7,500)	(205,000)	-	(10,000)	(10,000)	(220,000)
15	-	(7,500)	(7,500)	(212,500)	-	(10,000)	(10,000)	(230,000)
16	-	(7,500)	(7,500)	(220,000)	-	(10,000)	(10,000)	(240,000)
17	-	(7,500)	(7,500)	(227,500)	-	(10,000)	(10,000)	(250,000)
18	-	(7,500)	(7,500)	(235,000)	-	(10,000)	(10,000)	(260,000)
19	-	(7,500)	(7,500)	(242,500)	-	(10,000)	(10,000)	(270,000)
20	-	(7,500)	(7,500)	(250,000)	-	(10,000)	(10,000)	(280,000)
			Net Present Value—Option A	$(180,364)			Net Present Value - Option B	$(190,171)

6%—Discount Rate (Institution's Incremental Borrowing Rate)

INTERNAL RATE OF RETURN

Internal Rate of Return (IRR) analysis identifies the interest rate (in this context, same as the discount rate) that makes the net present value of a project's cash flows exactly equal to zero. Institutions can use IRR analysis to rank order projects, as with ROI, and to determine the cost of funding that, all else being equal, represents the breakeven point for project economics.

Table 1-5 presents IRR calculations for two boilers that an institution is considering installing. The data indicate that while the high performance boiler carries a higher initial price tag, it yields a better investment return over 10 years due to its stronger performance (this analysis assumes all operating characteristics other than energy savings are identical for the two boilers). Additionally, the analysis shows that the high performance boiler will yield a positive net return over 10 years at a financing rate below 10.4 percent, while the standard boiler will only break even at a financing rate of 5.3 percent or better.

Because IRR analysis integrates the time-value sensitivity of NPV analysis in a metric that is not dependent on project scale and therefore lends itself more readily than NPV to project-by-project comparison, business officers frequently use IRR analysis to analyze and prioritize among sustainability investments.

Table 1-5

Internal Rate of Return Calculation Examples

	Option A—High Performance Boiler		
Year	Capital Cost	Energy Savings	Annual Cash Flow
1	$(100,000)	$15,000	$(85,000)
2	-	15,000	15,000
3	-	15,000	15,000
4	-	15,000	15,000
5	-	15,000	15,000
6	-	15,000	15,000
7	-	15,000	15,000
8	-	15,000	15,000
9	-	15,000	15,000
10	-	15,000	15,000
Internal Rate of Return—Option A: 10.4%			

	Option B—Standard Boiler		
Year	Capital Cost	Energy Savings	Annual Cash Flow
1	$(80,000)	$10,000	$(70,000)
2	-	10,000	10,000
3	-	10,000	10,000
4	-	10,000	10,000
5	-	10,000	10,000
6	-	10,000	10,000
7	-	10,000	10,000
8	-	10,000	10,000
9	-	10,000	10,000
10	-	10,000	10,000
Internal Rate of Return—Option B: 5.3%			

COST OF DELAY

Much as business officers can use life cycle cost analysis (LCCA) to factor into economic analysis often-overlooked "returns" on capital investments such as decreased maintenance and other operating savings, business officers add a new dimension to their financial analysis by quantifying the cost of delaying a project's initiation. By analyzing the cost of delaying a project in terms of energy savings or generation revenues foregone during the period of delay, business officers can check the common instinct to delay projects until internal funds become available rather than pay more for external funding immediately. Business officers often find that their institutions benefit economically from paying marginally more to raise external financing and initiate the project immediately, as the cash flows the project generates in its first years more than recoup those additional financing costs.

Energy efficiency vendors emphasize the cost of delaying energy-saving investments in buildings and other infrastructure, and several online resources help building owners understand and implement this type of analysis. For example, the DOE/EPA Energy Star program provides on its Web site a Cash Flow Opportunity (CFO) Calculator that helps building owners determine whether they will benefit economically from delaying a project until internal funds become available or by initiating it sooner by using external financing.[9]

Indicative Example. Take, for example, an institution planning a $1 million retrofit project designed to replace lighting systems due for an upgrade and a 20-year-old HVAC system while installing a new energy management system. The ESCO working with the institution has estimated that the new equipment has a blended average life of eight years and the retrofit project will yield a simple payback of five years. The institution must decide whether it will benefit more economically by waiting until internal funds become available next year or financing the installation immediately with borrowed funds.

To analyze the project's economics, the institution calculates that average monthly savings equal about $16,667 ($1 million divided by 60 months). The institution estimates it could finance the equipment using a seven-year lease purchase agreement priced at 6 percent, implying an annual financial obligation of $175,303 (12 times $14,609). As shown in Table 1-6's "Option A—Immediate Borrowing," the institution would realize annual cash flows of $35,974 over the term of the lease purchase agreement while installing the project immediately.

Alternatively, the institution could fund the project with internal resources by delaying installation for one year, during which time the institution would pay its local utility $200,000 for energy consumption it would have avoided if it installed the project immediately. "Option B—Delayed Funding" projects the cash flows resulting from this funding strategy.

As Table 1-6 reveals, the institution pays $1,227,119 total for the project under Option A ($175,303 times 7) but only $1 million under Option B. However, the cost of delaying the project a year more than offsets the extra $227,119 in financing costs the institution pays under Option A. We see this by comparing the two scenarios' net present value of cash flows, discounted at the 6 percent borrowing rate. By initiating the project immediately with a lease purchase agreement rather than waiting a year to fund the project with internal resources, the institution realizes $100,069 of superior value ($263,352–$163,283).

Table 1-6

Cost of Delay Calculation Examples

	Option A—Immediate Borrowing				Option B—Delayed Funding			
Year	Savings	Payments	Annual Cash Flow	Cumulative Cash Flow	Savings	Payments	Annual Cash Flow	Cumulative Cash Flow
1	$200,000	$(175,303)	$24,697	$-	$-	$-	$-	$-
2	200,000	(175,303)	24,697	24,697	200,000	(1,000,000)	(800,000)	(800,000)
3	200,000	(175,303)	24,697	49,395	200,000	-	200,000	(600,000)
4	200,000	(175,303)	24,697	74,092	200,000	-	200,000	(400,000)
5	200,000	(175,303)	24,697	98,789	200,000	-	200,000	(200,000)
6	200,000	(175,303)	24,697	123,487	200,000	-	200,000	-
7	200,000	(175,303)	24,697	148,184	200,000	-	200,000	200,000
8	200,000	-	200,000	348,184	200,000	-	200,000	400,000
9	200,000	-	200,000	548,184	200,000	-	200,000	600,000
10	200,000	-	200,000	748,184	200,000	-	200,000	800,000
11	200,000	-	200,000	948,184	200,000	-	200,000	1,000,000
12	200,000	-	200,000	1,148,184	200,000	-	200,000	1,200,000
	Net Present Value - Option A			$263,352	Net Present Value - Option B			$163,283

6%—Interest Rate on Lease Purchase Agreement
$14,609—Monthly Payment on Lease Purchase Agreement
$175,303—Annual Payment on Lease Purchase Agreement

BEYOND MONETARY RETURNS

Environmental Impact. Many colleges and universities are interested in quantifying the environmental benefits of their sustainability initiatives. The following list captures the more common metrics used to measure sustainability investments' environmental impact:

- Emissions prevented in pounds per year for carbon dioxide, sulfur dioxide, nitrogen oxides, and mercury
- The carbon dioxide equivalent of planting x numbers of trees
- The equivalent of x number of miles not driven
- The equivalent of x number of cars taken off the road

The process of converting reduced consumption data to emissions equivalent is far from perfect. However, institutions can benefit in their conversion efforts from tools provided by the National Renewable Energy Laboratory (NREL), the EPA, and others. NREL's Renewable Energy Converter converts power generation data from biomass, concentrating solar, geothermal, photovoltaics, and wind to metrics including: annual household electricity needs met; tons of carbon monoxide, coal, nitrogen oxides, and sulfur dioxide reduced; and cubic feet of natural gas displaced.[10] The EPA has helpful tools including eGRID, a searchable database on air quality that shows the fuel mixes used to generate electricity region by region and reports emission factors for various power plants. EPA's Power Profiler informs users about how a region's fuel mix and emissions compare to national averages and, based on this data and a selected zip code, translates a consumer's power consumption to equivalent carbon emissions.[11]

Other Benefits. Sustainability projects frequently yield indirect benefits beyond purely environmental "returns." For example, projects designed to improve a building's functioning often contribute to increases in worker health. These indirect benefits in turn reduce employee attrition and sick days, boosting employee work productivity. While difficult to measure accurately, these benefits represent significant economic and non-economic returns on sustainability investments.

Pursuing Funding

BLENDING PROJECTS—SEQUENCING

When designing sustainability programs, colleges and universities should determine whether they prefer to let returns on sustainability projects revert to the general fund, or to apply those returns as funding for subsequent sustainability investments. Naturally, each institution will be guided in making this decision by its own circumstances, including its sustainability goals, competing demands for capital, and other factors.

Size and timing of returns vary between sustainability investments, so a given project's returns provide a "reinvestable" source of funds that are suitable for some projects but not others. Colleges and universities frequently earmark savings from energy efficiency projects as a funding source for further efficiency or other sustainability investments. To carry this out, the administration channels savings into an account or fund dedicated to future sustainability investments instead of allowing the savings to revert to the general fund. An institution can earmark "top line" savings from projects, rather than use those savings to service the debt that funded the original project, or instead earmark net cash flows after all project costs have been covered.

When institutions use efficiency savings to pay for renewable energy, they usually channel the savings toward REC or third-party power purchases rather than on-site development due to the scale and timing of efficiency savings. The capital requirements of most on-site renewable projects would outstrip savings from even the largest energy efficiency projects, and renewable projects' require capital upfront whereas efficiency savings accrue over a number of years. However, institutions can use energy savings to pay for a portion of development costs, such as debt service which occurs over time much like energy savings. Sometimes, an institution issues a loan from its general fund to the sponsor of a renewable project and determines that the sponsor will cover debt service entirely or in part with savings from energy-efficiency investments.

To rely on energy savings as a source of funding, an institution must estimate with confidence the dollar value of those savings. An institution can estimate this value based on pre-installation engineering estimates, actual savings measurements for projects already installed, and/or calculations using the International Performance Measurement and Verification Protocol procedures.

CASE STORY

University of Pennsylvania.[12,13] In April 2009, the U.S. Environmental Protection Agency's Green Power Partnership recognized the University of Pennsylvania (Penn) as the leading purchaser of green power among the nation's higher education institutions. In 2008, Penn purchased nearly 193 million kilowatt-hours of green power, 46 percent of the school's annual electricity consumption. Penn has paid for a portion of these purchases with more than $5 million in cash savings the university recognizes each year due to its energy conservation efforts. From its Operations Command Center, Penn engineers control campus-wide chilled water and steam utilities, and air-handling systems in buildings across the campus. Through sophisticated temperature/time optimization, temperature setback, and demand management techniques, Penn is able to avoid costly peak utility charges and conserve energy year round.

AGGREGATING PROJECTS—SCALING

Colleges and universities often benefit in at least three ways by aggregating multiple sustainability projects into a single, larger project: efficiencies of approaching energy systems holistically rather than as a sum of discreet pieces of equipment; bulk pricing on goods and services; and improved financing rates. Naturally, business officers should weigh the potential for achieving these monetary savings against the cost of delay and other expenses associated with coordinating a large, sophisticated sustainability effort.

Aggregating for Intra-System Efficiencies. Rather than view and invest in a facility as the sum of discreet pieces of energy-related equipment (boilers, chillers, and lighting in a building, for instance), an institution should consider how those pieces relate to one another and invest in the facility as a unified system. By taking this approach, an institution can optimize efficiencies among facilities' many energy-related parts. ESCOs and other sophisticated energy consultants bring this holistic perspective and expert understanding of systems to efficiency investments and other integrated energy projects.

Aggregating for Bulk-Purchasing Discounts. Occasionally, an institution can realize discounts on products and services by purchasing these products and services in bulk. Opportunities for bulk purchasing discounts abound across a range of sustainability investments.

One area where an institution can achieve bulk pricing is in the purchase of green power. For example, 40 Pennsylvania colleges and universities have realized discounted pricing by purchasing wind through a consortium called the Pennsylvania Consortium for Interdisciplinary Environmental Policy (PCIEP). Similarly, six colleges and universities in New Jersey have aggregated their purchase of fuel cells to obtain better pricing, while others are purchasing discounted green power by aggregating in conjunction with state agencies. In June 2005, the University of California (UC) and California State University (CSU) combined to purchase 73,000 MWh worth of wind and landfill RECs, which at the time represented 15 percent of their combined load and the largest ever purchase of renewable energy by a university system. Because of the size of this purchase, the universities paid only 25 cents per student, or about $42,000 a year for the initial six-month REC contract. This UC-CSU collaboration built on the institutions' experience since 1998 of using their combined size to purchase traditional power at discounted prices.[14]

Aggregating for Improved Financing Terms. Occasionally, an institution can reduce its borrowing rates by funding multiple projects through a combined financing. By bundling multiple projects into a single financing, an institution may be able to spread transaction costs across a larger total financing. An institution also might find that by aggregating enough projects (not all of which need to relate to sustainability), the institution positions itself to raise money on the capital markets and, in doing so, realize lower interest rates. Of course, business officers should weigh the potential for realizing these benefits of combined financings with the potential downsides, such as delaying projects in anticipation of a larger financing and foregoing project-specific financing opportunities that can be lost in a combined financing (for instance, when attracting tax equity investors, funding a renewable project with a bond may make more sense).

COMBINING SOURCES OF FINANCING

Colleges and universities fund all but the smallest projects from a combination of sources, as most projects require funding that exceeds amounts available from any single source.

In designing a funding strategy, a business officer should begin by determining which funding options fit the envisioned project well. One distinguishing feature of projects is the timing of their funding requirements. For instance, while on-site renewable developments require significant upfront capital outlays, energy efficiency retrofits frequently pay for themselves over time under leases. Projects also distinguish themselves by the amount of security the project offers financiers, with financiers preferring collateral such as power purchase agreement (PPA) payment commitments and easily detached assets to weaker forms of security such as assets installed in buildings that are difficult to remove and resell. Each project's requirements regarding timing and scale of funding and offerings in terms of security of lenders will guide a business officer's search for project financing.

Once informed about funding norms for the project in question, a business officer must next assess his/her institution's ability to secure the appropriate types of funding. Typically, business officers will find that their institution is well positioned to tap some sources of funding, while less able to access other sources. For instance, while public universities are eligible to issue Clean Renewable Energy Bonds, independent institutions cannot issue these bonds. Most determinants of an institution's ability to access financing are less binary than whether they are public or private, and include factors such as: size and status of operating and capital budgets; scale and covenants of existing borrowings; credit rating; alumni and student readiness to support sustainability projects; and geographic location, to the extent some utilities may offer more attractive incentives than others. These are a few of the factors that guide a business officer's ultimate determination of a project funding strategy that is both appropriate and feasible.

Depending on the project, business officers might start their funding considerations by analyzing what resources if any the institution could allocate from its operating and capital budgets or other internal sources. Simultaneously, business officers might explore opportunities to receive subsidized funding through utility rebate programs or public and private grants. While these sources can seem particularly attractive because they appear cost free, business officers should remember that any source of capital has some cost. For internal funds, this cost equals the opportunity cost of sacrificing an alternative use of those funds—be that paying down debt or funding other priority projects with the capital in question. For internal funds, rebates, grants, and all types of funds that an institution cannot access immediately, the business officer should assess the cost of waiting for those funds defined in savings or income foregone while delaying project initiation.

Often, a business officer will seek to work with a third party in part because that third party is able to capitalize on subsidized financing that the institution cannot receive. This is particularly common with renewable power projects, which often qualify for tax-related incentives that colleges and universities cannot use due to their tax-exempt status.

For example, business officers often fund wind development from numerous sources, even when they are able to reduce upfront costs through operating leases or performance contracts. Institutions manage to fund only very small development projects (e.g., a few kilowatts of installed capacity) or research projects entirely through rebates and grants and often arrange multiple funding sources even for these small-scale projects. For larger wind development projects, a business officer might cover one-third of capital costs with state and federal grants. The institution might fund another 50 percent of development costs with debt structured to allow the institution to service the debt with revenue from the wind project's electricity sales. With nearly 90 percent of the costs covered by rebates, grants, and debt, the institution might cover the remaining costs with allocations from the its capital or operating budgets, alumni gifts, or, in the case of wind projects large enough to attract private equity, equity from investors who invest in return for the project's production tax credits and other tax-related subsidies. This scenario is just one of many financing combinations a business officer might arrange to fully fund a renewable development project.

NOTES

[1] Association for the Advancement of Sustainability in Higher Education (AASHE), "Energy Conservation Policies," http://www.aashe.org/resources/energy_conservation_policies.php (accessed April 24, 2009).

[2] McKinsey & Company, *Reducing U.S. Greenhouse Gas Emissions: How Much at What Cost?* p. xiii.

[3] AASHE, *AAHSE Digest 2007: A Review of Campus Sustainability News*, p. 9.

[4] Reports estimate that LEDs have useful lives of 35,000 to 50,000 hours, compared with 10,000 to 15,000 hours for fluorescent tubes and 1,000 to 2,000 hours for incandescent bulbs. http://www.ledrunlights.com/ledlights.html (accessed April 20, 2009).

[5] Andrea Putman and Michael Philips, *The Business Case for Renewable Energy: A Guide for Colleges and Universities* (Washington, DC: NACUBO, 2006), pp. 5-6.

[6] Ibid. p. 4.

[7] Ibid. p. 53.

[8] Environmental Health & Engineering, "Profiting through Campus Sustainability: Financial Tools and Strategies," (Needham, MA), pp. 3-5, http://www.eheinc.com/download/ProfitCampusSustainability_Strategies.pdf (accessed April 8, 2009).

[9] U.S. Department of Energy/EPA Energy Star, "Calculating the Cost of Delay: An Introduction to the Cash Flow Opportunity (CFO) Calculator," http://www.energystar.gov/ia/business/Self_Guide_ES_CFO.pdf (accessed April 24, 2009) and www.energystar.gov/ia/business/cfo_calculator.xls (accessed April 13, 2009).

[10] Putman and Philips, *The Business Case for Renewable Energy: A Guide for Colleges and Universities*, p. 85.

[11] U.S. Environmental Protection Agency, eGRID, http://www.epa.gov/cleanenergy/energy-resources/egrid/index.html (accessed April 24, 2009).

[12] University of Pennsylvania (April 21, 2009), "University of Pennsylvania Recognized by EPA as Top Green Power Purchaser in the Nation" (press release), http://www.upenn.edu/pennnews/article.php?id=1625 (accessed May 5, 2009).

[13] University of Pennsylvania, "Energy Management: Conservation," http://www.upenn.edu/sustainability/energy-management.html (accessed May 5, 2009).

[14] Putman and Philips, *The Business Case for Renewable Energy: A Guide for Colleges and Universities*, p. 54.