



Higher Education: Leading the Nation to a Safe and Secure Energy Future

America's colleges and universities are well positioned to lead the nation in advanced energy efficiency and contribute to an energy independent economy. Small changes in federal incentives can make a big difference for the higher education sector to help contain energy costs and dramatically reduce and manage energy consumption. This report, published by the National Association of College and University Business Officers (NACUBO), Second Nature (SN), and the American College & University Presidents' Climate Commitment (ACUPCC), explores how the federal government can develop and enhance clean energy incentives and investments that are specific to the higher education sector. Among the most effective options are to allow tax-exempt bond financing to prepay power purchase agreements that require no price escalation, develop a loan guarantee program for energy-efficiency or renewable-energy projects, and enable long-term charitable deductions and tax credits for biomass and biomethane fuel-source contributions. The higher education community believes that such changes in tax policy and federal grant programs would allow colleges and universities to increase operational efficiencies, reduce long-term energy expenses, and ultimately contribute to administrative efforts to contain college costs.

Building on a Strong Foundation

Step on to any U.S. college or university campus and you will witness firsthand a new energy economy in motion. Higher education institutions are on the forefront of advancing efficient and renewable energy production—from wind and solar generation, to natural gas cogeneration, to geothermal and biomass heating and cooling systems. Equally impressive are the dramatic measures taken to maximize the operating efficiency of campus infrastructure. During the past decade, institutions have systematically curtailed energy consumption through multiple rounds of lighting upgrades, weatherization initiatives, and energy audits and system controls, and have implemented institution-wide Energy Star procurement policies. Buildings that adhere to advanced levels of energy-efficient performance criteria are commonplace on many college and university campuses. The sector has also embraced aggressive programs for water conservation, waste minimization and recycling, alternative-fuel vehicle fleets, and local food production—each with direct and indirect impacts on campus energy demand.

All these changes are spurred in part by a growing environmental consciousness among students, but they also represent higher education's commitment to equip graduates to be future leaders and problem solvers within a starkly different energy economy than that of decades past. The pursuit of substantial energy savings and new energy sourcing also reflects a strong and growing commitment to energy efficiency among presidents and campus business administrators and a mounting consensus that such shifts in campus operations are necessary to contain costs. Ensuring long-term energy reliability and financial security of the academy are crucial in advancing the educational mission of America's colleges and universities.

Higher Education's Social and Economic Impact

Combined, the nation's 4,000-plus private nonprofit and public colleges and universities—ranging from large research-intensive universities to residential liberal arts institutions to community and technical colleges—educate more than 20 million students each year. Increasing access to and affordability of higher education is a priority for the higher education sector. Extending the opportunity to attend college or university to as many citizens as possible is likewise critical to the nation's economic recovery, long-term prosperity, and global competitiveness through continued leadership in research and innovation. At the same time that colleges and universities in the United States play a critical role in the development of an educated and socially responsible workforce, they likewise are an integral part of the economic viability and stability of the communities in which they reside—often serving as one of the largest employers in their region and thereby generating significant economic activity throughout the country.

In recent years, higher education institutions have been challenged to keep tuition costs down while simultaneously increasing their enrollments and bolstering financial aid for the growing number of low-income students and their families who need it. Colleges and universities have been particularly challenged to find ways of financing energy-efficiency or renewable-energy projects because of extraordinarily sharp declines in state support coupled with the diminished ability of endowments to support operations. Opportunities and incentives to contain campus energy costs would enable institutions to moderate overall operating expenses.

Financing and Fiscal Stewardship

Because the primary mission of colleges and universities is to educate and support students in their learning environments, the largest share of the costs associated with colleges and universities are in support of the people who teach students, conduct research, and manage the necessary infrastructure that allows colleges and universities to play a unique role in American life. Close behind are the costs affiliated with operating and maintaining the campus physical plant. According to the National Center of Education Statistics (NCES), colleges and universities annually expend more than \$14 billion in operations and maintenance of buildings and grounds. They also expend between \$6 billion and \$7 billion each year on energy and utilities, about three quarters of which is directed toward electricity generation, transmission, and use.

Estimates from APPA, the national association representing higher education facilities officers, suggest that America's colleges and universities collectively own and manage more than 250,000 buildings and heat and cool more than five billion square feet of space on a daily basis—no insignificant expenditure. For every college and university, stewardship of energy resources bears a direct impact on the institution's ability to be a good steward of its financial resources. Opportunities to significantly reduce energy consumption directly correlate to an institution's ability not only to contain costs, but also to better employ taxpayer dollars, be they state operating funds at public institutions or federal grants and contracts supporting university-based research. Increasing the energy efficiency of university laboratories stretches taxpayer dollars further as academic researchers pursue scientific, medical, and technological discoveries important to patients, consumers, and society at large.

Higher Education: The Ideal Partner

As private nonprofit institutions or, in the case of public institutions, as entities of state government, institutions of higher education have been challenged to identify external sources to help finance energy-efficiency and renewable-energy endeavors, particularly at the federal level. Many existing federal energy-efficiency and renewable-energy incentives were designed as tax incentives for for-profit enterprises or as grant opportunities for state and local governments. Thus, the tax-exempt sector and

public institutions of higher education have not been able to directly benefit from such federal programs as the Business Energy Investment Tax Credit, the Renewable Energy Production Tax Credit, or the Energy Efficiency and Conservation Block Grant Program. Yet, in many ways, institutions of higher education represent the ideal partner to engage in advanced energy solutions.

Small-scale cities. Many higher education institutions are, in effect, small-scale cities. Through the built infrastructure of their campuses, colleges and universities operate as mini-municipalities of several hundred to tens of thousands of individuals. Many campuses have their own power plants in addition to academic and research buildings, dormitories, cafeterias, athletic facilities, transportation fleets, and more.

Long-term investors. As long-standing institutions, many colleges and universities are economic anchors in their communities, and as such, they are in a position to make investments with a long-term view. The same cannot be said for many other industries that make investments based on short time horizons and in the context of shareholder concerns about immediate returns on investment. The higher education sector's long-term perspective regarding investments, infrastructure, and buildings, combined with its willingness to adopt new ideas and technologies and to "go deep" with energy-efficiency retrofit projects underscore the fact that American colleges and universities can play a key role in leading the nation to energy independence, energy security, and energy innovation.

Cross section of the nation. Geographically diverse and serving nearly every population center across the country, U.S. higher education institutions are ideal places to test unique local and regional energy solutions and markets in the drive toward energy efficiency, energy independence, and energy security. Campuses provide readymade demonstration sites for testing emerging technologies and approaches and modeling what is possible for the nation at large.

Learning laboratory. Higher education has a long tradition of equipping graduates with not only the technical skills and knowledge to meet current workforce requirements, but also the critical problem-solving abilities to discern emerging trends and to solve society's greatest challenges. Modeling a variety of energy solutions on their campuses is one way colleges and universities are preparing future scientists and civic leaders to meet tomorrow's energy challenges and opportunities. Students on campuses across the country engage directly in energy stewardship efforts, from participating in campus energy audits to conducting and supporting energy-related research.

Job trainer. The rise in green employment opportunities—most notably in wind and solar installation as well as building design and construction—has necessitated the rapid deployment of workforce training programs aimed at delivering workers to fill the market demands of an emerging green energy economy. From the responsiveness of community and technical colleges to quickly develop and introduce training programs to retool workers' skill sets, to the systems thinking and complex problem solving offered through immersive learning opportunities that are a hallmark of so many residential liberal arts campuses, to the sophisticated and cutting-edge discovery that takes place at the nation's research universities, the higher education sector collectively holds the capacity to train the next generation of energy managers, engineers, architects, scientists, and entrepreneurs.

Natural collaborator. Whereas some sectors of American society remain highly competitive, higher education, by and large, is a natural collaborator, willing to join with peers and other entities in pursuit of a common agenda. In addition to business relationships with private-sector vendors to advance campus energy-efficiency efforts and partnerships with government agencies to set and comply with energy standards, the higher education sector has formed a number of impressive coalitions and devised voluntary standards to encourage the sector as a whole to embrace the new energy economy and commit to accountability of its performance.

- Most notably, the American College & University Presidents' Climate Commitment (ACUPCC), formed in 2007, is a coalition of more than 675 higher education presidents—representing almost one third of the U.S. student body—whose institutions have embraced a process to eliminate the

net greenhouse gas emissions of their institutions and produce graduates with the knowledge to help create a sustainable, healthy, and just society. These colleges and universities are planning, financing, and deploying a host of energy-efficiency and renewable-energy projects.

- The Association for the Advancement of Sustainability in Higher Education (AASHE) and the Higher Education Associations Sustainability Consortium (HEASC) are among other industry groups supporting sector achievements in advanced energy efficiency. Both groups have a broad reach—representing students, faculty, and administration, and spanning the full scope of campus operations, including student life, physical plant, procurement, the business office, and environmental health and safety.
- Statewide and regionally, a number of university systems and coalitions are working together to boost renewable-energy sourcing and make deep cuts to overall energy consumption and grid dependence. The University of California System and the New England Board of Higher Education are two among numerous entities that have undertaken efforts to extend best practices among individual institutions within a particular region.

Test bed of innovation. Society has always looked to higher education institutions and their leaders to identify current problems, anticipate future challenges, develop innovative solutions, and model the actions that society itself must adopt to continue to thrive in an increasingly global and resource-stretched economy. Institutions of higher learning have long been hotbeds of scientific and technological breakthrough, and in the realm of energy efficiency and energy production, they've quickly shepherded emerging solutions such as biofuels and biomethane co-generation facilities, geothermal and ground-source heating-and-cooling applications, thermal energy storage, advanced lighting technologies, and smart meters and building controls.

Driver of market transformation. In addition to showcasing to society what is possible in the realm of deep energy efficiency, the higher education sector has the capacity to create new and better markets for goods and services. Consider that the U.S. higher education sector represents operational budgets totaling \$350 billion annually—about 2.5 percent of U.S. gross domestic product (GDP). College and university campuses not only possess the purchasing power to encourage emerging and local energy markets, but they are also in a position to sustain these markets. In the same way that the movement toward local food sourcing has in many regions brought back the local farm through assurances of a steady buyer (i.e., campus dining services), higher education institutions can be a stabilizing force as a buyer of localized energy development, which in turn can spur innovation and small-business job growth with long-term investments in wind, solar, geothermal, biomass, and biomethane in particular.

Colleges and universities likewise model a “systems thinking” approach for integrating and maximizing the benefits of combined heat and power, waste heat recovery and utilization, demand-based energy management, and energy storage. Across America are many clusters of commercial, retail, and institu-

Smart Labs—University of California, Irvine.

“Smart Labs” at the University of California, Irvine, are proving that achieving advanced energy efficiency is feasible. Because research universities in particular are extraordinarily large energy consumers, reducing the energy consumption of a laboratory is the primary way to shrink the utility budget of the institution. Until recently, attempts to improve laboratory efficiency had plateaued at about 25 percent, but UC Irvine raised the performance bar for all labs and is achieving a savings goal in excess of 50 percent.

Its “Smart Labs” concept utilizes digital controls that are integrated with advanced occupancy and air quality sensors, reducing the number of times air has to be supplied, heated, cooled, humidified, filtered, distributed, and expelled. Most new and retrofitted laboratories could cut energy consumption in half by integrating such technologies. In the case of the Sue & Bill Gross Stem Cell Laboratory on the UC Irvine campus, the energy savings resulting from the smart-lab design criteria are equivalent to taking 130 automobiles off the road for 20 years.

tional buildings that could operate much more efficiently if the same or similar approaches to energy management of our most energy-efficient campuses were deployed. Through implementation of projects and technologies with the potential to be truly market-transformative, the higher education sector offers the possibility to depart from status-quo approaches in the areas of building mechanical and electrical design and energy infrastructure design.

Potential Savings in Energy Demand, Supply, and Distribution

The U.S. higher education sector has made significant strides in increasing the operational efficiency of the academic enterprise. Yet, new opportunities exist for colleges and universities to dramatically improve their energy and fiscal stewardship by further reducing energy consumption (demand), altering and expanding their energy sourcing (supply), and maximizing infrastructure improvements that address energy storage (distribution).

Demand. Opportunities for higher education to lower demand through deep energy retrofits fall into three primary categories.

1. Smart labs and high-performance buildings.

As a nation, the United States takes pride in its status as a world leader in cutting-edge research. One reason that research-intensive institutions in particular have difficulty reducing overall energy consumption is because today's highly sophisticated research typically requires advanced levels of heating and cooling, illumination, and information technology (IT) infrastructure to support the research mission. The costs to build highly efficient labs and retro-commission existing labs and other campus facilities to improve their energy efficiency are extensive, yet the potential energy savings through the introduction of advanced efficiency measures are as dramatic. When considering that for many research universities, two thirds of total energy costs for the campus' core teaching and research buildings are directly associated with their laboratories, it makes sense to implement measures that safely manage "smart" energy use. The ability to dramatically curtail research-related energy consumption—particularly in the thousands of university research labs across the country—would not only lower the overall cost of research-related education but would help maximize the federal dollars flowing into the higher education sector for sponsored research, thereby providing a direct benefit to taxpayers.

2. **Illumination.** Every campus, large or small, can benefit operationally from broad incorporation of the latest developments in advanced lighting technologies to more efficiently illuminate everything from classrooms to parking lots. Today's lighting retrofits go far beyond switching out

Smart Lighting Initiative—University of California, Davis.

Motivated by the California Public Utilities Commission's aggressive energy-reduction targets, the University of California, Davis, adopted its Smart Lighting Initiative with a goal of reducing the campus's electricity use for lighting by 60 percent by the end of 2015. The UC Davis initiative is a campus-wide effort that includes participation by facilities management, student affairs, design and construction management, the UC Davis Energy Efficiency Center, and Capital Resource Management, in addition to the California Lighting Technology Center (CLTC) and Environmental Stewardship and Sustainability. All UC Davis smart-lighting projects are based on innovations developed or refined by designers and engineers at CLTC. Innovations demonstrated and installed on campus are transferable to institutions of higher education, communities, and K–12 campuses, hospitals, industrial areas, commercial buildings, federal and military facilities, and other spaces.

To date, UC Davis has installed numerous energy-efficient lighting projects. Among the outcomes:

- The Smart Lighting Initiative will cut campus electricity use by 30 million kilowatt hours (kWh) annually.
- UC Davis will save an estimated \$3 million annually in electricity costs, in addition to savings from reduced cooling needs and maintenance costs.
- Potential energy savings of 50 percent to 60 percent are achievable using currently available technologies.
- Electricity consumption by exterior lighting could be reduced by a minimum of 2.7 million kWh per year, or about 30 percent.

fixtures. Total redesign of lighting systems can incorporate better spacing of fixtures and the introduction of task lighting as well as circuits zoned to maximize daylighting and influence occupancy behavior. This more sophisticated approach to determining lighting requirements and efficiencies of laboratories, classrooms, office spaces, residential settings, and alongside roads, parking facilities, streets, and pathways suggests that the potential for savings is not only significant when extended across an individual campus, but is also highly scalable across the entire higher education sector and beyond.

IT Efficiency and Conservation—Stanford University.

Stanford University, California, hosts approximately 40,000 desktop and laptop computers and uses roughly 6,000 servers for administrative and research computing. Approximately 15 percent of campus electricity energy use is due to IT infrastructure. In addition, because computers generate heat, it often takes as much energy to cool computing equipment as it takes to run it. Making IT infrastructure more efficient reduces the electricity needed to run computing and telecom equipment, the cooling needed to keep facilities at the right temperature, the energy used to build the systems, the resources consumed to build out new facilities, and the electronic waste that results from equipment disposal.

“Sustainable IT” at Stanford aims to inform and educate the community on the benefits of more energy-efficient computing and to provide the tools and resources to empower others to lead their own initiatives. Stanford’s IT services provides a Work Anywhere Toolkit that allows staff to work remotely and save the energy generated from commute trips. The university’s desktop energy-saving program includes centrally-funded desktop power management software for all faculty, staff, and students; moving backups and patches from night to day; putting computers in sleep mode; and reducing peripheral energy usage by providing special pricing with smart power strips. Turning off monitors and putting computers to sleep when not in use is estimated to save the university more than two million kWh/year in electricity usage.

3. IT/computers. While computing and information technologies do not account for the biggest share of campus energy consumption, they do represent the fastest-growing energy strain on most campuses. Growing on average at a rate of 20 percent per year, IT-related energy costs could quickly eclipse those of illumination if left unchecked. For instance, computing clusters purchased with federal dollars create excessive energy demands when the equipment is not installed in an energy-efficient facility setting.

Supply. Expanding energy-supply options is good not only for colleges, but for the country. Many higher education institutions are already pursuing a diverse energy strategy centered on enhanced efficiency and the transition to renewable and reliable clean energy sources as a way to stabilize long-term energy costs, provide hands-on educational opportunities for students, encourage local and regional economic growth through development of new energy markets,

Geothermal Solutions—Ball State University.

Ball State University, Muncie, Indiana, created the nation’s largest ground-source, closed-loop, district geothermal energy system—benefitting both the economy and the environment. Water heated by the earth began flowing through a new geothermal district heating-and-cooling system in spring 2012. This portion of the geothermal conversion allows Ball State to reduce its reliance on four aging coal-fired boilers. The project provides employment for several hundred contractors and suppliers and an opportunity for an estimated 2,300 direct and indirect jobs for 44 firms in 15 counties. When the system is fully operational, the university will be able to shut down the aging campus boilers. The system will heat and cool 47 buildings and result in \$2 million in annual savings. To create the system, Ball State drilled approximately 3,600 boreholes in borehole fields around campus, though these won’t be noticed after construction is complete. Each borehole was covered and the area restored to its previous use, retaining campus beauty. The system’s implementation demonstrates that geothermal energy coupled with ground-source, heat-pump technology can be used on a large-scale district distribution system. Since ground-source geothermal energy can be used in nearly every state, the environmental and economic implications have a national reach.

Smart Grid—University of Minnesota Morris.

A recent analysis of the potential benefits from the integration of smart-grid technologies throughout the campus of the University of Minnesota Morris found that full-scale implementation and adoption of integrated smart-grid technologies—including demand response, distributed energy resource systems, supply-side management, and advanced metering infrastructure—will significantly reduce the university’s energy costs and allow the campus to become energy self-sufficient and produce more power than it consumes.

The campus’s array of renewable resources includes a bio-gasification plant fueled by crop residues from nearby farms, solar thermal panels, a solar photovoltaic system, and two 1.65MW wind turbines. With the ambitious goal of becoming energy self-sufficient, the University of Minnesota Morris is looking to decrease its energy use and costs by installing various smart-grid technologies throughout its campus to make further use of its renewable-energy distributed energy resource (DER) systems. While traditional centralized power stations often waste more than 60 percent of the primary energy through heat release and transmission, DERs can be up to 80 percent to 90 percent efficient. Integrating technology that allows for monitoring this energy use online allows consumers access to real-time information, which results in decreased energy usage.

Adopting time-of-day pricing offered by the utility, coupled with its advanced metering infrastructure (AMI), will facilitate both energy conservation and cost savings by allowing load to be shifted from on-peak (higher prices) to off-peak (lower prices). Significant cost savings can be achieved from the combination of energy conservation, time-of-day pricing, and active energy load management. While significant initial investments are required to install the necessary smart-grid technologies, once installed, the annual savings can be used to pay back the initial investments and are especially beneficial as energy prices continue to rise.

and reduce dependence on non-domestic energy supplies. Generating demand for renewable energy should encourage continued development of related technologies that can lower the costs of these energy sources.

Distribution. As the nation moves to increase its share of renewable energy production, lingering challenges include the intermittency of renewable power and the lack of an adequate energy storage and distribution system. In many respects, colleges and universities are in the best position to lead the country in developing solutions to thermal energy storage and distribution because of efforts already under way on many campuses to incorporate smart metering and design microgrids that can transfer energy across campus infrastructure based on demand.

Closing the Cost Feasibility Gap

While many colleges and universities have tackled the low-hanging fruit of quick-payback energy efficiency and conservation efforts on their campuses, deep energy-efficiency measures represent a tremendous and as yet untapped opportunity for the higher education sector to further reduce operational costs. Yet, the terms of the scale of such investments are often daunting. To engage in the type of large-scale and long-term projects that could achieve up to 50 percent or greater in energy savings would require substantial up-front investment. According to a 2011 study commissioned by the Institute for Building Efficiency (“Energy Efficiency Indicator 2011”), lack of funding to pay for improvements was by far the primary barrier to pursuing energy efficiency (62 percent) among higher education respondents, compared with only 30 percent of all other respondents. Because these bigger projects carry a much longer payback, often over 20 or 30 years, the resulting “cost feasibility gap” is simply too big for many institutions to surmount in the early years without raising student fees and federal indirect cost rates. Pushing an institution’s debt capacity to its limits in pursuit of a large-scale energy project could result in a lowered credit rating that would make borrowing more expensive for every activity, including working capital and new construction.

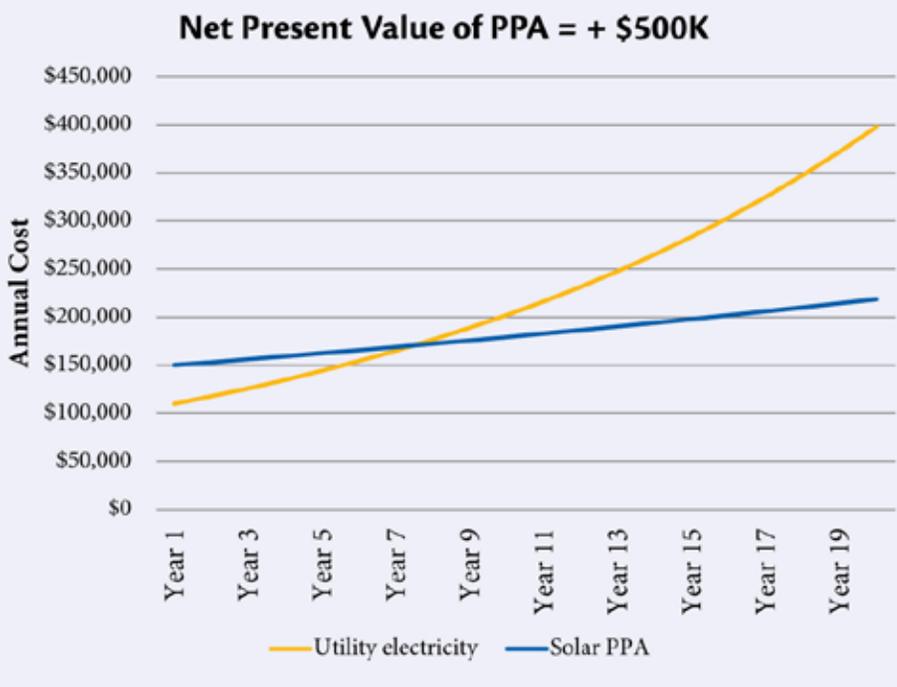
Herein lies a key role for the federal government: to assist institutions in meeting the initial costs of pursuing advanced energy-efficiency opportunities, infrastructure modifications, and alternate sourcing of energy. The right mix of incentives and investment could boost institutions over the hump of the current cost feasibility gap in order to invest in projects that over time would yield long-term savings dividends for taxpayers. Bridging this gap would also allow institutions to model how society can transition to an energy economy that is far less reliant on nondomestic energy sourcing.

The Renewable Energy Hurdle.

According to a recent report by the University of California (“Prospectus for a Sustainable Future”), the “central challenge in adopting renewable power is the initial cost when compared to business-as-usual.” A hypothetical example in the report illustrates how renewable energy proves considerably less costly in the long run, while traditional energy costs increase dramatically.

“Suppose an institution enters a solar power purchase agreement (PPA) for one million kWh per year priced initially at 15 cents/kWh, escalating 2 percent per year after year one. Meanwhile, the business-as-usual baseline cost of 11 cents/kWh for utility power escalates approximately 7 percent per year.

Under these circumstances, business-as-usual utility costs escalate faster than renewable energy costs, and the life-cycle value of renewable solar energy shifts into the positive realm despite higher initial costs, as denoted by positive net present value (NPV). Over time, renewable energy proves less costly, particularly after year seven when the cost curves intersect.”



Among the additional ways that taxpayers, and the economy in general, can benefit from tax breaks, subsidies, and guaranteed loans aimed at deep energy-efficiency projects and renewable-energy projects within the nonprofit higher education sector is through distributed generation, including on-site renewable installations. These reduce the costs to utility ratepayers (households as well as industries) of new transmission and distribution infrastructure, which is very costly.

Likewise, in states with renewable portfolio standards (RPS) policies—which require electric utilities to provide a certain percent of renewable energy by a certain date—it is almost certain that electric rates will escalate several percent per year faster than the price of inflation. In other words, there will be real economic cost increases due to the fact that in these states renewable power is replacing lower-cost “brown” power. While renewable power is typically more costly than grid power during the initial 5 to 10 years, once installed, renewable power has a rather flat rate of cost escalation—probably a percent or two less than price inflation.

Because of this, federal taxpayers would benefit if the “cost feasibility gap” were subsidized in the early years, thereby making it possible for institutions to procure or develop renewable power without paying an initial cost penalty that they would have to pass along in the form of tuition and fee increases and higher indirect costs for sponsored research. A long-term benefit to taxpayers occurs as installed renewables return savings over time due to their relatively flat cost curve even while grid power continues to escalate 3 to 4 percent faster, compounded indefinitely. The terms of this “cost feasibility gap” subsidy could be designed to ensure intended taxpayer dividends and to dis-incentivize renewable projects that would not yield these dividends.

Five Policy Options for Fostering Energy Efficiency and Renewable Energy at Colleges and Universities

While the U.S. Department of Energy has established programs and committed budgetary resources to other sectors (such as industrial facilities and commercial buildings) and specific technologies (such as solar, wind, and geothermal), the department's interest in higher education has tended to focus on research rather than deployment. Likewise, in recent years, a number of federal grant opportunities, loan guarantees, and tax credits have been structured in ways that exclude or limit participation by private nonprofit and public institutions of higher education. Several examples of such programs include the Energy Efficiency and Conservation Block Grant Program, the Energy-Efficient Commercial Buildings Tax Deduction, the Renewable Electricity Production Tax Credit, and the U.S. Department of Treasury Renewable Energy Grants. As tax-exempt entities, colleges and universities must partner with commercial developers to benefit from such programs.

A variety of new federal policy options could stimulate deep energy-efficiency and renewable-energy investments at colleges and universities. Institutions could leverage federal support with state and local government initiatives as well as with institutional funds and private-sector investments. In some instances, slight tweaks to existing legislation could exponentially expand possibilities and mitigate or eliminate eligibility barriers.

1. Allow tax-exempt revenue bond financing to prepay power purchase agreements.

The transition to renewable energy is most expensive for the first 5 to 10 years until projects begin to pay off. Because large-scale power purchase agreements (PPAs) for these projects cost more initially, one solution would be to allow colleges and universities to prepurchase a 20-year supply of power with low-cost capital bonds and with flexibility to shape the debt (e.g., interest-only payments during the early years). The opportunity to use tax-exempt revenue bond financing for prepayment of PPAs is currently not a qualified use for the nonprofit higher education sector, although it is available to municipal utilities.

Many colleges and universities effectively constitute small municipalities, replete with infrastructures, municipal services like parking and security, and on-site energy utilities that serve an array of customers. Investing in an institution's energy infrastructure will yield certain, long-term fiscal benefits to taxpayers through downward pressure on tuition and indirectly through lower federal and state financial aid dollars spent on utility bills.

2. Develop new energy-efficiency and renewable-energy loan options for institutions of higher education.

Colleges and universities use term loans to fund a wide variety of projects, including energy investments. There is wide variability in up-front and ongoing administrative costs as well as interest rates, debt term and structure, and market conditions on bank debt. A federal loan guarantee program and/or a federal revolving loan fund dedicated to higher education energy-efficiency and renewable-energy efforts can take some of the variability and uncertainty off the table as institutions embark on a long-term energy strategy.

- a. Establish a federal loan guarantee program for energy-efficiency or renewable-energy projects at institutions of higher education. One potential solution for financing advanced energy-efficiency and renewable-energy projects is to provide access to guaranteed loans. Federally backed loan guarantees are particularly beneficial to colleges and universities because these would prevent institutions from pushing beyond their debt capacity limits, which could jeopardize an institution's credit rating and adversely impact its borrowing ability, its reputation, and its cash flow while also increasing the cost of all functions that depend on financing. Providing such an option for the higher education sector to finance energy projects would also provide real value for the government, since there are few entities that are less risky than public universities when it comes to

offering loan guarantees, and since the outcome would return real savings to taxpayers.

- b. Develop a federal revolving loan fund for energy-efficiency initiatives. Revolving loan funds (RLFs) are increasingly common on college campuses and could be used as a model for federal investment. A revolving loan fund provides capital for projects that create some level of return or cost savings, such as energy-efficiency or renewable-power projects. Some portion of that return or savings is used to repay the fund until the full project cost has been paid off. Repayment can include an interest rate or be interest-free. As the fund is replenished it can finance more projects that meet the RLF's investment criteria. According to a recent study by the Sustainable Endowments Institute, more than 50 higher education institutions have at least \$66M invested in green revolving loan funds, with an average rate of return of 32 percent. Colleges and universities have generally found RLFs to be a flexible, relatively low-cost, high-return mechanism for funding energy-efficiency projects. Such a program on a national scale would result in tremendous efficiencies on campuses across the nation.

3. Establish, alter, and fund federal grant programs.

Section 471 of the Energy Independence and Security Act of 2007 authorized, for FY09-FY13, grants and loans to institutions of higher education to carry out projects to improve energy efficiency. Unfortunately, the program has never been funded. Congress should support the overall goals of Section 471 and consider reauthorizing and funding the program. The higher education sector recommends modifying the program to incent state-based matching grant programs, eliminating the \$1 million limit on the maximum award, and enabling the federal grant to support up to 30 percent of total project cost.

Additionally, the American Recovery and Reinvestment Act of 2009 created a renewable-energy grant program that is administered by the U.S. Department of Treasury as Renewable Energy Grants, taken in lieu of the federal, business, energy investment tax credit (ITC). Only colleges and universities partnering with commercial developers can benefit from the program. Eligibility should be extended to tax-exempt entities.

4. Allow long-term charitable deductions and tax credits for biomass and biomethane contributions.

Solar, wind, hydro, and geothermal energy are not viable options in all parts of the country. However, biomass and biomethane, especially in agriculturally dense communities, have proven to be practicable options and of growing interest within the higher education sector for combined heat-and-power applications. These systems hold great promise not only for college and university energy generation but for transforming the nation's energy economy. Yet, construction of a bio-digester plant represents a huge capital investment—upwards of tens of millions to hundreds of millions of dollars to get up and running at scale. Likewise, assurance of a steady flow of the materials needed to power the system is essential for embarking on such a large-scale commitment. A change in the tax code to assign a charitable contribution to a supplier of organic material (e.g., farm, canning operation, cheese maker, etc.) and make it contingent on a length of time (e.g., 10 years) would give incentive to the provider to maintain the flow of materials and would provide reassurance regarding supply to institutions contemplating such a major investment. Gift tax benefits should be offered for the imputed value of source materials if donors are willing to make a 10-year commitment.

Extending existing incentives and tax credits to biomass, biogas, biomethane, and geothermal production in addition to wind, solar, and hydro power solves a supply-side challenge and could make the difference for many institutions to take advantage of readily available renewable-energy sources in their region. Agricultural communities in particular offer great promise for institutions to partner on projects that would reduce consumption of and dependence on foreign sources of energy and would open up new possibilities for domestic fuel markets.

5. Extend eligibility of clean and renewable energy bonds.

The U.S. higher education sector is a national leader in renewable-energy purchasing and develop-

ment. Colleges and universities in many cases are exceeding state-mandated renewable portfolio standards as part of their total power supply, some with support from Clean and Renewable Energy Bonds. The CREB program allows entities to finance renewable-energy projects at lower costs than traditional financing mechanisms. Currently, private colleges and universities are not eligible to take advantage of this tax credit bond. Extending eligibility of this financing option to independent institutions could boost participation in renewable-energy markets.

Where to From Here?

Because the nation's colleges and universities employ systems thinking in their everyday operations, their campuses offer a unique venue to test and deploy new energy technologies and strategies. In the process, higher education institutions provide excellent models for society for the large-scale approaches to energy efficiency and smart-energy sourcing that will be increasingly required to thrive as a nation. As such, the higher education sector can help lead the way in tackling key energy challenges, including issues of energy storage and distribution. As more campuses continue to transition to purchasing a greater share of energy from clean, domestic, and renewable sources, they are also modeling the possibility of safe and secure energy consumption and energy independence to their surrounding communities and to society at large.

In many respects, colleges and universities represent the ideal partner for government to engage in advanced energy solutions on a national scale. More so than any other sector in the country, higher education is positioned to implement new technologies and energy solutions and to bring them into operation quickly. The federal government in particular can assist institutions in meeting the initial costs of pursuing deep energy-efficiency opportunities, infrastructure modifications, and alternate sourcing of energy with the right mix of incentives and financing options to boost institutions over the hump of their current "cost feasibility gap." Bridging this gap would not only allow the higher education sector to realize long-term energy savings in support of its academic mission, but would also allow institutions to encourage and sustain new local and regional energy markets and thereby model how society can transition to an energy economy that is far less reliant on nondomestic energy sourcing.

At a time when economic resurgence and job creation remain national priorities, incentivizing investment in infrastructure that can lead to economic productivity and markedly lower costs is not only logical, but necessary. While infrastructure projects such as roads and bridges may take years to design, environmentally permit, entitle, and complete, the energy infrastructure of our colleges and universities clearly meets the requisite criteria for smart public investment that broadly benefits citizens and taxpayers with economic dividends that are almost immediate. Such investments represent compounded savings not only in direct energy costs for institutions but indirect costs for state and federal governments when reduced utility bills stretch the impact of taxpayer dollars allocated for student financial aid and sponsored research.

For public institutions in particular, it is fiscally responsible for governments to take the steps necessary to make every investment in energy efficiency for the properties they own. Through bolstering incentives and investments in advanced energy efficiency and clean domestic-energy sourcing, both federal and state governments have the means to avoid waste and to pursue the wise use of taxpayer dollars applied to these efforts to ensure that precious resources are available for other critical needs.

About Second Nature

Second Nature works to create a healthy, just, and sustainable society by transforming higher education. Second Nature is the lead supporting organization of the American College and University Presidents' Climate Commitment, a growing network of over 675 signatory higher education institutions in all 50 states that have made a public commitment to transform the educational experience for all students so they are prepared to solve the climate crisis.

Learn more at: www.secondnature.org.

About NACUBO

NACUBO, founded in 1962, is a nonprofit professional organization representing chief administrative and financial officers at more than 2,500 colleges and universities across the country. NACUBO's mission is to promote sound management and financial practices at colleges and universities.

Learn more at: www.nacubo.org

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