Driving Energy Efficiency through Higher Education Collaboration

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Rocky Mountain Institute (RMI) is an independent, non-partisan nonprofit that drives the efficient and restorative use of resources. RMI advances market-based solutions, engaging businesses, communities, and institutions to cost-effectively shift to efficiency and renewables. We employ rigorous research, analysis, and whole-systems expertise to develop breakthrough insights. We then convene and collaborate with diverse partners—business, government, academic, nonprofit, philanthropic, and military—to accelerate and scale solutions.

ABOUT ARCH
The Alliance to Retrofit Chicago Higher Education (ARCH) was created to bring together higher education institutions in the Chicago area to share best practices and lessons learned from expanding efficiency in existing buildings and improve collaborative efforts on developing effective strategies for promoting greater investment in energy efficiency by project participants. ARCH is a project of the Global Philanthropy Partnership, which is funded by the Joyce Foundation, the Chicago Community Trust, and the Comer Foundation.
EXECUTIVE SUMMARY
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The Alliance to Retrofit Chicago Higher Education (ARCH), a project of the Global Philanthropy Partnership and administered by CB&I, was created to help institutions in the Chicagoland region work together to find effective strategies for reducing energy consumption and carbon emissions on their campuses. Through this work, ARCH began conversations with other networks across the country to understand their programs, progress and lessons learned. It is clear that groups of institutions, working together, sharing practical advice, exploring common solutions, and collaborating around challenges, represent a powerful vehicle for enhancing efforts on the individual campuses. However, these conversations also discovered that not all collaborative efforts were successful.

To better understand these dynamics, ARCH, in partnership with the Rocky Mountain Institute (RMI), researched collaboration efforts occurring within the higher education sector. This research explores how collaborations work best, documents the benefits that accrue to participants in these collaborations, and assesses how these collaborators can effectively partner with local governments and utilities to promote greater investment in energy efficiency and drive further reductions in energy consumption on campuses.

This report aims to start a larger conversation about these needs and the benefits of collaboration; how best to expand these partnerships into geographies where they may not currently exist; how to increase their effectiveness; and how to use these networks as a mechanism for scaling efficiency efforts and reduce the transaction costs associated with efficiency efforts. Though resources exist for enabling individual institutions to become more energy efficient, there is less known about how groups of institutions can best collaborate with each other and with other partners. It is essential that individual institutions, cohorts, municipalities, and utilities have a platform for enhancing the effectiveness of their efforts.

KEY FINDINGS ABOUT THE NEEDS THAT EXIST TO EXPAND COLLABORATION AND INCREASE ITS EFFECTIVENESS INCLUDE:

1. Researching the measurable impacts of cohorts and better understand how to broaden collaborations and make them more impactful.

2. A platform to allow cohorts to communicate with each other and share successes, failures, and lessons learned. A platform of this nature has the potential to drastically increase the effectiveness of individual cohorts.

3. Web-based tools and on-line resources to help cohorts lacking an outside facilitator maintain this critical function. An online platform also could connect cohorts to funders interested in supporting this critical service.

4. A set of industry best practices to offer insight into the mechanisms critical for success, such as developing common commitments and metrics for measuring impact.
INTRODUCTION
Driving energy efficiency through higher education collaboration

The higher-education sector presents a key opportunity to address climate change and energy-reduction goals across the country. College and university facilities account for 5% of U.S. commercial-building emissions and comprise over 5 billion square feet of space, leading to nearly $14 billion in annual energy costs. Estimates suggest that sustained efforts in the higher education sector could yield more than $1 trillion in energy savings over 10 years. Unlocking the vast savings potential in this sector is critical to meeting the ambitious carbon-reduction goals of states, cities, and utilities.

Unlocking these savings often feels like a solitary and lonely exercise — the occupancy sensor reducing light levels in unused spaces; a Building Automation System shutting off heating and cooling equipment after hours, when everyone has left the building; a building engineer replacing incandescent bulbs with LEDs; the output from wind turbines out on a desolate plain replacing electrical output from coal-fired plants, often nearer to urban cores.

These activities are core elements of most campus action plans and produce significant results. However, a growing aspect of climate reduction strategies includes a more social element: competitions among departments or dorms around energy reductions; schools combining their purchasing power to increase renewable energy supply; or a group of universities entering a city led better buildings challenge in unison; and institutions around the country sharing results from their individual projects to help improve outcomes for the sector.

No doubt the mechanisms through which civic engagement and social connectedness produce such results — better schools, faster economic development, lower crime, and more effective government — are multiple and complex...Social scientists in several fields have recently suggested a common framework for understanding these phenomena, a framework that rests on the concept of social capital. By analogy with notions of physical capital and human capital — tools and training that enhance individual productivity — “social capital” refers to features of social organization such as networks, norms, and social trust that facilitate coordination and cooperation for mutual benefit.

Robert Putnam

INTRODUCTION

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The Higher Education sector is one whose roots are firmly planted in the idea that collaboration can be instrumental in driving success. Examples of collaboration between institutions are commonplace across the county as seen by the countless research projects, student associations and athletic conferences. Peer-to-peer exchange networks provide opportunities to share effective methods as well as barriers to success. Creating a formal, recognized group around a particular the issue or

1 http://xroads.virginia.edu/~hyper/DETOC/assoc/bowling.html#FOOT4
2 Higher Education in a Warming World: The Business Case for Climate Leadership on Campus
3 College Construction Report 2015
cause can elevate the issues’ importance, allow for more visibility for leadership, and bring increased importance to the issue. These networks also provide a platform for sharing knowledge, reducing risks and allowing effective strategies to be adopted more quickly. With a growing interest in greening their campuses, it is no surprise that schools have begun to partner with one another to make their campuses more sustainable and energy efficient.

This paper explores how collaboration between universities can be an effective mechanism for facilitating institutional change and catalyzing future energy efficiency and sustainability projects. These collaborations, termed cohorts, are groups of institutions focused on a common objective.

This report serves as a practitioner’s guide to help cohorts become more effective and better connected, and demonstrate the opportunities for municipalities and utilities to understand the potential for cohorts to increase the effectiveness of energy reduction efforts and goals. The study is meant to serve as the starting point for a broader conversation about collaborative efforts nationally.

Numerous case studies are provided for each of these four areas to highlight particularly effective examples.

To strengthen collaboration, there is a need to capture the success stories, archive them and create an easy way for these mechanisms to be deployed across the networks. There are currently many guides and organizations dedicated to providing higher education with access to best practices on energy efficiency and sustainability on the building and campus level. There are far fewer studies addressing how universities, colleges, municipalities, and utilities can make collaboration more effective. This report outlines the gap within this sector of providing effective resources to elevate cohorts. The formation of higher education cohorts focusing on energy efficiency and sustainability provides significant opportunity; this report aims to formalize these opportunities through the use of case studies and research. Shorts falls around data tracking on how cohorts are increasing tangible results and the benefits they can bring are addressed throughout this paper; the necessity for platforms and resources where being self-administered groups can go to find out what makes a successful cohort will also be evident throughout this paper.

SPECIFIC OBJECTIVES OF THE REPORT INCLUDE:

1. Explore various examples of collaboration among networks of higher-education institutions, and offer tools to develop a shared agenda for moving energy efficiency and sustainability forward (cohorts).

2. Explore partnerships among cohorts and municipalities and provide tools to what makes them successful.

3. Explore partnerships among cohorts and utility-funded efficiency programs.

4. Determine the gaps that currently exist in understanding what makes collaborations effective.
COLLABORATION
**THE IMPORTANCE OF COHORTS**

While institutions are expanding energy efficiency programs on their own campuses, they are also increasingly looking to their peers for assistance. Higher-education cohorts are an important mechanism to accelerate and scale energy efficiency on and across campuses; they provide a platform to share lessons learned, leverage collective purchasing, and take advantage of shared resources. Cohorts can vary widely in their geographic reach, institutional makeup, and specific goals and objectives. But in-depth research and interviews conducted with 25 cohorts across the country reveal common characteristics or practices of groups that have been the most successful in driving change.

- **Top-Level Buy-In:** Support from high-level university officials provides an important context for achieving results.
- **Defined Roles and Accountability:** Assigning a group facilitator drives action and success.
- **Information Sharing:** Sharing best practices and lessons learned offers a straightforward mechanism for cohorts to show value to their members.
- **Commitments:** Having participants commit to a specific outcome is crucial to raising accountability.
- **Documenting Value and Outcomes:** Measuring the value created by the cohort ensures continued participation by members.
- **Fostering Internal Relationships:** Extending involvement to other stakeholders on individual campuses is critical for attaining success.
- **Leveraging Collective Action:** Being perceived as behind the curve may allow institutions to achieve results that may not have been impossible on their own.

One mechanism many schools use to collaborate with one another is through participation in energy efficiency and sustainability cohorts. A “cohort” is a group of institutions that partner with one another around a common interest(s). This commonality can be geographic area/region, institution type (i.e. public/private), achievement level, a specific technical issue (i.e. geothermal energy) etc. For the purposes of this report, the classification of what defines a cohort is not constrained by size. However, the size of a cohort should reflect the purpose of the group. For example, smaller cohorts can be more impactful for participating campuses due to a focus on a specific issue, while larger cohorts can carry more influence due to their size, make-up and reach. Energy efficiency and sustainability focused cohorts come in many different shapes and sizes but the general purpose for all of them is to save money and drive tangible change on their respective campus.

Five best practices have been focused on and deemed as useful strategies to all energy efficiency and sustainability cohorts; these strategies can most effectively drive success and can lead to fundamental changes for institutions involved. These best practices were determined after in-depth research of a variety of cohorts across the country and individual interviews with members of these groups. Using the information gathered during the research process the writers of this report collectively agreed upon the practices that were seen to most effectively and efficiently drive energy savings at a campus level. While cohorts can be successful utilizing one or two of these best practices our research indicates that groups who use take a holistic approach and operate using all five best practices are the most effective at leveraging the benefits that come with collaboration.
TOP LEVEL BUY-IN

For collaboration among Colleges/Universities to be successful a level of “buy-in” or support from high levels of the administration is paramount. While approval from administration officials (President, Provost, CFO, etc.) is vital, the support from top-level executives such as the President, CFO or Board Members can be just as important. For the context of this paper, support is defined as either written or verbal approval of the group’s existence or actions.

The commitment from these officials adds legitimacy to the group and provides value to the participating members that energy efficiency and sustainability are issues of importance for the administration. Groups that receive top-level buy-in have an increased likelihood of seeing significant change across participating campuses. Alternatively, groups who do not receive support from top-level executives are likely to have a more difficult time effecting change.

CASE STUDY

NAME: Alliance to Retrofit Chicago Higher Education
LOCATION: Chicago, IL
PARTICIPANTS: 11 schools
COMMONALITY: Region
SUMMARY:

The Alliance to Retrofit Chicago Higher Education (ARCH) is a cohort of 11 Chicago area schools that meet bi-monthly to discuss best practices and innovations in energy efficiency. In 2014, all 10 schools located in the city formally signed onto the City of Chicago’s Retrofit Chicago “Commercial Buildings Initiative (CBI).” This commitment required executive level approval and entails a 20% energy reduction in identified buildings over 100,000 square feet within five years. In aggregate, the committed buildings exceed 3.7 million square feet of space and will lead to CO2 emission reductions of 11.2MMT. This commitment from high ranking university officials was a showing of support for the work that led to this commitment and added a sense of legitimacy to the group’s operations moving forward. ARCH provided a platform for its members to collectively commit to developing and sharing best practices in order to have a positive impact in the region and ensure these strategies have scalability.
DEFINED ROLES & ACCOUNTABILITY

Because most cohort participants are volunteering their time, the presence of a designated group facilitator is a critical component to the success of a cohort. The group facilitator role is usually an organization or individual who administers, manages, and often facilitates the group. In most cases, the responsibilities of group facilitator include planning upcoming meetings, managing of emails and bringing in outside speakers. The presence of group facilitator can also add a dimension of accountability to the group by following up with members about collaborative projects and keeping the group on task during meetings and seminars. In many cases cohorts designated the role of administrator to a third party or a representative of a member institution whose role is solely to serve as the facilitator of the group. In contrast, some cohorts choose to divide administrative responsibilities among participating members. While this approach can succeed, lack of time and accountability can cause the group to wind down and disband.

CASE STUDY

NAME: Higher Education Working Group
LOCATION: Boston
PARTICIPANTS: 11 schools
COMMONALITY: Region
SUMMARY:

The Higher Education Working Group (HWEG) was created in 2011 as an offshoot of the City of Boston’s Green Ribbon Commission. It is comprised of high-level sustainability professionals who come together as representatives of their institutions who hold regular meetings once a month, and convene one-to-two larger meetings a year. The group is facilitated by a part-time external coordinator and managed by the Harvard Office for Sustainability. The presence of both a third party coordinator and representatives of a member institutions whose sole purpose is to aid in the group’s facilitation provides the group with a wide array of resources that can be used to drive the group’s success and is a main reason why the HWEG is consistently able to bring high level decision makers to the table. According to HWEG participants, these meetings have brought real benefit and caused an increase in information sharing among campus sustainability leaders. The events have also been successful in creating new connections and providing resources to people in thinking differently on how to tackle the climate and sustainability challenges they face on campus.
A successful cohort can also serve as a unique platform for information sharing. Cohorts provide opportunities for likeminded institutions to meet with one another and share best practices and lessons learned about an area that is of interest to all involved. This can be done by sharing information with one another such as: success of past projects — what has worked and hasn’t, experiences with providers and contractors and the effectiveness of different types of equipment. By sharing these lessons learned, institutions are provided with the necessary information to implement projects in a more efficient and cost effective manner. Alternatively, it can also prevent institutions from making similar mistakes others have made in the past. Aside from sharing information about project successes/failures; cohorts can allow schools to share technical data and performance metrics. The availability of this data among participating institutions can identify areas for improvement and encourage institutions to benchmarking against each other. Cohorts allow schools to compare themselves against their peers and see where they are being innovative and also where there is room for improvement. Benchmarking against one another can also provide a level of friendly competition between participating schools. This level of friendly competition can oftentimes serve as added motivation for an institution to pursue energy efficiency. Although is hard to measure tangible impact cause by the sharing of information among institutions, there is real value in this practice and the cohort model provides an ideal platform to do it.

**CASE STUDY**

**NAME:** California Community College System  
**LOCATION:** California  
**PARTICIPANTS:** 112 Schools, 75 million Sq. ft.  
**COMMONALITY:** School Type (Community College)  
**SUMMARY:**

The California Community College System as a network/cohort agreed to use a uniform data system, called ‘FUSION’, to track their energy consumption and building data. This uniform data system is a central hub which enables actionable items for all participating institutions. This system combines school’s data to a common data service platform that can be assessed by a variety of people. The availability of this data can be helpful for energy efficiency because it consolidates and uniform all building/portfolio data in one place. The schools are using this data to do economic analysis of specific buildings and campuses which has directly led to increased building performance and energy savings for its participants.
DOCUMENTING VALUES & OUTCOMES

One of the most critical components for driving success through collaboration is the need for the group to document progress toward energy efficiency. Documenting energy reduction that can be directly attributed to a group can quantify the value of being part of that group to an individual institution. The attribution of energy savings can help demonstrate the value that comes with an institutions involvement in a cohort. Though it often proves difficult to correlate savings directly to participation in a cohort, methods of doing so include energy projects that stem from exchanging lessons learned during group meetings, leveraging relationships to obtain funding for a project, and, savings attributed to technical resources provided through group participation. Without some level of tracking efficiency gains it is impossible to demonstrate to stakeholders any measureable outcomes that can be attributed to cohort involvement and therefore make it near impossible to measure a cohort’s overall impact or success.

CASE STUDY

NAME: Illinois Green Economy Network
LOCATION: Illinois
PARTICIPANTS: 45 schools
COMMONALITY: Statewide Community College System
SUMMARY:

The Illinois Green Economy Network (IGEN) is cohort of 45 schools that convene to share best practices in sustainability between all community colleges in Illinois (the third largest community college system in the nation) and their respective communities with the goal of spurring economic development in a way that leads to healthier, equitable, resilient, vibrant, and more sustainable communities in Illinois. Currently the group is working on initiatives having to do with energy innovation, energy efficiency, freshwater resources, sustainable food, advanced manufacturing and electric vehicles / biofuels. To document the network’s energy efficiency progress, IGEN uses the energy dashboard system Lucid, an energy dashboard that which tracks real time energy use and monitors consumption and tracks improvement over time. Lucid is an energy dashboard that is commonly used by schools to document real time energy usage but what makes IGEN’s use of it unique is that the dashboard is monitoring energy performance at multiple institutions. Because of this, IGEN’s dashboard allows cohort members to monitor the network’s overall efficiency gains over time, which can provide concrete data to the group’s overall impact.
BOLSTER INTERNAL RELATIONSHIPS

Improving energy efficiency on college campuses is not specific to one specific department. Usually it falls under the direction of one department (sustainability or facilities) but when in reality this issue can affect operations of a variety of offices (sustainability, facilities, finance, residence life, academics, research, IT etc.). For campuses to most effectively implement energy efficiency and sustainability projects all of these stakeholders must be engaged. However, this has proven to be a challenge for many campuses. Effective cohorts can serve as a mechanism for connecting these departments and strengthening the working relationships between them. Participation in cohorts provides for increased opportunities for internal discussions and can lead to a level improved connectedness among departments. Cohorts provide the resources and influence needed to effectively engage all necessary stakeholders and can also be used to increase the ease of communication between them. With an engaged stakeholder base institutions are able to increase the effectiveness of their efficiency and sustainability projects.

CASE STUDY

NAME: Vermont Campus Sustainability Network
LOCATION: Vermont
PARTICIPANTS: 16 Schools
COMMONALITY: State
SUMMARY:

The Vermont Campus Sustainability Network (VCSN) is a group of 16 schools that meet twice a year to share energy efficiency and sustainability best practices and lessons learned. VCSN is sponsored by the University of Vermont (UVM) and Efficiency Vermont, the statewide energy efficiency program. A pillar issue for VCSN is improving interdepartmental communication in regards to energy on member campuses. To achieve this VCSN is working with experts within the network (UVM), as well as outside (Efficiency Vermont) to develop strategies to successfully create “Energy Green Teams” on participating member campuses. The opportunities and resources provided in this cohort will lead to more efficient and effective energy staffs for participating schools.
PARTNERSHIPS WITH MUNICIPALITIES

HIGHER EDUCATION AND MUNICIPALITY COLLABORATION

Colleges and universities are important institutions in their localities due to their size, level of employment, and social purpose. Effective partnerships between campuses and municipalities benefit both parties by aligning interests and leveraging the resources and strengths of each party. Municipalities can provide a context for action by eliciting commitments from universities and raising the visibility of efficiency among senior leadership. Institutions, in turn, can assist in shaping local ordinances (e.g., energy benchmarking), joining energy efficiency programs and initiatives, participating in planning and research, and engaging students, faculty, staff, and alumni around the municipalities’ emission reduction goals. Given the limited resources available to municipalities, partnering with local institutions can help to drive implementation of municipal energy and sustainability projects and goals.

Effective partnerships between higher education and municipal governments require tangible goals and are best accomplished when tackling a specific policy objective. As major landowners, universities can be leaders in setting and implementing strong climate goals, and assisting in expanding these programs to neighboring communities. The strongest partnerships integrate a specific commitment to sustainability, energy conservation and efficiency, and GHG mitigation. Many informal partnerships and projects happen between universities and cities, but programs with tangible goals and requirements typically work best.

An area of growing collaboration is in disaster preparedness and emergency response. In the wake of Hurricane’s Katrina and Sandy, the higher education sector has also increasingly been involved in municipal resiliency planning as their campuses have become important elements of a community’s response to extreme weather events and the challenges presented by climate change. Universities also have significant faculty and student intellectual expertise in many areas that can be leveraged to inform approaches for confronting climate change.

The municipalities of Oberlin, Ohio, and Los Angeles, California have been highly successful in exchanging ideas and resources with the institutions in their locales and in creating partnerships that have benefitted both parties and driven significant carbon reductions.
CASE STUDY

Oberlin College, City of Oberlin

Oberlin, Ohio, a city with a population less than 9,000 people is the home of a world-recognized collaboration between the college and municipality called the Oberlin Project. The partnership, which became an operating initiative in 2011, includes Oberlin College, Oberlin City Schools, the City of Oberlin, Lorain County Community College, the Joint Vocational School, community members, and private sector organizations. This project, which defines its current goals below, catalyzed many of the sustainability initiatives and greenhouse gas reduction strategies undertaken by the partners.

Oberlin Project's current goals:4

- Creating one of the first climate positive cities in America by shifting the City and College to renewable energy sources, radically improving efficiency, sharply reducing our carbon emissions, and improving our economy in the process.

- Creating new and supporting existing business ventures in energy efficiency and solar deployment, food and agriculture, and the sustainable use of local resources.

- Conserving 20,000 acres of green space and developing a robust local foods economy to meet 70% of our consumption.

- Creating an educational alliance between the College, the Oberlin schools, the Joint Vocational School, and Lorain County Community College focused on integrating sustainability into education at all levels.

- Developing a 13-acre Green Arts District at the US Green Building Council Platinum level.

- Serving as a model that can be replicated in other communities.

An extraordinary project that will transform a community and show America how to create a prosperous, creative, and sustainable world... visionary, revolutionary, and certainly necessary

Sherrod Brown
U.S. Senator for Ohio5

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4 http://www.oberlinproject.org/
5 http://new.oberlin.edu/dotAsset/4550134.pdf
In order to achieve these goals, the Oberlin Project has been organized several working teams including economic development, education, energy, policy, agriculture, community, and data collection and analysis. So far, the city has installed Environmental Dashboards in all of the public schools and throughout the city to educate about the initiative and quantity progress. Oberlin has also transitioned the cities’ recycling fleet to hybrid hydraulic vehicles and has implemented a Zero Waste Plan.

In order to achieve the ambitious goal of becoming one of the first climate positive cities, the Oberlin Project partners established a Climate Action Committee, which developed a Climate Action Plan (CAP) in 2013. This document acts a unifying roadmap suggesting continuous next steps for energy efficiency measures, demand reduction, and renewable energy generation for the City.\(^\text{6}\) In addition, the City of Oberlin and Oberlin College signed to become one of 18 Climate Positive Development Program Cities through the Clinton Foundation. This places Oberlin in the elite position of being one of only three cities in the United States to sign on to the challenge. Examples of the types of projects underway to meet these goals range from individual construction projects, such as the 2015 groundbreaking of a 50 unit affordable housing development that will be climate positive, to drastic changes to the city’s energy portfolio.

Oberlin College partnered with the City of Oberlin and the local community owned, not-for-profit electric utility (Oberlin Municipal Light and Power System), to take actionable steps to achieve carbon neutrality by transitioning generation fuel sources from coal to methane emitted from landfills. In 2015, the city’s electricity generation is projected to emit only 19% of the greenhouse gases that were produced in 2012, which has greatly helped Oberlin to meet its target of cutting 2012 greenhouse gasses in half by 2015.\(^\text{7}\) This example highlights the importance and influences a municipality and high education institution can have on the energy portfolio of the utility servicing them. This example also solidifies the Oberlin Projects as one of the most successful community campus partnerships in the United States due to its rapid stakeholder unification and measurable action to meet the ambitions goals.

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CASE STUDY

UCLA, City of Los Angeles

In April of 2013, President Obama advocated a call to action, to establish “Grand Challenges”, ambitious yet achievable goals to solve our biggest societal issues. In response, the University of California Los Angeles (UCLA) launched one of the most aspirational campus/municipality partnerships in the country. The Sustainable LA Grand Challenge Project is a collaborative effort between the City of Los Angeles and UCLA dedicated to achieving 100% sustainability in water and energy, without harming biodiversity, within the City by 2050. As the second largest city in the United States, with a population greater than 23 states in a county that is more populated than 43 states, this goal would make the LA region a sustainable and replicable example for the world.

According to the UCLA Grand Challenge, the particular criteria for each project must be “specific, measurable, achievable, relevant, time-bound, and capture the public’s imagination” which is what makes this ambitious endeavor unique. With 150 faculty and researchers, as well as 30 departments, currently committed to the Challenge, UCLA is in the process of creating a roadmap to achieve its goals. The transformation for the LA region to produce all of its energy locally with renewable resources, while relying entirely on local water supplies, will require significant policy changes, leading city planning infrastructure, and cutting edge technologies. Therefore, the collaborative stakeholders involved with the Challenge include academic and regional experts in climate change, water quality, water supply, smart grid technologies, renewable energy, public policy, air quality, and environmental justice.

To achieve these goals research action plans are currently being completed by four interdisciplinary research committees, which are being funded by foundations, private donors, and the Office of the Vice Chancellor for Research: 1) Energy 2) Water 3) Biodiversity 4) Spatial and Discipline Integration. Committees 1-3 are dedicated to achieving their respective 100% sustainability goals by 2050 while the Spatial and Discipline Integration Committee is tasked with integrating all of the research action plans. These action plans, which will be completed in 2015, will establish research priorities, long-term funding plans, and knowledge gaps. The individual action plans will then be aggregated into a holistic roadmap establishing the next steps over the next few years.

This planning phase for the Grand Challenge was funded by a grant that also included the following objectives: create a working outline and project management timeline; increase the quality and quantity of partnerships and critical stakeholders; and raise public awareness and support. A robust Project Team was established early on, consisting executive directors, project and program directors, research chancellors, and student and public relation officers, to ensure the success of the projects planning phase. In addition, the UCLA student community is eager to be involved with the project and in the fall of 2014, over 250 student applicants applied for one of 55 spots for a year-long research program. Each accepted student would be matched with a faculty member participating with the Sustainable LA Project.

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8 http://www.grandchallenges.ucla.edu/about/
PARTNERSHIPS WITH UTILITIES

HIGHER EDUCATION AND UTILITY COLLABORATION

Due to their substantial energy use, large number of buildings, and long-term ownership, colleges and universities are ideal partners for utilities. Individual institutions, as well as cohorts, have formed successful partnerships with their utilities to promote, fund, and implement energy efficiency measures. Some of these partnerships include working to overcome specific internal energy efficiency barriers and co-creating solutions that help meet institutional climate goals. Colleges and universities are also helping utilities meet the challenges of enhanced environmental and renewable standards as well as aging infrastructure. By capturing utility efficiency incentives, instituting sub-metering, participating in demand-response programs, and creating a more resilient grid, campuses can significantly reduce costs, while helping utilities better serve the surrounding community.

In this regard, they act as ‘micro-municipalities’ that often have more progressive sustainability goals and requirements. Similar to municipalities, it is in the best interest of a college or university to reduce their operational risk, lower energy costs, and it is their mission to provide services to the community. Many campuses have progressive environmental goals that reflect that mission, driven by faculty research and the growing demand for sustainability from students. Finally, campuses are uniquely able to pilot, and research innovative solutions. Because of these factors, colleges and universities around the country have the opportunity to help utilities facing a significant burden to comply with environmental and renewable standards while simultaneously dealing with aging infrastructure. In doing so, colleges and universities can benefit their surrounding community and save millions through energy conservation.

Through utility efficiency incentives, sub metering, demand response measures, and the ability to disconnect from the grid entirely, many campuses are able to:

- Obtain additional significant energy savings through incentivized efficiency projects (on top of savings gained from the retrofit alone)
- Identify the most cost effective energy efficiency measures
- Generate power themselves when the grid is in trouble
- Reduce their energy demand to reduce pressure on the grid when power demand is high
- Achieve best energy economics by managing the ratio of self-generation vs. energy purchased from the grid
- Maintain operations during natural disasters
- Provide low cost power to the local community
- Incorporate renewable energy into their supply portfolio, thereby reducing local air pollution and improving the health of its student and local population and, in some cases, helping the utility achieve its renewable energy targets

But there are some challenges to achieving these mutually beneficial relationships. In many cases, campuses have central generation plants, which supply some proportion, or their power needs. Utilities can be less motivated to provide energy efficiency incentives for campuses that self-generate because their relative demand on the grid is

http://blog.rmi.org/blog_2013_07_23_microgrids_and_municipalization
lessened. This can be a particular issue for campuses serviced by investor owned utilities (IOUs) that service other large energy consuming clients such as industrial parks, manufacturing plants, or airports. In California, the community college, university, and state university systems were able to overcome this barrier joining forces and creating a partnership with four IOUs. In their 2013-2014 cycle, these utilities have provided $35 million in incentives for energy efficiency measures within the campuses in an incredibly successful partnership.\textsuperscript{11,12}

### CASE STUDY

**California Utility**

One mechanism to implement energy efficiency measures on campuses is through incentivization partnerships with their utilities. A leading example of type of partnership, and the significant energy savings it can achieve, is the UC/CSU/IOU Energy Efficiency Partnership in California between the University of California System, the California State University System, and California’s four investor owned utilities. This partnership was established in 2004 to encourage and broadly implement energy efficiency within California’s higher education sector. Due to success of the program, the partnership has been renewed four times since, during the 2006-08, 2009 Bridge Period, 2010-12, and most recently 2013-2014 cycles. The utilities, Pacific Gas & Electric (PG&E), Southern California Edison (SCE), Southern California Gas (SCG), and San Diego Gas & Electric (SDG&E), provide financial incentives for the campuses within their territory. The utilities are offering $28.7 million in incentive dollars for the following projects:\textsuperscript{13}

1. Retrofit and Monitoring -Based Commissioning (MBCx) projects: $0.24/kWh and $1.00/therm
2. Lighting projects capped at 50% of total project cost
3. All other energy efficiency projects capped at 80% of total project cost
4. New Construction Projects: $0.10/kWh above standard SBD rates and $1.00/therm

In order for the program to meet its goals, each partner (the utilities and each individual campus) provides resources, infrastructure, technical expertise, personnel, financial skills, and administrative support. In addition, the entire program is run by Newcomb Anderson McCormick (NAM), a project management consultant, who coordinates all activities across the state. To help organize efforts, three teams were established, each made up of representatives from the partner organizations:

\textsuperscript{11} http://www.cccutilitypartnership.com/index.html
\textsuperscript{12} http://eestats.cpuc.ca.gov/EEGA2010Files/SCG/PIP/2013/Clean/1%20-%20SCG%20IP%20PIP.pdf
\textsuperscript{13} Ibid.
The structure and inter-party collaboration of the Partnership has led to numerous successful energy efficiency projects that have yielded significant savings. For example, in 2013 the University of California San Francisco (UCSF) received $757,000 from the partnership to replace one of two absorption chillers and upgrade the chilled water plumbing system. This upgrade, for the Moffitt-Long hospital whose failing chillers were over 30 years old, is estimated to save UCSF $1.3 million annually.14

This is just one example of the impact this type of campus/utility partnership can have on one campus. At the system level, all of the projects implemented at the UC and CSU campuses have received over $85 million in energy efficiency incentives to date! This is achieved an annual savings of 40 MW, 300 million kWh’s, and 17 million therms per year.15 In fact, following the success of the UC/CSU/IOU Energy Efficiency Partnership, another program was created in 2006 to extend energy efficiency incentives to the California Community College System. The same four investor owned utilities do to create the CCC/IOU Energy Efficiency Program and have a combined 2013-14 incentive budget of $5.9 million.16

Overcoming barriers and establishing a successful mechanism for utilities to provide efficiency incentives for campuses is only one side of the coin. On the other side, there are numerous barriers within any college or university that can make implementing efficiency difficult, or impossible such as lack of funding, split incentives amongst departments, insufficient workforce training, or uncertainty of energy savings. Efficiency Vermont, ‘energy efficiency utility’ in Vermont, was able to overcome both sides of barriers by consolidating efficiency efforts and working directly with colleges and universities. Before 2000, the state legislature authorized the creation of an energy efficiency utility in which all customers pay a small line item on their bill to fund efficiency projects. Efficiency Vermont uses a market based approach to fund these projects, which need to meet specific energy goals dictated by the state.

To help engage the higher education sector in the state, Efficiency Vermont collaborated with the Vermont Sustainable Campus Network (VSCN) to learn how they could help meet campus sustainability goals. As a sponsor of VSCN, a network of 23 campuses, Efficiency Vermont is able to work directly with the campuses to identify barriers and test

<table>
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<tr>
<th>EXECUTIVE TEAM</th>
<th>MANAGEMENT TEAM</th>
<th>TRAINING &amp; EDUCATION TEAM</th>
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</thead>
<tbody>
<tr>
<td>Sets overall vision and policy</td>
<td>Manages day-to-day issues</td>
<td>Hosts training sessions and web-based seminars</td>
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<tr>
<td>Executes program contracts and agreements</td>
<td>Approves projects and monitors progress</td>
<td>Coordinates conferences and best practice program elements</td>
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<tr>
<td>Meets quarterly</td>
<td>Meets every 3 weeks</td>
<td>Meets bi-weekly to bi-monthly</td>
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15 http://www.ucsuiouee.org/
16 http://www.cccutilitypartnership.com/index.html
solutions to overcome them. Whether a campus is struggling with budget issues, project management, or communicating the value of efficiency projects to senior leadership, Efficiency Vermont works directly with them to overcome their specific barrier. This is a drastically different approach than providing finite incentives for specific energy efficiency measures, and one that relies on a deep understanding of campuses and trusting relationships. In fact, Efficiency Vermont has a handful of account managers that have become subject matter experts for college and universities because they work primarily in that sector. Richard Donnelly, a Strategic Planning Manager at Efficiency Vermont, believes there is usefulness in consolidating market knowledge and intelligence in account managers by having them manage specific sectors such as higher education. This collaborative relationship between the campuses and Efficiency Vermont has been so successful, that the utility has helped set up green revolving funds in half of the schools to help accelerate efficiency adoption.

Utility incentives for efficiency measures work best when a college or university can easily identify which measures are the most cost effective. One of the most impactful strategies to help identify energy efficiency measures is to sub-meter individual buildings. Sub-metering is a growing trend in the higher education sector providing a variety of proven benefits from a management, engineering, and business perspective. However, greater adoption is still needed to accelerate efficiency within campuses since only 48% of schools meter all non-lab classroom facilities, according to a survey conducted by the EPA. In some cases, entire campuses of large universities only have a handful of meters, sometime only one master meter.

Another strategy that campuses can use to reduce energy costs, obtain utility rebates, and support the utility grid is demand response (DR), a term that describes the customer-driven relationship between the utility and the user. In a DR program, electricity consumers change their normal consumption pattern to match the supply of the utility grid, providing stability to the system. Demand response benefits consumers by allowing them to respond to changes in electricity prices (which incentivize conservation during high demand with peak demand charges) or to obtain utility incentives in the rate structure design.

CASE STUDY

Princeton

Princeton University provides another example of how grid connected microgrids can combine community service benefits with institutional energy cost savings. In 2012, when Hurricane Sandy knocked out the Public Service Electric and Gas Company (PSE&G) grid, Princeton was able to power its campus for 2 days until the grid was back online. Within minutes after the PSE&G grid went down, Princeton's microgrid shut off power to non-critical campus buildings. By doing so, the university was able keep 4,000 apartments, 35 high-rise buildings, garages, three shopping centers, and six schools running for 2 days. Princeton was able to export enough heat and power for 12,000 people in addition to the campus acting as a refuge for community members and a staging ground for emergency workers.

Princeton's microgrid is capable of producing 15 MW of power and consists of a gas-turbine combined heat and power (CHP) generator, a 5.4 MW photovoltaic system, and a district heating and cooling system. On average the campus uses 16 MW of power but that demand can be as high as 27 MW on a hot day and as low as 10 MW at night. This fluctuation in Princeton's energy demand, their sophisticated ability to generate their own electricity, and their utility interconnection, allows Princeton to continually achieve the best economics for their energy. This is done through a real-time energy dispatch system which allows Princeton to adjust how much power it buys from the grid based on real-time pricing. When grid electricity is expensive (usually around midday), Princeton produces more of its own power. When the grid electricity is cheaper than the microgrid's production capabilities (usually at night), or campus power use is high, Princeton buys more from PSE&G.

Princeton's reciprocal relationship with PSE&G goes beyond the ability to ease pressure on the utility. Princeton also provides ancillary services, such as frequency regulation and synchronous reserve services, which it can sell to the PJM market. Edward Borer, Princeton's Energy Plant Manager describes the relationship as mutually beneficial to both parties, "we don't look at the utilities or the ISO as the opposition. In a lot of ways we are shoulder to shoulder. A lot of our work is synergistic".

Tom Nyquist, Princeton's Executive Director of Engineering and Campus Energy Cost Efficiency has been an industry leading advocate for microgrids based on Princeton's success. He argues the benefits of the microgrid are the reduced environmental impact, natural disaster resiliency, and the opportunity to use renewable energy in a deregulated market. It also allows the university to minimize its energy costs by managing its power purchase supply.
CONCLUSION
CONCLUSION

WHAT MORE IS NEEDED?

The research indicates that there is growing interest in collaboration among institutions, stakeholders, and established cohorts. The data also demonstrate that cohorts have a measurable impact on driving emission reductions and facilitating action. Through sharing best practices, gaining executive buy-in, leveraging collective action, and forging joint commitments, cohorts can broaden engagement, enhance management systems, speed adoption of new technologies, green supply chains, and increase investment in efficiency within individual institutions. Thus, collaboration greatly enhances the key elements of efficiency on campuses, but more action is needed.

While cohorts are found to be a mechanism for successfully catalyzing institutional change, there is need for more research and effort to strengthen and support cohorts.

- Research is needed to demonstrate the measurable impacts of cohorts and better understand how to broaden collaborations and make them more impactful.

- A platform could allow cohorts to communicate with each other and share successes, failures, and lessons learned. A platform of this nature has the potential to drastically increase the effectiveness of individual cohorts.

- Web-based tools and on-line resources would help cohorts lacking an outside facilitator maintain this critical function. An online platform also could connect cohorts to funders interested in supporting this critical service.

- A set of industry best practices could offer insight into the mechanisms critical for success, such as developing common commitments and metrics for measuring impact.

For further information on the findings or research from this report, please contact kyle.nagel@cbi.com