The State of Sustainability in Higher Education 2015: Emissions Metrics, Consumption Trends & Strategies for Success

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In 2008, as a significant number of campuses across the country mobilized to offer leadership around climate change solutions, Second Nature published a guidance document for signatories to the American College & University Presidents’ Climate Commitment, now called the Carbon Commitment, that featured the “carbon management hierarchy,” a representation of the generally accepted “best practice” approach — both in and beyond higher education — to tackling energy and greenhouse gas emissions management.

**The Carbon Management Hierarchy**

- **Avoid**
  - Avoid carbon intensive activities (and rethink business strategy)
- **Reduce**
  - Do whatever you do more efficiently
- **Replace**
  - Replace high carbon energy sources with low carbon energy sources
- **Offset**
  - Offset those emissions that can’t be eliminated by the above

Over the past decade, campuses across the country have invested significant effort, attention, and money toward the key challenges embodied by this hierarchy: conservation, efficiency, fuel-switching and offsetting. This report assesses the impacts of these activities by taking the first comprehensive look at emissions and energy trends from a nationally representative set of schools. It explores key questions:

- How much does progress depend on the amount and type of campus capital investment?
- How can campuses be more strategic and effective in managing carbon and energy footprints?
- How much impact do external factors (e.g. public policies, energy costs, etc.) have?
- How complete is the available set of campus sustainability metrics? Is anything missing?

The answers to these questions are relevant for sustainability and facilities managers on campuses, their CFOs, presidents and trustees, and the students they serve. Sustainability offers opportunities to reduce costs while greatly enhancing the “return on investment” for students preparing for 21st century careers.

**CAMPUS CARBON FOOTPRINTS IN CONTEXT: HOW WE GOT HERE**

In 2002, a handful of colleges and universities began measuring and publicly reporting their carbon footprints — largely to illustrate the potential practical implications of meeting targets established by the Kyoto Protocol to the 1992 United Nations Framework on Climate Change. The majority of campuses conducted their measurements using the Campus Carbon Calculator™, an Excel-based tool developed in partnership between the University of New Hampshire and nonprofit Clean Air-Cool Planet (CA-CP).

At that time, there were very few colleges with sustainability departments in the U.S.; it was not yet a mainstream area of focus for higher education.

Over the next five years the field grew rapidly and much of the momentum centered on climate and energy issues. Launched in 2007, the Carbon Commitment epitomized this focus.
The Carbon Commitment was significant in several ways:

1. It made public reporting mandatory for its signatories, and provided a new, central repository for this reported data.

2. It asked schools to establish reduction baselines and climate action plans.

3. It spurred greater codification of campus reporting and target-setting frameworks.

CAMPUS CARBON REPORTING FRAMEWORKS: A PRIMER

By the launch of the Carbon Commitment, there were already hundreds of schools voluntarily measuring and publicly reporting their carbon footprints, but schools were sharing data sporadically through hundreds of diverse campus publications and websites. The majority of these institutions continued using the Campus Carbon Calculator™ (CCC) which had been continually developed in alignment with global carbon accounting standards called the Greenhouse Gas (GHG) Protocol.

KEY SUSTAINABILITY ACHIEVEMENTS IN HIGHER EDUCATION

1990  Talloires Declaration
1997  Kyoto Protocol adopted
2000  LEED standards launched by USGBC
2001  GHG Protocol-First "corporate standard" for carbon accounting published by GHG Protocol
2004  CCC v4.0 made widely available on CA-CP website
2006  California Global Warming Solutions Act mandates statewide reporting and reduction targets
2006  AASHE launches
2007  Energy Action Coalition organizes first Powershift conference in D.C.
2007  College of the Atlantic becomes first institution of higher education to meet carbon neutrality target
2007  Massachusetts Executive Order 484 requires state campuses and agencies to reduce emissions and energy use
2007  American College & University Presidents’ Climate Commitment, now known as the Carbon Commitment, was launched
2010  First annual Princeton Review Guide to Green Colleges published
2010  AASHE STARS 1.0 launched
2011  Carbon Management and Analysis Platform (CMAP) pilot launched
2014  Capital Partners Solar Project announced
2014  University of California announces largest campus solar purchases in U.S. to date
2015  Green Gigawatt Partnership launched
One of the most important functions of the GHG Protocol was to create a framework for setting boundaries:

**Temporal:** Established a baseline year against which to measure progress;

**Organizational:** Defined what organizational units would be included whether based on ownership, or control. In practical terms, this allowed institutions to be strategic, while also remaining clear and transparent, about what locations or facilities they include in their reports (and thus in their goals)—for example, by deciding to include or not to include emissions from satellite campuses, research hospitals.

**Operational:** Defined what sources of emissions-production would be included. The concept of “scopes” helped users distinguish between different kinds of emissions sources both in their measurement and reporting. This 3-Scope framework has facilitated useful clarity in GHG tracking.

The GHG Protocol included guidance about what constituted a “complete” GHG inventory: Scope 1 and 2 sources being mandatory, and Scope 3 being optional. The Carbon Commitment likewise required reporting of Scope 1 and 2, as well as a subset of Scope 3 (commuting, study abroad, and business travel).

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**THE POWER OF AGGREGATED, STANDARDIZED DATA**

Since 2007, over 600 campuses that signed the Carbon Commitment have been reporting their Scope 1, 2, and selected Scope 3 sources every other year. In addition, other campuses have opted to set their own emissions reduction goals and to hold themselves publicly accountable through regular reports. More than 90% of these campuses have done so via the Campus Carbon Calculator™. Based on this demand, Sightlines and CA-CP collaborated to create a user-friendly, web-based version of the Calculator, called the Carbon Management and Analysis Platform (CMAP), which would aggregate the campus input as well as emissions output data into one central database to be used for research purposes by sustainability professionals, faculty, or students. In 2014, CA-CP transferred the CCC, CMAP, and all related intellectual property to the University of New Hampshire, which continues to support the CCC and CMAP. Now, UNH and Sightlines are taking the first comprehensive look at energy and emissions trends from a diverse national set of schools, based on the following data sources:

- **Sightlines Return on Physical Assets (ROPA) database,** with the CCC calculation methodology overlaid. This database has only a subset of the inputs that go into a full campus GHG inventory, but those inputs are generally the primary Scope 1 and 2 emissions sources. This database has extensive Quality Assurance/Quality Control (QA/QC) for its inputs.

- **CMAP database,** with data from both inputs and outputs of campus GHG inventories. Currently, this data is self-reported and has no significant quality assurance mechanisms; also, the number of schools using CMAP is small compared to the number of schools using the Excel version of the tool. For those reasons, the ROPA data set was used to perform the primary analyses, and the CMAP database was used mainly for comparison and “reality-checking” the results.

Ultimately, the goal is to shift all users of the Excel-based version of the Campus Carbon Calculator to CMAP, while we build in more quality control mechanisms. In so doing, we can provide data with which to do a much more granular analysis.

In the meantime, however, this report represents an important first step towards what we hope will be annual updating of a long-term and comprehensive analyses, from which the entire higher education sector can learn, plan and benefit.
Sightlines maintains the largest third-party verified database of higher education facilities data in North America. This study is based primarily on data collected from these 343 colleges and universities. These institutions educate 2.6 million students, and have a collective 1.5 billion gross square feet (GSF) of facilities assets; they represent different Carnegie classes. Campuses are located in 44 states, representing all geographic regions of the country. The database is comprised of 60% public institutions and 40% private institutions; its breakdown is 34% comprehensive institutions, 21% research institutions, 36% small institutions, and 9% community colleges. With the exception of community colleges (which are underrepresented), the database reflects the composition of higher education institutions in the U.S. as a whole.

In this report, we primarily analyze trends from fiscal year 2007 through fiscal year 2014, because that is the date range for which the most complete data are available. Data are collected directly from institutions that use Sightlines’ proprietary ROPA process. Inputs are updated yearly, and verified using a standard process to ensure consistency in reporting across institutions. This process quantifies data from source documents (such as energy bills), qualifies data by benchmarking it against campuses, and verifies the results by reviewing them with campus facilities and sustainability staff.

The following metrics are collected to analyze energy trends:
- Energy consumption
- Energy cost
- Fuel type data

Energy consumption and fuel type data are used to calculate partial emissions profiles for each institution. Emissions from purchased fossil fuels and purchased electric are calculated using the methodologies and emissions factors from version 8.0 of the Campus Carbon Calculator™, which are consistent with GHG Protocol Standards and Guidance. Additionally, Sightlines collects a complete building list, age profile of buildings and campus user statistics for each institution.
This data is used to normalize energy and campus age metrics. Finally, capital expenditure data is collected and categorized according to type of work completed. Sightlines uses five packages to classify dollars spent:

- **Space renewal**: renovation and replacement of internal building space, such as classrooms

- **Building systems**: renewal of HVAC, electrical, plumbing, and mechanical systems

- **Envelope**: replacement of roof, windows, doors, foundations and exteriors

- **Infrastructure**: heating/cooling and electrical distribution systems

- **Safety/code**: fire protection, ADA compliance, security systems

Collecting information on these packages enables us to better understand capital investment into energy efficiency projects.
We began by calculating the average total of Scope 1 stationary and Scope 2 emissions and energy consumption, for the subset of 267 campuses for which we had at least five consecutive years of high quality, verified data – FY2010-FY2014.

Average emissions for that subset dropped from an institutional average of 47,722 Metric Tons Carbon Dioxide Equivalent (MTCDE) in FY 2010 to 45,394 MTCDE in FY 2014, a modest reduction of nearly 5%. However, total average institutional energy consumption on these campuses increased during this time period, by 3%. Most of this increase appears to be attributable to campuses adding new buildings and additional square footage to their physical footprint, a topic we will discuss further later in this report.

To put these numbers into context, we examined U.S. Department of Energy data on total national greenhouse gas emissions. In 2010, total U.S. greenhouse gas emissions amounted to 6.899 trillion MTCDE. By 2013 (the last year of available US data), the total dropped to 6.672 trillion MTCDE, a reduction of 3.5%. The 5% reduction seen by higher education institutions in our data suggests that despite efforts and commitment across higher education institutions to lead on the issue of energy use and carbon emissions, campuses have performed at a level that is a little better than the national average. We will examine some of the likely reasons behind these results in the next section.

For all subsequent analyses, we looked at energy and emissions data normalized according to the number of GSF on a given campus. Normalizing energy and emissions data helped to eliminate issues with changes in the database composition from year to year. Consequently, we were able to include data from all 343 campuses in the database, and consider data from within a longer time frame (FY2007-FY2014).

The normalized data shows that U.S. higher education institutions, on average, reduced their emissions per square foot from stationary Scope 1 and total Scope 2 sources by 13% between 2007 and 2014.

However, total energy consumption of stationary fossil and electric fuels per square foot was down only 2% - showing only modest gains in efficiency.
Emissions per square foot from purchased fossil fuel energy decreased 14% between 2007 and 2014. This decline was a result of reduced overall stationary fossil fuel consumption (4%) coupled with a rapid shift to natural gas, a lower-cost fossil fuel favored for its low emissions factor.

In 2007, natural gas accounted for 74%, coal for 17% and oil and other fuel types for 9% of fossil fuel consumption. By 2014, natural gas usage increased to 87% of all fossil fuel consumption. This is a significant shift over a seven-year period, reflecting greater availability and lower costs of natural gas as well as greater campus interest in burning cleaner fuels. Our data shows that natural gas mainly replaced coal as a fuel source.

Fossil fuel consumption per square foot dropped by nearly 10% from 2007-2010 — but these gains were lost as a result of colder-than-average winters in 2013 and 2014; hence the 4% cumulative decline.
Emissions from purchased electricity as measured by MTCDE/1,000 GSF decreased by 2% since 2007.

During the same time period, electric consumption as measured by BTU/GSF increased by 1%.

How is it possible that emissions went down while consumption went up? It’s due to the fact that the U.S. electrical grid has become cleaner since 2007. The use of natural gas increased by 8% between 2007 and 2012 (the most recent year for which data is available). The use of renewables increased by 4% from 2007 to 2012.
In order to understand the relatively small amount of progress made in reducing carbon emissions at higher education institutions over the past eight years, we drilled down into the main source of emissions: energy consumption. This section of the report looks at how factors such as campus size, growth in space and capital investment influence energy consumption and ultimately carbon emissions.

**SIZE MATTERS**

The data indicate a strong relationship between total energy consumption and campus size. Not surprisingly, larger more complex institutions, such as research universities, consume more fossil fuels and electricity than smaller liberal arts institutions. The following chart is a scatter plot of all 343 institutions analyzed by total energy consumption (MMBTU) as a function of total gross square feet (GSF). Those that have more than 10,000,000 GSF generally are above the trend line in total energy consumption; institutions with less than 5,000,000 GSF are mostly below the trend line. The larger institutions have more technically complex buildings (e.g., research laboratories), operate for longer hours during the day, and have many more students, faculty, and staff on campus.

Since 2007, the amount of space built on campuses has increased 10%. During the same time period, enrollment increased 7%. They grew more-or-less in tandem between 2007 and 20011, but enrollments leveled off in 2011 and began to dip in 2012, as space growth continued. Some of this space was planned during the enrollment growth and brought online after 2012. The continued “building boom” means that campuses have more, and newer buildings — many of which are more technically complex than the other buildings on campus, and consume additional energy per square foot.
CAPITAL INVESTMENT SHIFTS

The chart in this section shows a substantial shift in where public institutions are spending their limited capital dollars. In 2007, public campuses invested 44% of their funds on space and safety code projects and 56% on more durable envelope/mechanical systems and utility infrastructure that likely have the effect of reducing energy consumption. By 2014, the amount of capital funding spent on envelope/mechanical systems and infrastructure increased to 64%.

By contrast, private campuses spending on space renewal/safety code projects stayed relatively stable during the 2007-2014 period. The difference between the sectors can be explained by the fact that public institutions spend an average of $3/GSF less than private institutions\(^1\). This means that public institutions must prioritize capital projects to address core building systems and envelope — the result being a positive effect in terms of reduced energy consumption.

We see some of the results of the shift of capital investment at public institutions when we look at energy consumption by sector. From 2007-2014 public institutions reduced energy consumption by 5%, while private institutions reduced consumption by less than 2%. Public policies and requirements to reduce energy consumption may have played a role in this reduction. If so, these policies also led to public campuses to refocus their capital investment towards envelope/mechanical systems and utility infrastructure.

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The “average” numbers imply that all campuses are moving in unison, but in fact, some have had success in controlling energy consumption and emissions, while others have struggled more. Upon closely examining inputs from a subset of the campuses in the database for which there was seven years of data (from 2007-2014), some key factors begin to emerge. Of these 194 institutions, 67 (or 35%) reduced their stationary fossil fuel consumption by more than 10% per gross square foot (GSF), and 67 (35%) reduced electric consumption by more than 10% per GSF. (36 institutions reduced both fossil and electric consumption by 10% or more per GSF.)

An examination of the relationship between age of buildings and capital investment in envelope, mechanical systems and infrastructure, and energy consumption, shows that institutions with stable energy consumption have the oldest building age profile and the highest capital investment in their mechanical systems and building envelopes. This suggests that campuses with aging buildings need to invest at ever-increasing levels just to keep systems running at the same level of efficiency and keep energy consumption stable.

Most institutions (76 or 39%) remained relatively stable, neither increasing nor decreasing energy consumption by more than 10% per GSF. The remaining institutions increased energy consumption by more than 10%. Fifty-one institutions (or 26%) have increased stationary fossil fuel consumption, and 22 institutions (or 11%) have increased electric consumption by more than 10% per GSF.

### Summary of Changes in Consumption

<table>
<thead>
<tr>
<th>Change in Consumption</th>
<th>Sample Size</th>
<th>Weighted Renovation Age</th>
<th>Capital Expenditures (Envelope+ Systems+ Infrastructure)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduced Consumption by More than 10%</td>
<td>67</td>
<td>33.2</td>
<td>$2.54</td>
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<tr>
<td>Stable Consumption</td>
<td>76</td>
<td>34.6</td>
<td>$3.01</td>
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<tr>
<td>Increased Consumption by More than 10%</td>
<td>51</td>
<td>31.7</td>
<td>$2.52</td>
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<table>
<thead>
<tr>
<th>Change in Consumption</th>
<th>Sample Size</th>
<th>Weighted Renovation Age</th>
<th>Capital Expenditures (Envelope+ Systems+ Infrastructure)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduced Consumption by More than 10%</td>
<td>67</td>
<td>30.3</td>
<td>$2.70</td>
</tr>
<tr>
<td>Stable Consumption</td>
<td>105</td>
<td>34.9</td>
<td>$2.78</td>
</tr>
<tr>
<td>Increased Consumption by More than 10%</td>
<td>22</td>
<td>33.7</td>
<td>$2.52</td>
</tr>
</tbody>
</table>
The campuses that either increased or decreased energy consumption by 10% or greater had a slightly younger age profile than campuses with stable consumption. However, the campuses that decreased electric consumption spent almost $0.20 more per square foot capital on envelope, mechanical systems and infrastructure. There was not a similar relationship with respect to capital expenditures and fossil consumption.

WHICH CAMPUSES ARE MAKING PROGRESS AND WHY?

INFRASTRUCTURE IMPROVEMENTS INCREASE ENERGY EFFICIENCY AT WASHBURN

Washburn University in Kansas is one institution that shows how infrastructure improvements can create gains in energy efficiency. In 2013-2014, Washburn entered an energy performance contract with the TRANE Company through USBank. Trane installed new equipment and building automation controls in seven campus buildings and made scheduling and set-point adjustments in most of the remaining buildings on campus. Annual energy efficiency savings are projected at $617,880 and will be used to pay the debt over a 15 year time frame.¹

¹ http://www.washburn.edu/faculty-staff/campus-services/facilities-services/energy-efficiency-policy.html
THE IMPORTANCE OF INSTITUTIONAL COMMITMENT

We analyzed emissions for 103 campuses that are Sightlines members and have signed the ACUPCC (now called the Carbon Commitment) against those that have not (281 campuses). Commitment signatories have 47% lower emissions from purchased energy (per square foot of built space). Signatories are consuming, on average, 27% less energy (again, per square foot) than non-signatories in 2014. Campuses that signed the Commitment seem to have greater focus on emissions and energy reduction.

We also analyzed whether a subset of these Commitment signatories seem to demonstrate an overall downward trend in energy consumption over time. One to two years after signing, the change in average normalized energy consumption among signatories is negligible. At three years post-signing, average consumption dips, with a reduction of 4% against baseline. By year five, consumption fell by 8%. In year six, consumption reduction leveled off. This suggests that institutional commitment over time can make a difference on energy consumption, and can motivate campuses to take advantage of “low-hanging fruit.” However, getting beyond the more straightforward opportunities to the really expensive or technically complex projects, and sustaining reductions in the face of other factors — such as continued campus build-out, aging buildings, and limited capital investment — is significantly more difficult. It requires systemic shifts.
BIG CHANGES REQUIRE BIG PLANNING AT NYU

A plan set in motion in 2006 is helping New York University, one of the largest campuses in the nation, reaching its sustainability goals ahead of schedule. As a Charter signatory of the American College and University Presidents’ Climate Commitment, now known as the Carbon Commitment, in 2007, NYU has agreed to achieve climate neutrality by 2040.¹ NYU was further motivated by the PlaNYC Climate Challenge, the mayor’s plan calling for all city institutions of higher education voluntarily reducing greenhouse gas (GHG) emissions by 30% by 2017.² The 2006 institution-wide initiative created a Sustainability Task Force, established a Sustainability Fund and announced the $125 million new co-generation (CoGen) plant project.³ In 2010, NYU’s Climate Action Plan further solidified the institution’s commitment to sustainability, and ‘fuses the short-term climate change mitigation strategies of the Mayoral Challenge commitment with the broader goals of the ACUPCC; each complements the other and anchors NYU’s overarching commitment to sustainability.’⁴ In 2011, NYU’s natural gas-fired CoGen plant went online, a formidable replacement for their 30-year-old, oil-fired plant. This CoGen upgrade alone forecasted a reduction in GHG emissions of over 20% while attaining nearly 90% energy efficiency. When combined with consistent decreases in GHG emissions since 2006, NYU has already achieved a GHG reduction goal of approximately 40%.

¹ http://www.nyu.edu/about/news-publications/news/2010/03/12/nyu_releases_climate.html
⁴ Ibid., p. 11
Many factors affect emissions and energy consumption at campuses. Some are under the control of the institutional decision-makers, such as fossil fuel sources, where electricity is purchased, how capital is invested, and the commitment and policies to reduce carbon emissions and energy consumption. These factors help explain some of the trends we have identified. However, there are additional factors outside the control of the institution that have an impact on carbon emissions and energy consumption. Some of these factors are examined in this section.

ENERGY COST

Earlier in this report, we documented factors that have an impact on energy emissions and consumption. In this section, we analyze the relationship between the cost of energy and emissions from consumption.

Energy cost per unit is the highest in three regions: the Far West & Southwest, New England, and Mid-East (i.e. mid-Atlantic). These regions have the lowest average normalized energy consumption, and lowest normalized emissions.

In fact, unit cost more closely aligns with energy consumption and emission trends than climatic indicators like degree days (which indicate the amount of heating or cooling needed based on local temperature trends). For instance, the Great Lakes and New England regions had a very similar number of degree days in 2014. However, the cost of energy in New England is $40/MMBTU while in the Great Lakes region it is $20/MMBTU — a 50% differential. Emissions from purchased utilities are 65% higher in the Great Lakes region than in the New England Region. There is clear evidence that consumption and emissions are higher in regions with lower energy costs.
The American Council for an Energy-Efficiency Economy (ACEEE) produces a yearly scorecard that ranks states based on the strength of their energy efficiency policy. Ranks are on 33 categories that include utility policies (e.g. programs for improving electric or natural gas efficiency, and offering performance incentives), funding (e.g. availability of financing assistance, grants, and other incentives) and regulatory factors (e.g. building code stringency and enforcement). The data indicate that institutions located in states with poor energy policy are struggling to control both emissions and energy consumption.

Institutions located in states in the bottom third of the policy scorecard have carbon footprints that are 43% bigger than those from states in the middle rank, and 72% bigger than those from states in the top rank. These same institutions from poor-scoring states consume, on average, 18% more energy than those in the middle rank, and 22% more than those in the top rank. States that score highest in terms of their energy policy and available incentives tend to be in regions where energy costs are the highest (e.g. New England, Mid-East, Far West.) Most of these states offer financial incentives to lower energy consumption, and higher education institutions appear to have taken advantage of them.

However, even in the absence of favorable state energy policies, campuses can make progress as a group if their institutional policies align with reduction in carbon emissions and energy consumption; the case study below from Mississippi highlights such an example.
LEADING BY EXAMPLE IN MASSACHUSETTS

In 2007, the legislature of Massachusetts announced Executive Order 484 – Leading By Example: Clean Energy and Efficient Buildings, an order that addressed the environmental impact of all buildings managed by the Division of Capital Asset Management and Maintenance (DCAMM). DCAMM manages all state buildings, including the UMass system and all other state and community colleges. Order 484 promoted energy conservation, clean energy practices and waste reduction, established reduction goals, and outlined new construction criteria.

To help campuses meet their goals, the Energy Team (E-Team), a business unit of the Facilities Management and Maintenance group at DCAMM, "worked to ensure that facilities attain practicable goals in sustainable design and construction and achieve optimal levels of energy and water efficiency for existing, renovated, and new buildings." Many of these 29 schools, including the UMass System, have signed the Carbon Commitment, formerly known as the American College and University Presidents’ Climate Commitment, and, with assistance from the E-Team, many are currently undertaking or have completed energy efficiency projects.

There is also a 21-page guide entitled "Campus Sustainability Best Practices: A Resource for Colleges and Universities" designed to offer tools on issues ranging from renewable energy initiatives to financing and education.

MISSISSIPPI STATE SYSTEM POLICY

Mississippi Public Universities are reducing energy consumption and increasing efficiency, helped largely by policies set in place by the Board of Trustees and the system-wide Energy Council, which is comprised of university representatives, system personnel and a Board representative.

In 2010, a goal of reducing energy consumption by 30% by 2020 was set. In FY14, "despite a 20% increase in square footage and an exceptionally cold winter, the system achieved a 21% reduction in consumption." The Mississippi Institutions of Higher Learning (IHL) has a 15-item sustainability policy that outlines procedures designed to help guide improvements across operations, grounds, materials, and transportation. The policy instructs each institution to develop their own campus policy and states that "no less than 25 percent of the expected annual recurring savings from completed energy efficiency projects to be set aside to finance future energy efficiency efforts," which creates a built-in funding source.

4 http://www.mississippi.edu/eea/docs/eea/lbe/lbe-campus-sustain-practices.pdf
5 http://www.mississippi.edu/ihl/newsstory.asp?ID=1110
6 http://www.mississippi.edu/facilities/downloads/sustainability_policy.pdf
SUMMARY OF FINDINGS

In summary, an analysis of campus energy and emissions data from a nationally-representative set of U.S. institutions of higher education for the period 2007-2014 concludes the following:

• Gross average emissions from Stationary Scope 1 and Scope 2 sources are down a modest 5% from 2010-2014, and gross energy consumption actually increased over the same period.

• Emissions per square foot were down 13% between 2007 and 2014; however energy usage per square foot was down only 2%.

• These findings do not reflect a lack of effort on the part of campuses; what they do reflect is new construction and renovations that added square footage also resulted in additional energy consumption. Adding to the physical footprint trumps efforts to reduce energy consumption.

• Most of the progress in reducing campus carbon footprints came as a result of switching from high-carbon energy sources (e.g. coal and oil) to lower-carbon natural gas and zero-emissions on- and off-site renewal energy.

• Campuses that shifted capital investment to envelope, mechanical systems like HVAC and utility infrastructure made more progress in reducing GHG emissions and reducing energy use. Public campuses improved more than private campuses, possibly reflecting stronger public policy goals.

• Schools with buildings of an older age profile had to spend more just to keep consumption stable.

• Campus size, density, age profile, and capital investment portfolios are key drivers of GHG emissions and energy consumption.

• Institutional commitment and leadership matters. For example, campuses that have signed on to Second Nature’s Carbon Commitment (formerly the ACUPCC) had lower emissions than non-signatories.

• Energy cost has a big impact on energy consumption. Campuses in regions where energy is cheap consumed more than campuses in high cost regions, even when degree days were similar.

• Public policy and incentives are critical. Campuses in regions with strong energy and GHG reduction incentives consumed less; those in states with weaker policies consumed more.

So what do these findings tell us? The next sections look at four strategies that offer higher education institutions a path to lower emissions and energy consumption:

1. Institutional commitment and leadership
2. Strategic investment based on life-cycle costing
3. Increased engagement in matters of public policy (i.e., incentives and regulation)
4. More sophisticated metrics, tracking and analysis to guide decision-making

INSTITUTIONAL COMMITMENT AND LEADERSHIP MATTERS

Institutional commitment is expected to be a driver in sustainability outcomes and, the data did highlight preferable emissions numbers for schools that were signatories of the most high-profile example of a U.S. campus greenhouse gas commitment. This internal commitment has helped them keep their average energy consumption, emissions, and costs lower than their counterparts’ and it led them to commit resources to sustain energy and emissions reductions.
Commitment is about more than espousing conceptual support; it’s about consistent, long-term action. As Cummings notes in his (2010) research of sustainability efforts at four schools, “to be a national leader requires direct and consistent attention from campus leadership.”

A recent study by the Association of Climate Change Officers reports, “Despite many universities having signed declarations, we found that strong administrative leadership is necessary to make those signatures meaningful.”

Successful long-term sustainability efforts also require at least one campus-based “champion.” These can be faculty or staff members (students are too transitory to be effective champions in this sense, though they can be very effective proponents for starting new efforts or making significant one-time shifts). These champions need to be able to marshal resources and provide incentives for participation by others. Without having at least one such champion, climate and energy efforts are likely to be intermittent, opportunistic or even haphazard, rather than strategic. Finding or creating, and empowering such champions is a critical component of institutional commitment and leadership.

Obviously, internal commitments are conditioned by several factors, particularly financial ones. A NACUBO/Second Nature policy brief that examined data from the Institute for Building Efficiency’s “Energy Efficiency Indicator” 2011 report found lack of funding was “by far the primary barrier to pursuing energy efficiency among higher education respondents” and determined that for bigger projects with longer paybacks, the resulting “cost feasibility gap” is simply too big for many institutions to handle.

It is important for sustainability advocates to engage campus business officers, academic leaders and facilities leaders to build support for how strategic investments can have a significant impact on reducing carbon emissions and energy consumption; with that understanding firmly in place, it is more likely that creative ways to fill that gap can be developed.
STRATEGIC INVESTMENT MATTERS

We started this report outlining strategies in the Carbon Management Hierarchy. Avoidance strategies are deemed the highest priority, as well as the most transformative and lasting in this hierarchy; however, the seven-year trends highlighted in this report suggest that the majority of the progress in cutting campus carbon emissions to date has been made by replacing high-carbon fuels with natural gas or renewables. Many of these fuel-switching projects have achieved significant cost savings. Shifts to renewables have helped campuses reduce energy cost volatility, and facilitate long-term planning.

Have we moved away, then, from the strategy of avoidance as the preferred method to reduce carbon emissions? Not necessarily. Fuel-switching strategies have made positive — even transformative — contributions to the shift toward low-carbon institutions, especially when coupled with sustained conservation and efficiency programs; however, this approach cannot single-handedly solve the problem. More fundamental changes also need to be made.

TURNING FACILITIES CHALLENGES INTO SUSTAINABILITY OPPORTUNITIES

In the Sightlines database, 40% of campus space was constructed between 1960 and 1975, to accommodate the baby boomer generation’s pursuit of higher education. The construction was fast, and during a period in which energy management was not a primary concern. The buildings of that era have not stood the test of time and are known for their high levels of deferred maintenance and for being “energy hogs.” The growing deferred maintenance in these 1960-70s buildings is one of the most vexing challenges campuses face today. While these older buildings are deteriorating, campuses across the country have added a significant amount of new space. There is simply not enough money to fix the older buildings and keep-up the newer buildings at the same time. The growth in campus building and the increasingly crushing burdens of deferred maintenance have been a factor contributing to spiraling operational (and thus tuition) costs, creating a crisis of campus sustainability in the most literal sense.

But these facilities challenges may be turned into sustainability opportunities, by implementing the following strategies:

- **Set capital priorities to proactively address the backlog needs in the aging buildings that are critical to mission and programs.** There is strong evidence that many of these buildings are already at high risk of failure for key building components; waiting for failures to occur will not only result in program disruption, but will also be much more costly than fixing the buildings now. Campuses should plan based on life-cycle costs: significant renovations of the 1960-70s buildings will immediately improve the energy consumption and long-term operating costs on campus.

- **Eliminate or replace aging space with new modern facilities,** especially those buildings of vintages where poor quality construction and lack of attention to energy use was prevalent. Sometimes less is more when it comes to addressing aging buildings with high backlogs. A “renovation through replacement” approach is a powerful — and ultimately, much less costly — way to eliminate aging space with high levels of deferred maintenance and excessive energy costs. In some cases, campuses can actually eliminate underutilized space in poor condition. Leadership needs to identify and implement such opportunities, however difficult. These might be the most valuable financial or operational contribution administrators or trustees could make the campus more sustainable.

- **Adopt policies that result in minimal net new square footage** and establish criteria for the construction of new space. New construction must support the mission of the institution and support future program needs. A number of campuses have already implemented “no net new space”
policies, meaning that they will balance any new
collection with elimination of other buildings. These
policies represent the high-impact “avoidance” aspect of the
carbon management hierarchy, and will pay off in reduced
energy consumption and carbon pollution, while improving
institutional sustainability.

IMPLEMENTING RENEWABLE ENERGY STRATEGIES

The massive move away from coal and oil to natural gas
was the biggest single driver in campus carbon emissions
reductions between 2007 and 2014. The question now is
whether natural gas will become the “new normal” and the
rate of reductions will plateau, or whether natural gas will
be the “bridge fuel” in the way some clean energy advocates
have envisioned.

Campuses can lead the way. There are significant
opportunities for campuses to implement further fuel
switching and use renewables like solar and wind as
part of their energy portfolio, and in so doing increase
the security of their power and energy supplies, reduce
cost volatility, and appeal to sustainability-minded
prospective students as well as alumni and
potential donors.

Large-scale adoption of renewable energy will require institu-
tions to create or leverage new financial strategies. For ex-
ample, some universities are finding ways to structure Power
Purchase Agreements (PPAs) for both on- and offsite renew-
able energy projects that require no up-front costs
and lock in rates that compete with conventional energy.
New federal programs and national initiatives (e.g. the Green
Gigawatt Partnership) are tools for reducing the transaction
costs of putting such deals in place. As energy production
and delivery systems continue to evolve, with new options
like cost-effective on-site power storage, micro-grids,
and other innovations, campuses that stay educated
and engaged about new options can benefit financially
and operationally.

The 2012 joint report by NACUBO and Second Nature,
“Leading the Nation to a Safe and Secure Energy Future,”
noted that campuses are particularly challenged to find
ways of financing renewable-energy projects because of
sharp declines in state support coupled with the diminished
ability of endowments to support operations and lack
of access to several forms of grants and tax incentives.
However, falling costs for technologies like solar,
coupled with innovation in financing mechanisms
(from the aforementioned PPAs to Green Bonds
— which have been successfully employed by a handful
of campuses over the past couple of years and offer
a great deal of untapped potential) are making it
increasingly evident that shifting to renewables
represents a real strategic opportunity for return
on investment.

CONCLUSIONS AND RECOMMENDATIONS

LEWIS AND CLARK’S GREEN POWER INITIATIVE

As one of the Princeton Review’s Green Honor Roll institutions, Lewis and Clark College in Portland, OR, is a leader in sustainability initiatives. Most noteworthy is their 100% renewable energy powered undergraduate campus. Started in 2003, the campus’ Green Power Initiative has expanded through voluntary student fees, which increased from $20 to $85 annually in the 2010-11 school year. This money is used to purchase Renewable Energy Certificates (RECs) that represent 30% of energy usage. More than 87% of students are contributing. As RECs have decreased in price, a surplus fund has been created to fund the next phase of energy-saving projects.\(^2\) Additionally, the majority of buildings on campus are sub-metered, which allows the real-time tracking of energy usage and efficiency.

1 http://www.lclark.edu/about/sustainability/campus/green_power/
2 http://www.lclark.edu/about/sustainability/campus/green_fee/

CAPE COD COMMUNITY COLLEGE LOOKS TO THE SUN

In 2006, Cape Cod Community College (CCCC) was on the leading edge of the sustainable building movement when the Lyndon P. Lorusso Applied Technology Building became the first state-owned building in Massachusetts to receive Leadership in Energy and Environmental Design (LEED) gold certification. Beyond this achievement, CCCC looks to the sun’s energy to help reduce reliance on electricity from the grid. Their solar farm went online in 2012 and integrates more than 2,500 panels on the ground, building roofs and a carport structure. The energy harnessed has reduced the college’s grid-based BTU consumption by nearly 40%.
PUBLIC SECTOR-BASED INCENTIVES AND REGULATION MATTER

As the data clearly illustrates, campus’s energy use, costs and emissions are strongly influenced by their respective public sector and regulatory environments. Public sector funding and regulatory factors also impact renewable energy use and emissions performance. State-based regulatory factors likely explain, for example, a predominance of Massachusetts institutions among the colleges in the database that reduced their consumption by 10% or greater (see page 20).6

In spite of the ways in which state and federal energy policies and regulations clearly impact their bottom lines, it is not clear that campus administrators are engaging as actively as they might in energy policy dialogues with elected officials, regulators and/or their utilities. This is a missed opportunity not only to influence their operating environments, but also to lead on a key economic development issue: the future of our national energy system. There are many options for shaping and responding to the regulatory environment issues discussed here. First, campuses could further support calls for clear federal and state-level policies aimed at incentivizing conservation, efficiency, and renewable energy efforts — for example, to allow tax-exempt revenue bond financing for power purchase agreements, or to develop new loan options.7 Likewise, they can advocate for rules and rates that make it easier and more cost effective for institutions to produce energy on-site and feed it into the grid. These policies will have major implications on utility prices across the board.


7 Second Nature/NACUBO (2013)
METRICS MATTER

The higher education sustainability movement has made great strides on a number of fronts. To support that progress, organizations like AASHE, Second Nature, the U.S. Green Building Council, the Sustainable Endowments Institute, APPA, and NACUBO have invested significant resources into developing valuable, user-driven tools and platforms for collecting and reporting out metrics — from institutional carbon footprints and (qualitative) climate action plans, to leadership commitments like LEED, to investments in energy efficiency and renewables through revolving funds, and more.

While a significant and growing number of campuses are using these and other tools — including, of course, the Campus Carbon Calculator™, Carbon MAP, and Sightlines ROPA process and Sustainability Solutions — to measure their carbon emissions and energy management efforts, we still don’t have solid, qualified/verified data in a number of key areas. Moreover, none of the available data is organized or structured in a way that makes it easy to access, analyze or interpret across platforms. Conducting analysis within these constraints illuminated significant measurement gaps:

- We know that fuel switching is a core part of this story, but we were unable to trace a comprehensive, contextualized picture of investment in, or deployment of, renewables on or off campus. The data necessary to do such an analysis do, arguably, exist — but they are presently in too many fragmented places, and have too little regimented QA/QC.

- Likewise, the necessary data was not readily available to do a rigorous analysis of renewable energy certificate (REC) or carbon offset purchases, and the degree to which these have figured or are expected to figure into campus’s near-term carbon management strategies.

- Due to a lack of consistent temporal and organizational boundaries, and data collection methods, we could not observe anything clearly meaningful or make actionable conclusions around Scope 3 emissions (which is why no Scope 3 data is included). Given that some analyses suggest campus Scope 3 emissions can be larger than Scope 1 and 2 combined — this is a significant data gap. Looking at the life-cycle emissions impact of all fuels, for example, might lead to very different energy infrastructure investment choices than what we’ve seen over the past several years. Campuses need better tools, and encouragement to adopt more consistent practices, for accurate, relevant modeling of their entire Scope 3 emissions profiles (not just a subset).

The limits of what is possible with the current data “ecosystem” suggest that everyone could benefit from improved, streamlined systems for capturing key data accurately and comprehensively; for aggregating it; and for making it openly accessible. Moving toward such systems will require sustained, systemic collaboration on the part of the varied organizations that currently facilitate this kind of data collection and reporting.
The bottom line suggested by the data is this: We in higher education need to do a better job moving beyond talking about reductions in carbon emissions and walking the walk when it comes to addressing climate and energy issues. This need presents a critical opportunity to ensure that our higher education institutions are as socially relevant and sustainable — in every sense of the word — as possible, for decades to come.

The trends and findings presented here offer some insight into possible strategic priorities and even adjustments campuses can make in their carbon leadership efforts moving forward. The reality is that we need to invest more "up-front": more attention, more sustained focus, more creativity, and — yes — more financial capital, if we are going to make the progress we need to make on energy and climate change. Shifting to renewables by contracting power purchase agreements does not require any up-front capital, but can reduce energy cost volatility, facilitate long-term budget planning, reduce energy costs, and dramatically curb greenhouse gas emissions. Combining these strategies with conservation and greater efficiency can result in large and lasting energy and GHG savings.

Unfortunately, if we don’t make these investments now, colleges and universities will continue to see our physical campuses deteriorate, our energy consumption and costs rise, and our ability to offer value questioned.

It is urgent that we focus on these four opportunities:

1. Make, and invest in, significant institutional commitments to cutting energy use and emissions.

2. Prioritize avoiding new emissions sources by "right-sizing" campus; contain life-cycle costs and maintain efficiency through "re-setting" age profiles.

3. Leverage opportunities, such as large-scale power purchase agreements, to replace fossil fuels with renewable energy technologies. Take every advantage of innovative funding mechanisms and emerging energy storage technologies.

4. Engage actively, at a leadership level, in local, regional and national dialogues on energy rules and regulations, incentives, and systemic infrastructure investments.

5. Ramp up efforts to improve the availability of key sustainability tools, metrics, datasets and modeling capabilities. Focus, for example, on better data around renewable energy, RECs and offsets, Scope 3 emissions, energy spending and investment, and returns on said investments. This recommendation applies to the non-profits, agencies and businesses that serve higher education (e.g. professional associations like AASHE, APPA and NACUBO; nonprofits like USGBC, Second Nature and SEI; and businesses like Sightlines). It also applies to campuses themselves — like UNH — whose participation and investment in these resources is essential to success.

Seizing these opportunities will require even more innovative thinking, breaking down of traditional silos, willingness to experiment and to do things differently, and to act boldly.

The good news is that all of these investments will have a high return, both in terms of financial resources and in terms of making it easier for every institution to effectively manage its physical campus. It’s a difficult but obvious choice; the only one that will allow higher education to fulfill its ultimate social mission — preparing future generations to lead, grow and thrive.
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It is our hope that the report will help inform, prompt dialogue, and inspire leaders on campuses everywhere who are seeking to “raise the bar” further when it comes to campus leadership on energy and climate change solutions.

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About UNH Sustainability Institute
The UNH Sustainability Institute facilitates integration of diverse perspectives, disciplines and knowledge to address sustainability’s grand challenges. As a university-wide institute, it supports innovation across curriculum, operations, research and engagement. The Institute acts as a cultivator and champion of sustainability on campus, in the state and region, and around the world, and is recognized for its unique, creative approach and thought leadership. Learn more at www.sustainableunh.unh.edu.

About Sightlines
Founded in 2000, Sightlines is a subsidiary of The Gordian Group. Sightlines gives colleges and universities the independent data and perspective they need to make critical decisions about their most valuable assets – their facilities. Sightlines stewards the industry’s most extensive verified database, allowing more than 450 institutions across the U.S. and Canada to benchmark an institution’s facilities against universities and colleges across the nation. Sightlines’ flagship offering for members is ROPA+, a fully integrated solution for facilities intelligence that leads members through a comprehensive process of discovery, prediction and performance measurement. Other Sightlines solutions provide higher ed executives with insights to assist with capital planning, space management and campus sustainability initiatives.