

How Green is (O)IT?

A status report on OIT's contributions to NC State's sustainability efforts, fall 2009

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Executive Summary

NC State's Office of Information Technology (OIT) can take pride in the way our systems and services contribute to the university's commitments to being a leader in environmental sustainability and to achieving climate neutrality. OIT's information and communication technology (ICT) and high-performance computing (HPC) services reduce the need for transportation, fossil fuel and paper use. These services enable distance education and telework, and they increase the campus capacity to do research and development in fields critical to addressing climate change. OIT provides ICT capabilities that support the social, economic and environmental aspects of NC State's concept of a [sustainable campus](#).

The issue of power used by ICT needs to be addressed campus-wide, however, especially in terms of how it impacts the university's carbon footprint and commitments to environmental sustainability. According to the 2008 [NC State Green House Gas \(GHG\) Inventory](#), electricity purchases account for 53% of the GHG emissions associated with the campus. Based on estimates from EDUCAUSE on the typical patterns of power consumption on campuses, a large portion of this footprint is likely from ICT. Although ignored until recently in most discussions of sustainability, the power used by NC State's ICT, including desktop and laptop computers, printers, data centers, and underlying ICT infrastructure, adds tons (perhaps more than 71,000 metric tons) of carbon emissions annually to the global environment.

In fall 2009, NC State Sustainability Officer Jack Colby called on OIT to become more involved in the growing number of campus sustainability initiatives. As a first step, the OIT Leadership Team requested a preliminary report on what is currently known about the environmental impact of OIT; current OIT green IT efforts; accepted metrics of ICT impacts; and possible improvements. This report is the result of that request.

The following chart is adapted from the EDUCAUSE 2009 research paper "[Getting Serious About Sustainable IT: Metrics, Tools, and Solutions](#)." It lists recommended green IT initiatives ranked by the expected cost and carbon-reduction benefits. The right-hand column summarizes the status of OIT and NC State's efforts.

“Carbon Reduction and Cost Factors in Green IT Initiatives “:

	Green IT Considerations	OIT/NC State status, fall 2009
High Carbon Reduction Low Cost	<p>Data center temperature</p> <p>Server rack blanking panel</p> <p>Power distribution units</p> <p>Hardware decommissioning</p> <p>Teleworking</p> <p>Business Travel reductions</p> <p>EPEAT/Energy Star purchasing (Note: servers, computers, monitors, printers are now all EPEAT and/or Energy Star rated)</p> <p>Power management (PM)</p>	<p>-Already implemented</p> <p>-Not yet implemented</p> <p>-Not yet implemented</p> <p>-In progress in Data Center 1, including decommissioning of mainframe computer; workstation reduction in computer labs being investigated</p> <p>- Student E-mail Initiative’s outsourcing of student e-mail will move this service to more energy-efficient Google Apps servers</p> <p>-VPN, remote access and other services support telework campus wide; could be enhanced</p> <p>-In progress due to budget cuts</p> <p>-Not required campus-wide; OIT purchases and recommends EPEAT Gold-rated computers for labs and classrooms; could be facilitated as part of PC and Printer Contract Purchasing project and campus awareness campaigns; CEST Purchasing work group may develop Sustainability Purchasing Policy similar to UNC-CH</p> <p>-Not yet implemented on desktops campus-wide; HPC/VCL PM measures deployed; PM of desktops, laptops, monitors, printers could be improved as part of Desktop Management and Virtualization project; options for improved PM of data centers and equipment being investigated</p>
Low Carbon Reduction Low Cost	<p>Digital imaging</p> <p>Print management</p> <p>Lighting</p> <p>Recycling</p> <p>Extend hardware life cycle</p>	<p>-New document imaging system (Hershey) in progress (will greatly reduce paper-based processes; will not be “low cost”)</p> <p>-Paper waste being reduced due to budget reductions</p> <p>-Improvements led by Facilities</p> <p>-Efforts led by Waste Reduction and Recycling; computer reuse and recycling processes in place campus wide</p> <p>-Being implemented campus wide due to budget issues; appropriate strategy only if hardware is energy efficient</p>

	Green IT Considerations	OIT/NC State status, fall 2009
High Carbon Reduction High Cost	Data center air handling Videoconferencing Virtualization Storage consolidation Virtual desktops/thin clients Virtual labs Distance learning	-Not yet implemented -Efforts led by DELTA -Server virtualization in progress -In progress along with Centralized Storage Project -Evaluated as part of the Desktop Management and Virtualization project; not feasible as a campus-wide solution at NC State. -NC State's Virtual Computing Lab (VCL) is a national model -Efforts led by DELTA; more than 300 credit courses offered online

Additional green IT efforts proposed for OIT and NC State include:

- Include sustainability benefits as routine part of OIT planning and reporting
- Include energy impact as routine part of OIT project planning and reporting
- Consult with ICT energy experts to conduct a study that includes data centers and ICT infrastructure and makes recommendations for short and long-term improvements
- Install meters to monitor and capture information on power consumption in data centers
- Reduce the number of small server rooms in departments and colleges
- Strive for carbon neutrality in the Data Center 3 facility being planned for Centennial Campus
- Work with the Office of Sustainability to promote green IT best practices campus wide
- Begin OIT's active participation on the Campus Environmental Sustainability Team (CEST) Purchasing and Energy workgroups; help work on the upcoming NC State Sustainability Strategic Plan and Climate Action Plan.

To facilitate OIT's alignment with university efforts and initiatives, we used the same categories in the [How Green is \(O\)IT?](#) report as those used by NC State's Office of Sustainability, with an emphasis in our report on the "Purchasing" and "Energy" sections.

How Green is (O)IT?

A status report on OIT's contributions to NC State's sustainability efforts, fall 2009

Introduction

OIT can take pride in the way our services contribute to NC State's commitments to being a leader in environmental sustainability and to achieving climate neutrality. Our information and communication technology (ICT) and high-performance computing services (HPC) reduce the need for transportation, fossil fuel and paper consumption; enable distance education and telework; and increase the campus capacity to do research and development in fields critical to addressing climate change. Furthermore, the NC State Office of Sustainability is an innovative user of OIT services - iTunesU, WolfBytes and electronic signage as well as the Web - to engage and inform the campus about sustainability issues and initiatives. The campus *2008-09 Sustainability Report* featured MarketPlace, the e-procurement portal developed by OIT and used across campus. "Electronic ordering and payment saves energy, time, paper and money," the report stated, estimating almost \$1.5 million in savings during 2008-09. Many other OIT services similarly contribute to campus efficiency and sustainability.

However, in recent years more attention is being paid to ICT's negative impacts on sustainability efforts. Globally, ICT is now recognized to have a large carbon footprint - right behind aviation and ahead of the steel industry - and ICT energy consumption is expected to [double in four years](#). Production data centers have been identified as a rapidly growing area of [global power consumption - and power waste](#). Electronics are said to be the source of [70% of heavy metals in landfills](#), and computer printers have led to an increase, not decrease, in office paper consumption, with the [average office worker using about 10,000 sheets of paper annually](#) according to the Environmental Protection Agency (EPA).

Not only do numerous US federal policies and initiatives promote sustainability for and with ICT, the ICT Industry as a whole has begun focusing on the issue. For example, the recent Gartner Symposium/ITxpo, listed "IT for Green" as a top-10 strategic technology for 2010, pointing out that IT can enable many green initiatives. EDUCAUSE made "Sustainability and Green IT" one of its three key themes for 2009, and the November 2009 EDUCAUSE Review focuses on "IT and the Greener Future." These very different groups both emphasize that ICT will continue to have a vital role in meeting the challenges of social, economic and environmental sustainability. At NC State that includes the "Red Goes Green" campaign to "reduce our carbon paw print."

According to Bill St. Arnaud at the [2008 EDUCAUSE Green IT Summit](#), "the typical university produces 200,000 - 500,000 metric tons (MTe) of CO₂ per year of which 100,000-300,000 tons are from cyberinfrastructure and ICT." The [NC State 2008 Green House Gas \(GHG\) Inventory](#) estimated that university activities resulted in the production of 270,069 metric tons of GHG in 2008; generation of the electric power consumed produced 53% (143,494 MTe) of campus emissions. If St. Arnaud's estimates are correct, ICT may be contributing more than 71,000 MTe of these emissions. Even if this is an over-estimate, the university is mandated by state law (North Carolina [Senate Bill 668](#)/Session Law 2007-546) to reduce building energy consumption by 20%. The current plan is to achieve this goal by 2015. As the university's central ICT organization, with networking and other infrastructure and services in almost all buildings on campus, OIT has a big part to play in this effort.

In fall 2009, NC State Sustainability Officer, Jack Colby, called on OIT and Vice Chancellor Marc Hoyt to become more involved in the growing number of campus sustainability initiatives. In particular, OIT was invited to participate on the Campus Environmental Sustainability Team (CEST) Purchasing Working Group. In addition, the CEST Energy Working Group has identified “Green Computing Best Practices” as a critical factor in achieving sustained change in energy consumption on campus, and OIT’s engagement in this work is expected.

As a first step toward more engagement in these issues, the OIT Leadership Team requested a preliminary report on what is currently known about the environmental impact of ICT on campus, current OIT Green IT efforts, accepted metrics, and possible improvements. This status report is a result of their request.

To align OIT information with campus sustainability efforts and initiatives, the following sections of this report use the same categories as those used by the NC State Office of Sustainability and the national [Association for the Advancement of Sustainability in Higher Education](#), with particular attention on the key ICT categories of Purchasing and Energy.

Purchasing

According to a recent estimate, NC State owns and operates more than 15,000 desktops computers and workstations (more than 2,700 in student labs), nearly as many monitors, and hundreds of printers. OIT has more than 2000 servers in university data centers. In addition, more than 98% of students have their own computers, and many of these are purchased through the NC State Bookstores. Last year, OIT alone purchased \$1,758,757 in ICT-related equipment. This adds up to a lot of ICT-related purchasing by the NC State campus community.

The EDUCAUSE 2009 research paper [“Getting Serious About Sustainable IT: Metrics, Tools, and Solutions.”](#) identifies purchasing [Electronic Product Environmental Assessment Tool \(EPEAT\)](#) or [Energy Star](#) qualified equipment as a top “High Carbon Emission/Low Cost” green IT initiative. EPEAT and Energy Star rank products based on EPA measures of energy efficiency and environmental impact. As of May, 2009 Energy Star is rating enterprise servers as well as consumer electronics. [Federal agencies](#) are now required to prioritize purchase of EPEAT-registered IT products; the [State Electronics Challenge](#) encourages state and local governments to follow this example. Although North Carolina [state law](#) requires state agencies to buy environmentally preferable products, the state does not yet mandate the purchase of Energy Star rated electronics. Nevertheless, UNC-Chapel Hill, among other peer institutions, has implemented an [Energy Efficiency Purchasing Policy](#). NC State is an Energy Star Partner, but does not yet have a campus-wide Energy Star or EPEAT purchasing policy.

The good news is that top IT vendors have become energy and environmentally conscious. Finding EPEAT and Energy Star qualified computers, laptops, printers and monitors is quite easy using the federally-sponsored EPEAT system. For example, the computers (laptops) available for online purchase from the NC State Bookstores are all rated at the EPEAT Silver or Gold level. Since 2007, computers used in OIT-supported labs and classrooms, along with most new workstations purchases by OIT staff, have qualified for EPEAT Silver or Gold rankings. This year, the workstations and monitors purchased for OIT-supported labs are 48.3% more energy efficient than the equipment they are replacing: the new monitors are all energy-efficient LCD flat-screen devices, and the computers are all rated EPEAT Gold.

To improve campus sustainability efforts in the area of ICT purchasing, OIT could:

- **Establish IT purchasing guidelines** - Require the consideration energy efficiency ratings, such as EPEAT or Energy Star certification, where possible in selecting equipment to be purchased; these guidelines would apply to OIT's ongoing operations and new initiatives, such as the PC and Printer Purchasing Combined Contract project; require reporting of compliance as a means of tracking changes over time.
- **Assign an OIT representative to the CEST Purchasing Working Group** - Work to establish a campus-wide Energy Star/EPEAT purchasing policy.
- **Promote EPEAT and Energy Star purchasing for personally owned devices** - Work with the campus Sustainability Office to promote green IT purchasing among students, faculty and staff for personal computing and mobile devices.

Energy

While ICT advances many sustainability goals (social, economic, research and operational), its impact on campus carbon emissions and electricity consumption is large and likely growing if steps are not taken to reverse current trends. The campus will need the participation of OIT to achieve its building efficiency and energy reduction mandates. Likewise, OIT will need university funding and support to rapidly implement projects that will reduce ICT's climate impact while meeting the university's academic, administrative, and economic needs for leading-edge technologies.

Most immediately, it is important for OIT to begin actively participating in the CEST Energy Working Group: This group is working with others on the new Sustainability Strategic Plan for the campus, which will be issued in spring 2010. OIT needs to be a partner in this process to ensure that ICT activities are included in ways that are both feasible and beneficial.

Initiatives aimed at reducing the impact of ICT energy use on university campuses typically focus on four categories of activities:

- Personal computers and desktops
- Data centers
- Research computing
- Cyberinfrastructure

In each of these areas, OIT has launched projects that will enhance energy efficiency or reduce energy use. However, in most cases, OIT has not included measurement or documentation the energy impact of these projects. The EDUCAUSE 2009 research paper on [sustainable IT tools and metrics](#) mentioned above includes a list of green IT initiatives related to energy consumption. The report estimated the potential carbon impact and cost of each initiative. These are noted below in parentheses where applicable.

Personal computers and desktops:

- **Power management** ("High Carbon Reduction Low Cost") - As part of the Desktop Management and Virtualization project, OIT is working with campus IT staff to develop a set of power savings standards for campus, expand the number of managed desktops, and implement automated power management

schemes for managed desktops and computer labs. Implementing power management on managed desktops is estimated to save campuses 180,000 kilowatt hours per computer and up to \$200,000 annually per 5,000 desktops, [EDUCAUSE reports](#).

- **Hardware decommissioning** (“High Carbon Reduction Low Cost”) - The Lab Seat Reduction project would reduce energy consumption by reducing the number of student computing labs and computers. The assumption is that students' academic computing needs can be met by a combination of student-owned computers and the Virtual Computing Lab. Most students (an estimated 86%, based on the most recent [ResNet survey](#)) now bring their own laptops to campus; laptops consume less energy than desktop computers.
- **Virtual desktops/thin clients** (“High Carbon Reduction High Cost”) - Evaluated as part of Desktop Management and Virtualization project; not feasible as a campus-wide solution at NC State. This option is not being pursued at this point in OIT's offerings.
- **Virtual Computing Lab (VCL)** (“High Carbon Reduction High Cost”) – NC State’s VCL is a national model, and the VCL software developed here is now being shared with other schools as an Apache Software Foundation open source incubator project. The VCL is based on blade servers, which are designed to be more energy efficient than standard rack servers (see the Research Computing section in this report for more information). It currently offers more than 500 24/7 virtual lab computers for campus and distance education users. According to estimates done by George Mason University, annual electrical and cooling costs per 250 VCL users is \$1,407; for equivalent PC use in a physical computing lab, they estimated annual electrical and cooling costs of \$11,594. Although a similar analysis has not been done at NC State, the expectation is that a comparison of VCL and physical labs’ energy costs would be similar.
- **Best practices education and outreach** - The energy saving measures listed above will not affect the energy use of many (perhaps most) of the computers on campus, such as the many university-owned computers that are not remotely managed, the approximately 7,000 computers owned by students in university housing, and the thousands of laptops off-campus students and others bring to campus and use university power to operate. Often, power-saving features are not enabled on these computers, and they are left on at all times with screen savers running. Although the impact would be difficult to measure, including green IT energy-saving best practices as part of campus-wide sustainability education efforts could be considered a “High Carbon Reduction Low Cost” initiative.

Data centers:

University data centers present a challenging dilemma. As on other campuses, NC State’s data centers, cooling and backup power resources are inadequate to meet the growing campus demands (and federal and state mandates) for increased IT server and storage capacity. Meanwhile, since the 2007 EPA [Data Center Report to Congress on Server and Data Center Energy Efficiency](#), there has been growing alarm about the rapid increase in data center power consumption and related carbon emissions.

OIT operates the university's primary data centers: Data Center 1 (DC1) in the Hillsborough Building and Data Center 2 (DC2) in the Administrative Services III Building. In addition, there is the Poe Data Center and an uncounted number of server rooms and racks operated in departments, colleges and research centers across campus. DC1 (about 3,500 square feet) and DC2 (about 4,000 square feet) are comparatively small for university data centers. Neither are in spaces that were originally intended for data center use, making power efficiency difficult to achieve. Nevertheless, they house more than 2,000 servers, storage, and networking equipment for the university's mission-critical enterprise applications (such as student information, financial and human resources systems), Web, e-mail and central research computing systems. Energy-saving schemes that might cause equipment failure or data loss are not an option. However, there are ways to improve the energy efficiency of the existing data centers.

- **Power management** ("High Carbon Reduction Low Cost") - The often misquoted adage, "You can't manage what you don't measure" may actually apply to data center power management. NC State does not have even basic power metering for its data centers, and so it is not possible to determine or track improvements in DC power usage effectiveness (PUE). PUE is currently defined as the ratio of IT energy use/total energy use and is considered the standard for measuring data center efficiency. According to the [November 2009 EPA Data Center Infrastructure Rating report](#) a PUE of 2.4 is average for data centers in the US, meaning it typically takes more energy to provide air and power conditioning and networking for data centers than it does to power the servers and storage. NC State's data centers may be below average (a good thing in this context), but we have no means of knowing.

OIT is investigating new options to improve power management in data centers. To do this most effectively and to fully collaborate with campus in achieving its energy reduction goals, OIT needs to work with the NC State's Facilities Division and Office of Energy Management to obtain proper metering capacities for DC 1 and DC2.

- **Data center temperatures** ("High Carbon Reduction Low Cost") - The overall temperatures in DC1 and DC2 have been raised as much as possible without risking equipment failure.
- **Hardware decommissioning** ("High Carbon Reduction Low Cost")-The Island of Improvement initiative currently in progress in DC1 will methodically "clear out, clean up and re-engineer" a portion of the data center. This work involves decommissioning old equipment and moving applications to more energy efficient virtualized servers.

The project to decommission the legacy university mainframe is also in progress; the space will be taken by multiple new servers, but it is not clear if this will result in reducing power and cooling needs. Outsourcing of student e-mail to Google Apps may lead to decommissioning several mail servers.

- **Server rack blanking** ("High Carbon Reduction Low Cost") – This strategy for improving server cooling efficiency has not yet been implemented.
- **Power distribution units** ("High Carbon Reduction Low Cost") - Not implemented, and perhaps not advisable in the antiquated DC1.

- **Data Center air handling** (“High Carbon Reduction High Cost”) - Up-fitting air handling systems DC 1 to achieve current best practices may not be worth the investment. DC2 systems are closer to best practices. However hot/cold aisle strategies for equipment in DC1 are planned as part of the Island of Improvement initiative.
- **Server virtualization** (“High Carbon Reduction High Cost”) -These efforts are moving forward as affordable and as possible without impacting critical systems or services.
- **Server consolidation** (“High Carbon Reduction High Cost”) – This is in progress along with the OIT Centralized Storage Project.

In addition to needing power metering to improve data center power usage efficiency, it would be advisable for the university to contract an expert, such as a US Department of Energy (DOE) Data Center Certified Energy Practitioner (DC-CEP) to assess the data centers and server rooms across campus for energy use and the most effective energy efficiency improvements. The first goal would not be to reduce power consumption, but to eliminate needless waste. This could help OIT meet growing campus ICT needs without increasing the campus carbon footprint.

Research Computing:

Unlike many other campuses, research computing at NC State is becoming more efficient and centralized into the campus data centers, instead of the more typical, less efficient model of researchers operating their own computing clusters. This is because of the innovations of OIT’s [High Performance Computing services](#), the HPC Partners program, and the cloud computing, computing-as-a-service (CaaS) model enabled by VCL technology. The HPC partners program allows researchers to purchase hardware that OIT will operate for them. When researchers are not using their equipment, it is made available to others on campus so compute cycles are not wasted.

In addition, OIT’s HPC blade servers are more energy efficient than standard rack servers. HPC staff recently measured the actual operation of 84 IBM x335 (1U) servers vs. 84 IBM HS20 (blade) servers with similar processors and memory. In addition to requiring half the space, the blade servers required significantly less power and cooling than the 1U servers (the blades consumed 21 KW of power and produced 71,673 BTU/Hr of heat; the 1U servers consumed 28.6 KW and produced 97,475 BTU/hr; this implies 6 tons cooling vs. 8.1 tons of cooling required, staff calculate.) The HPC production IBM Blade Center Linux Cluster has 782 blade server compute nodes; an additional blade-based Linux Cluster is under construction with 1000 compute nodes.

Cyberinfrastructure:

In the context of higher education, the term cyberinfrastructure includes data centers and research computing but extends beyond these to include high performance networking and a host of new integrated ICT systems and services for education and research. These extend from the individual campus level to national and international undertakings.

Recent cyberinfrastructure enhancements on the NC State campus include the upgrade of the university's Internet gateways to the NC Research and Education Network (NCREN) from 1 to 10 Gb/s. OIT plans to increase the campus fiber optic networking backbone from 1 to 4 Gb/s within the next two years. The energy implications of these projects could be calculated as part of cost-benefit analyses. OIT's Communication Technologies' engineers do power calculations for all network designs in campus buildings. While the power consumption of campus network equipment appears to be small, certain technologies can increase the potential power draw somewhat. At the [2008 EDUCAUSE Green IT Summit](#), Bill St. Arnaud of Canada's CANAIRE network called on universities to aim to research, develop and deploy "zero-carbon" computer and network architectures.

Waste Reduction and Recycling

NC State has implemented robust procedures campus wide to reduce the toxic impact of electronic waste. All departments know that surplus electronics, including computers, functional or not, must be processed through University Surplus. All electronics are either transferred back to campus, sold through Surplus' monthly sale to the public, or sorted, palletized and sent to a recycler on State contract. Computer reuse is also widely practiced on campus. For example, computers from computing labs managed by OIT are routinely "handed down" for reuse in other departments following the annual cycle of lab upgrades. OIT needs to ensure efforts on disk destruction (hard drives, tapes, etc.) are coordinated with university Surplus. OIT currently uses the services of Cintas Corporation for destruction of disks with potential sensitive data.

NC State used to have a daily van service making trips to transport forms, reports, printouts and other documents around campus. OIT no longer needs this service. It has been made obsolete thanks to the web-based applications developed for university administrative units by OIT's Enterprise Applications Services (EAS). Widely used examples include the MarketPlace e-procurement system, the WolfPack Reporting System, and other web-based administrative services provided within the university's MyPack Portal system. Likewise, the recently launched for Document Imaging Expansion project, which will enable online storage, retrieval and management of electronic images of documents, has the potential to enhance the efficiency of university business processes as well as enabling offices to "go paperless." While many groups across campus want this service, EAS does not now have the staff resources to meet these growing demands.

Transportation

NC State has many [Transportation](#) programs to reduce the use of private vehicles on campus. ICT provides resources that are listed by EDUCAUSE as green initiatives that reduce the need for transportation.

- [Telecommuting](#) ("High Carbon Reduction Low Cost") – OIT offers a number of services that enable employees to work from home. Tracking use of the Virtual Private Network (VP) service could be one indicator of work being done from home, although this would be only a partial indication, since many people use other OIT online services, such as the MyPack Portal, WolfWise and Cyrus webmail, to replicate their work environment at home. Telecommuting can also be used to limit the need for off-campus travel. For example, the NC State and UNC-Chapel Hill Joint Enterprise Services project uses

Web conferencing and online collaboration tools extensively to reduce the travel needed between campuses for this multiyear collaboration.

ICT services to support telecommuting could be enhanced and better publicized to make it easier for staff and faculty to work from home or avoid the need for travel to collaborate with others off campus. [NC State's Human Resources](#) guidelines state that most employees with probationary, permanent, trainee, or time-limited appointments are eligible to telework with supervisory approval. This option could be promoted more vigorously as an additional method for reducing the university's transportation-related carbon emissions.

- [Distance Education](#) (DE)(“High Carbon Reduction High Cost”) - NC State's Distance Education and Learning Technology Applications (DELTA) organization now offers more than 300 for-credit DE courses.
- [Virtual Computing Lab](#) (VCL)(“High Carbon Reduction High Cost”) - The VCL is available “anywhere, anytime” and reduces the need to travel as well as being more energy efficient than physical labs.

It is difficult to measure miles not traveled. However, the increase in students taking courses online and using the VCL implies a decrease in transportation.

Buildings

Data Center 3, a new 20,000 square feet facility on Centennial Campus, is planned but not yet designed or funded. It offers NC State the opportunity to join the ranks of universities leading efforts to develop next generation low-carbon or carbon-neutral data centers, as envisioned in a recent [EDUCAUSE Review article](#).

Community and Culture

Until recently at NC State, as elsewhere, the impact—either positive or negative— of ICT on sustainability efforts has not received a lot of attention. It is not easy to measure, and that makes it easy to ignore. Over the past few years, several specific green IT initiatives have been mentioned in campus sustainability reports, but ICT has not been systematically included in sustainability discussions, planning, initiatives or reporting. This is likely to change, with greater attention on ICT issues from the campus Sustainability Officer and the staffs of the Office of Sustainability and the Office of Energy Management. Awareness of green IT practices—among ICT professionals, facilities and sustainability planners, and every day users of computers across campus— has the potential of making a significant impact on the campus ecology including energy consumption, cooling needs and green house gas emissions.

OIT has not yet made a focused effort to help inform and energize the campus community about these issues or to contribute to advancing “NC State as an [innovative, sustainable community](#).” To measure culture change related to Green IT at NC State, OIT could chart the increase of inclusion of ICT in sustainability discussions, planning, initiatives and reporting. OIT could also:

- ***Create guidelines and tutorials for green IT best practices*** - Promote them among students, faculty and staff.

- *Create a Green IT section on OIT web site*
- *Work with the Sustainability Office to promote green IT at sustainability activities and events*
- **Publicize ICT activities and accomplishments that advance sustainability at NC State-** Help change the color of NC State's (O)IT from pale green to the beautiful dark color of Carolina pines.

Conclusion

The November 2009 EDUCAUSE Review focuses on "IT and the Greener Future." Its [lead editorial](#) advocates the value of making a business case (rather than a social or environmental case) for green IT initiatives. At NC State, the situation is somewhat reversed. Three of the four OIT Budget Reduction Projects launched in spring 2009 during the state budget crisis will also reduce ICT energy consumption or enhance energy efficiency. At least six other major projects on the OIT Project Road Map for the next two years will reduce the environmental impact of ICT or campus business processes.

The business cases have already been made for these projects, but the environmental cases have not. As a result, OIT is losing opportunities to 1) get help from Facilities and the Office of Energy Management to gather data to demonstrate the environmental benefits of these projects, 2) act as a model for other IT groups on campus, 3) collaborate in broader campus sustainability efforts, and 4) gain campus support and additional funding to implement high carbon reduction, high cost projects.

OIT is an integral part of the NC State community and the campus ecology. As elsewhere, in OIT there is the feeling that staff, facilities and budget are already stretched to the limit. Nevertheless, it seems likely that OIT's new projects and on-going services can be helped, not hindered, by paying more focused attention to how ICT activities impact campus sustainability efforts. Without more awareness and data, we can't convincingly answer the question "How green is (O)IT?" It seems that OIT is green in parts and getting greener. More importantly, we are being asked, and should, work with others on campus to shape strategies and actions that will make a real difference to NC State's carbon footprint, climate impact and sustainability commitments.