



Sustainable Duke



Is Technology Good for the Environment?



**Casey Roe
Assistant Director
Sustainable Duke**



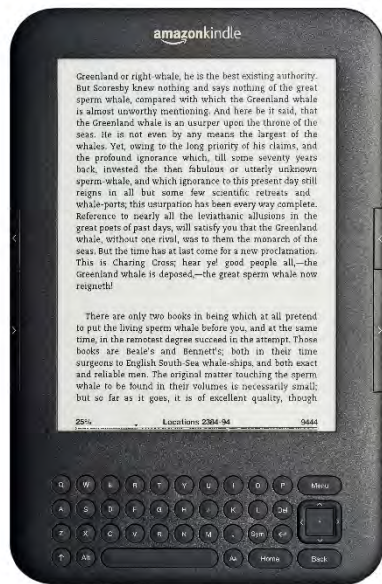
What is Sustainability?

“Meeting all the needs of the present without compromising the ability of future generations to meet their own needs”





Technologies in Daily Use





Global Environmental Implications

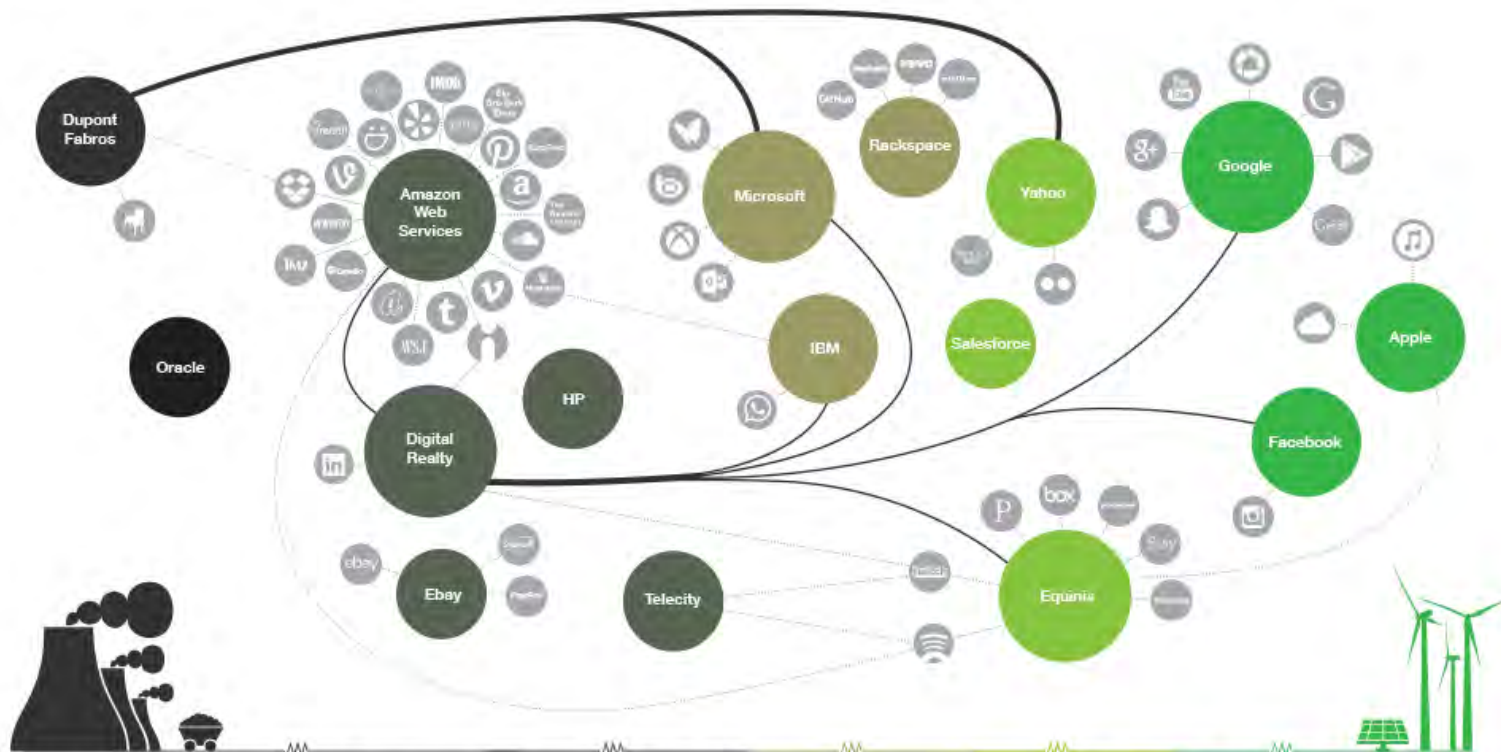




Data Centers

- 2% of global greenhouse gas emissions
 - Same as aviation
- Water
 - 3.5 million gallons / MW
 - Data centers range from 5-30 MW
 - 800+ data centers in California
- Tech companies could be drivers for clean technology

2015 REPORT 



Stuck in dirty energy past: Efficiency only, using mostly dirty energy, have taken few or no steps to switch to renewables

Middle of the Road: Taking steps toward a greener internet, but not leading the way.

Green Internet Innovators: Committed to 100% renewable energy. Their leadership is helping to make our lives, online and offline, greener.



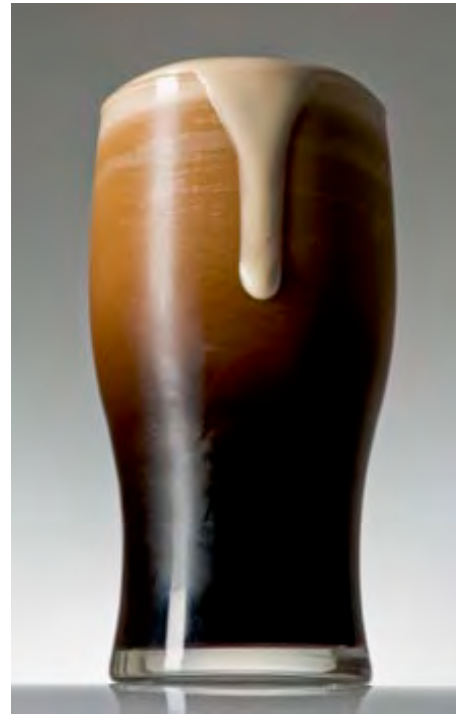
How Much Energy is “A Lot?”



1 Btu



Avg. 170 Btu/hr



700 Btu



114,000 Btu



Aggregate Impacts

- 1 iphone 5
 - About 5 watts per charge
 - \$.41 to charge in a year
- Consider:
 - 2016: 1 billion people worldwide have a smart phone



Energy in Production

- Mining accounts for ~10% of global energy use
- Manufacturing uses between 50-80% of an electronic product's total energy requirement
- Energy expended in manufacturing just a handful of microchips can be as much as energy to manufacture a car



Materials

- Resource depletion
- Hazardous chemicals
 - Health impacts in production & disposal
- For example:
 - Smart phone
 - 60+ elements
 - 200 chemical compounds
 - Computer circuitry production
 - 500-1000 chemicals



Computer, Tablet, Wearables

- Copper
- Aluminum
- Gold
- Zinc
- Nickel
- Tin
- Silver
- Iron
- Platinum
- Palladium
- Cobalt
- Tantalum
(coltan)
- Silicon
- Antimony
- Arsenic
- Hafnium
- Barium
- Cadmium
- Selenium
- Gallium
- Indium
- Niobium
- Lithium



End of Life

- Global e-waste: 41.8 million tons in 2014
 - Equivalent to 22 million standard sized sedans
- Average American: 65 lbs per year
- 60-90% of e-waste
 - Mountains of rubbish in developing world
 - Traded through criminal e-waste networks
- Worker health & safety
- Toxic chemicals, heavy metals
 - Residents, soil, water



Paper

- Basic recipe: wood, water, energy
- Water
 - 3 gallons water / sheet of paper
- Energy
 - Chop, dry, cook wood; roll and dry pulp
 - Equivalent to 2 gallons of gasoline / ream of paper



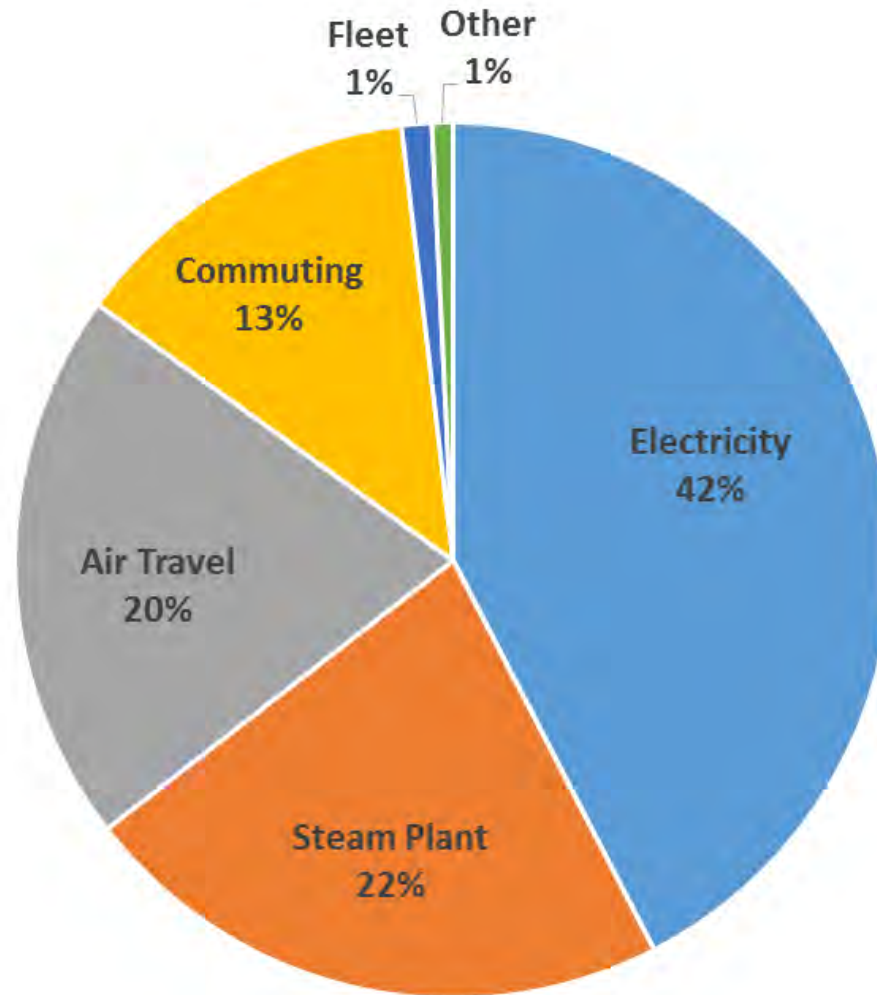
Sustainable Duke



**What is Duke
doing?**



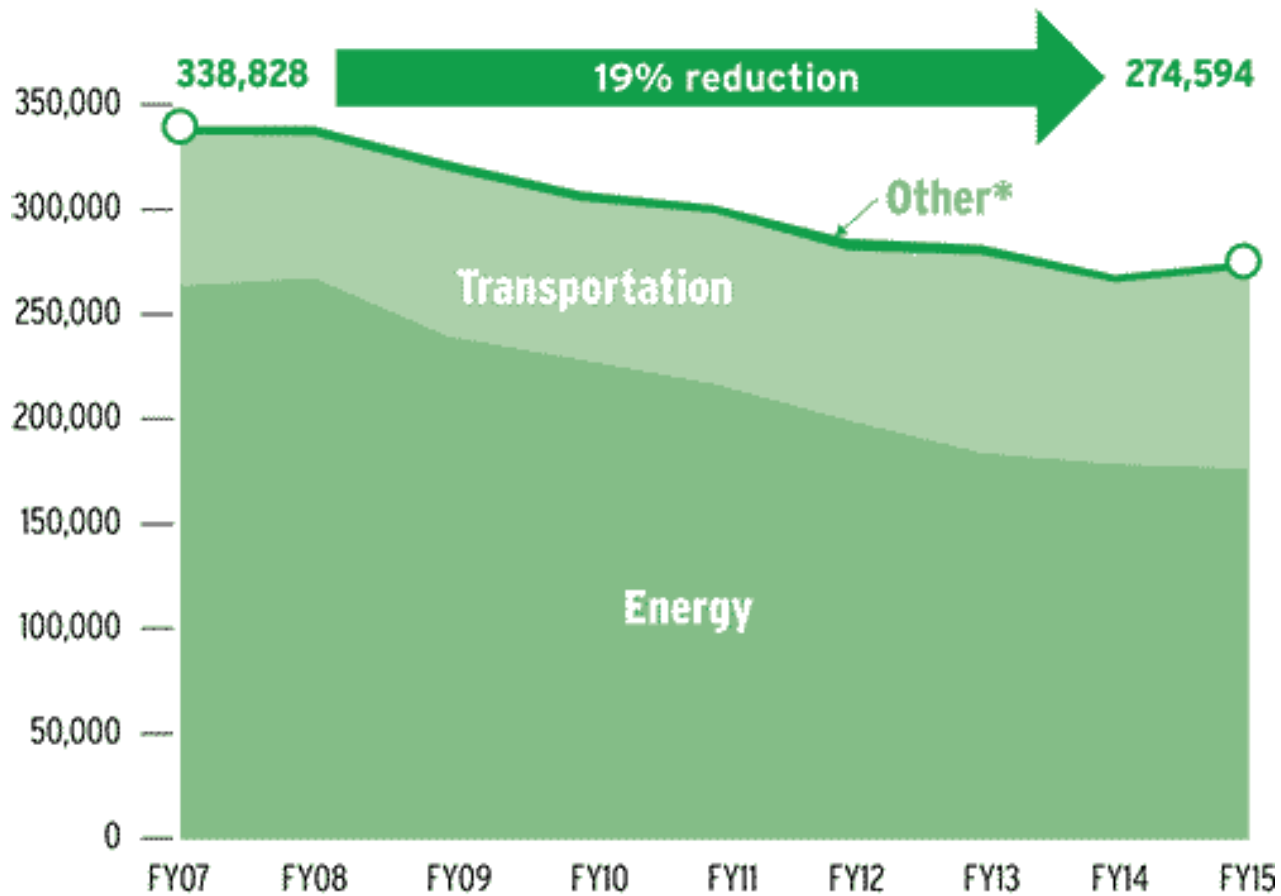
Duke University's GHG Emissions





FY15 GHG Emissions - University

University Greenhouse Gas Emissions



* Includes waste, refrigerants, and fertilizers.



What does this reduction mean?

- 19% reduction from 2007 baseline
- 64,000 metric tons of carbon reduced
- Equivalent to annual emissions from:
 - 13,500 passenger vehicles
 - 68 million pounds of coal burned
 - 5,800 homes' energy use
- Emissions are up from last year
 - Transportation
- Carbon offsets reach neutrality



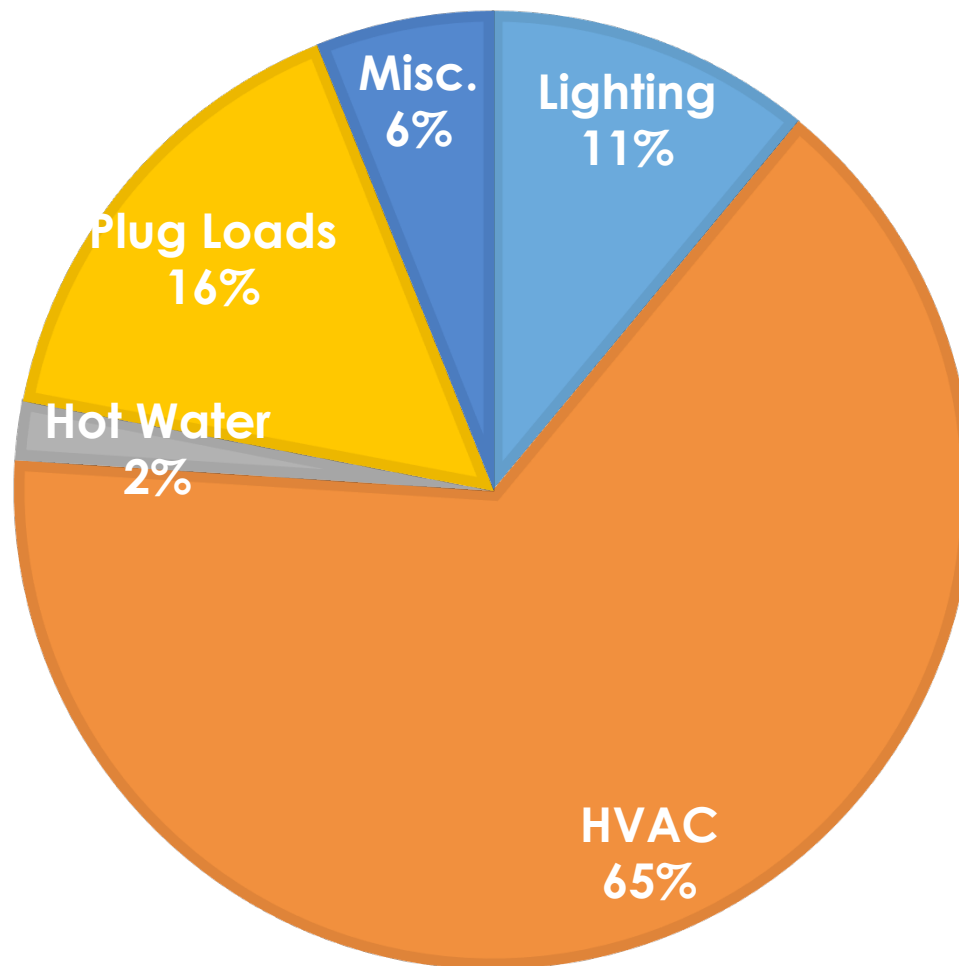
How Much Energy & Water Does Duke Demand?

System	Projected Usage, FY16	Common Energy/Water Units	Peak Demand
Steam	1,187,994,036 lbs	1,238,594 MMBtu	350,000 lbs/hr
Chilled Water	130,642,200 ton-hrs	1,567,706 MMBtu	37,000 tons
Electricity	468,987,331 kW-h	1,600,185 MMBtu	78 MW
Water	59,233,796 CF	442,993,994 Gal	2 MGD
4,406,485 Million Btu of Energy		442,993,994 Gallons of Water	



How Do Buildings Use Energy?

MODELED END-USE ENERGY CONSUMPTION - STUDENT HEALTH & WELLNESS CENTER





Greening IT at Duke

- Energy Star policy
- Consolidating servers into efficient data centers
- Educating staff
 - Power management
- Donating used computers
- E-waste recycling
- Telecommuting
- Phone & video conferencing



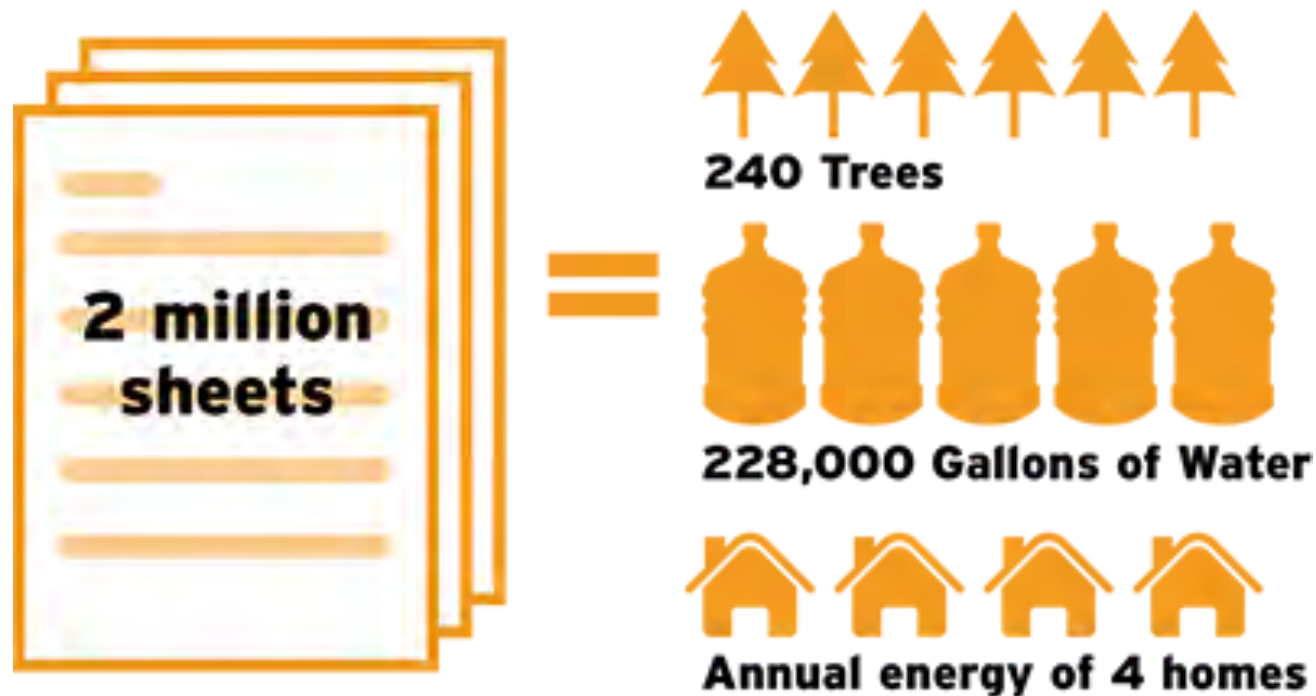
E-waste Recycling

- Refurbished when possible for local schools & non-profits
- Electronics recycler



Case Study: ePrint

ePrint Paper Savings



24% reduction in undergraduate printing in fall 2014



Sustainable Duke



What can you do?



Complex Choices: Book vs. eReader?

- Manufacturing
 - Book
 - 2/3 lb of materials
 - 2 gallons water
 - 2kw hours
 - eReader
 - 33 lb of materials
 - 79 gallons of water
 - 100kw hours



Complex Choices: Book vs. eReader?

- Over lifetime
 - eReader's lifetime ~ 2 years
 - Biological and ecological toxins are estimated to be 70 times greater
 - Environmental impact of one eReader is equivalent to 100 print books
- Will you read 50 books per year?



What actions can you take?

- Use electronics longer
- Purchasing electronics
 - EPA Energy Star
 - 15-25% more efficient
 - Recycled content
 - LED lighting
 - Printers and copiers
 - Duplex capable
 - Automatic stand by features



What actions can you take?



The simple choice for energy efficiency.

ENERGY EFFICIENT
products

ENERGY SAVINGS
at home

ENERGY EFFICIENT
new homes

ENERGY STRATEGIES FOR
buildings & plants

5 Tips You Haven't Heard

Think you know every energy-saving trick in the book? We've got 5 tips you may not know.

[READ MORE →](#)

1 2 3 4 5



ENERGY STAR is a U.S. Environmental Protection Agency voluntary program that helps businesses and individuals save money and protect our climate through superior energy efficiency. [Learn more about ENERGY STAR.](#)

ENERGY STAR RESULTS

A comprehensive review of ENERGY STAR and other EPA climate protection partnerships. See 2013 Annual Report.

ENERGY EFFICIENCY

FOR YOUR HOME

FOR YOUR BUSINESS



WINDOWS
GUIDE



PRODUCT
FINDER



TAX
CREDITS



FIND A
BUILDER

How can we help you?

[Improve your home's comfort and efficiency](#)

Seasonal Links

[Home Improvement FAQs](#)
[HVAC Maintenance Tips](#)

LOG IN TO ENERGY STAR

To get started, select the ENERGY STAR application you're trying to access. The appropriate login fields will then appear.

MY ENERGY STAR[®]
for the Home

ENERGY STAR[®]
Portfolio Manager[®]



What actions can you take?

- Energy Conservation
 - Turn off equipment and lights
 - Computer, monitor, printer, speakers, etc
 - Check with IT
 - Phantom power
 - Powerstrip
 - Energy saving modes
 - Sleep, hibernate
 - No screen savers
 - Eliminate unnecessary equipment





Power Management

- Strict energy management can reduce overall energy use of a typical workstation by up to 88%
- Sleep and hibernate modes can reduce energy consumption up to 60%



What actions can you take?

- Purchasing paper
 - High post-consumer recycled content
 - Staples offers comparable pricing
 - Forest Stewardship Council Certified
 - Chlorine free
 - Unbleached



What actions can you take?

- Printing
 - Default double-sided
 - “One-side-used” bin
 - Grayscale
 - Narrow margins

MMPC recomm revised.doc

- > -Office of Conference Services – 2 staff (Wayne Stevens and Neal Wheeler) provide Public Address and audio visual equipment setup and support
- > -Office of Distance Learning – various staff provide ad hoc support of hardware, software and training / assistance with developing materials for presentation
- > -Office of Information Technology – one staff member (Ronnie Adkins) provides assistance with project management and serves liaison with vendors to provide equipment recommendations, price quotes and installation.
- > -Camden Carroll Library – staff in multimedia resource center assist faculty and students in developing presentations
- > -Various support resources within each college include (but are not limited to) Patrick Hawkins, MMRC in Science & Tech, Mark Messer in College of Business, Tony Glover, Communications, Bill Cole and Lesia Lennox, Education, Robert Royar, English, Gary Mesa-Gaido, Art, etc. that assist faculty.
- > -PT3 Grant team – related instructional technology support
- > -Center for Teaching and Learning – related instructional technology support
- > -[Possibly add] Institutional Research and Computing Applications – Technology Training Program for faculty/staff
- > -[Possibly add] Office of Human Resources – professional development workshops for faculty/staff, sometimes on technology

4. The workgroup recognized multimedia support (as defined in the task overview section) as a critical support area that should co-exist within a larger umbrella of instructional technology support. There is also a recognized need for multimedia support for non-instructional events scheduled through Conference Services. Such support would necessarily be multifaceted, but can be broken into two main strands:

- I. Faculty support, including:
 - > -Distance Learning
 - > -Consulting and/or professional development in:
 - o -Instructional design
 - o -Academic software applications
 - o -Paradigms of teaching with technology
 - o -Digital portfolio production
 - o -Development of independent learning modules
- II. Facilities support, including:
 - > -Legal and ethical issues related to instructional technology
 - > -Facilities coordination (labs, classrooms and portable technology)
 - o -Scheduling

Comment: There are really two different types of people in this list: there are staff members who are specifically assigned to providing technology support, for the most part at the college level (Hawkins, Messer and myself) and faculty whose technology support is mostly in the form of maintaining use (or more) computer labs/classrooms, for the most part at the department level (everyone else, I think). I think we might want to separate these two kinds of support, especially since the faculty members often provide their support on top of their teaching load and other duties. I also notice that Humanista is the only college that does not have a college-wide technology support person of some kind (although they do have several departments that are very active in their use of technology). I wonder if it would be overstepping our bounds to recommend that CCI create this kind of position to coordinate its technology efforts.

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What actions can you take?

- Reuse, then Recycle
 - Recycling bins
 - Recycle toner cartridges
 - Recycle all e-waste
 - At Duke
 - Durham, Wake, Orange counties





What actions can you take?

The screenshot shows a web browser window displaying the Duke University Financial Services Procurement website. The page is titled "Duke FINANCIAL SERVICES PROCUREMENT" and features a navigation menu with various categories like Human Resources, Technology, Dining, etc. The main content area is titled "Surplus And Storage Programs" and contains several sections:

- How To Procure & Pay**: Purchasing Programs, Green Purchasing, Vendor Information, Supplier Diversity.
- Surplus And Storage Programs**: Online Tool Instructions, Online Tool Instructions (Clinical Engineering), Frequently Asked Questions.
- New Product Entry - Health System**: Product Issues & Recall Processes, Training, Forms, News & Events, Financial Services.
- Need Help?**: Find department contact.

The "Surplus And Storage Programs" section includes the following text:

Surplus And Storage Programs

All surplus property, including computers, that were purchased with Duke funds or are considered Duke property must be processed through Surplus Property Asset Disposition Tool for tracking purposes.

Please review the [Instructional Guide to the Asset Disposition Tool](#).

To submit a surplus property pick up request, please visit the online [asset disposition tool](#).

Please reference the following documents for additional information:

- [Clinical Engineering, Research Equipment and Medical Surplus Property Disposal Requests](#)
- [Surplus Property General Accounting Procedure \(GAP\)](#)
- [Equipment Screen Forms](#)
- [Temporary Storage Solutions](#)
- [Frequently Asked Questions](#)

For information regarding Duke Global Health P.L.U.S. (Placement of Life-changing Usable Surplus), please visit the [Duke Global Health Institute website](#).

Surplus Property Donation Program

Good quality, surplus furniture and computers are available to Duke Departments at no charge through our Surplus Property Program. To request computers for Duke Departmental use or get a schedule of our upcoming furniture viewing/collection times, please email andrea.horn@duke.edu.

Contact Information

Craig Parker
Program Coordinator
Moving and Storage Program
(919) 684-3166
Craig.Parker@duke.edu

A large red arrow points to a box on the right side of the page titled "Surplus Property Pickup Request". The box contains the following text:

All surplus property items (including computers) must be entered into the [online asset disposition tool](#). Pickup requests should be made as far in advance as possible - preferably one to two weeks.

Clinical Engineering governed areas, research equipment and medical surplus have separate, [specific instructions](#). Please [review them](#) prior to scheduling a pickup if you are part of one of these areas.



What actions can you take?

- Travel
 - Telecommuting
 - Phone & video conferencing





Sustainable Duke



Duke Green Workplace Certification





Learn More

- Leading for Environmental Sustainability workshop
 - June 2, 8:30-11:30am





Questions?

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Sustainable Duke

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