STUDENT ORGANIZATION SUSTAINABILITY INITIATIVE PROPOSAL FORM

Part I- General Information:

Name of Student Organization	Office of Sustainability Internship - Waste Team
Contact/Responsible Person	Sean Starkey
Contact Office Held/Title	Team Lead
Contact Email Address	starkey7@vt.edu
Contact Telephone Number	757-353-7600

Part II- Project Cost Information

Estimated Cost of this Proposal	$3,700	See III.C. below
Estimated Savings -	TBD	See III.D. below
Net Cost of this Proposal =	$3,700	

Part III- Supporting Information

A. Please describe your sustainability initiative and attach supporting documentation.

The greatest energy consumers on Virginia Tech's campus are laboratory buildings. According to Virginia Tech's Energy Management department, the top five energy consuming buildings are Hahn Hall North, Hahn Hall South, Latham Hall, Vet Med Building, and Life Sciences Building; which are all laboratory buildings. According to the Virginia Tech Facilities Department website, laboratory buildings are four to six times more expensive to operate compared to the administrative or classroom buildings. Labs are prone to wasteful and excessive consumption. Although large mechanical controls for labs, such as ventilation systems, account for more than 50% of the overall energy consumption, simple fixes can make a large impact in reducing the energy expended. The Green Lab Initiative, led by The Office of Energy Management, the Office of Sustainability, and graduate student Ellen Garcia, plans to provide various tools intended to educate and encourage best lab practices in order to increase energy efficiency and overall sustainability in research. Each lab will receive simple and easily installable materials to encourage energy saving. Items included will be "shut the sash" fume hood labels, equipment magnets, light switch labels, faucet aerators, freezer replacement filters, outlet timers, and educational material about sustainable lab practices. Providing these items to the largest energy consumers on campus will not only make labs more energy efficient, but reduce the overall energy usage and cost for the university by optimizing energy consumption.

https://www.facilities.vt.edu/energy-utilities/energy-reduction-efforts/demand-side-management.html

B. How does this initiative help to achieve the goals of the Virginia Tech Climate Action Commitment Resolution and Sustainability Plan?

This initiative represents multiple goals of Virginia Tech Climate Action Commitment Resolution including:

Point 3: "Virginia Tech will establish a target for reduction of campus GHG emissions to 80% below 1990 emission level of 188,000 tons by 2050. Interim targets from 2006 emissions of 316,000 tons will be: for 2012, 295,000 tons (on path to 2025 target); for 2025, 255,000 tons (2000 emission level); and for 2050, 38,000 tons (80% below 1990 emission level)." Given that most of the energy use on campus comes from GHG's, reducing

the energy use with this initiative in some of the largest energy consumers on campus will help Virginia Tech reach this goal.

Point 4: “Virginia Tech will work toward these emission reduction targets through improved energy efficiency, reduction of energy waste, replacement of high-carbon fuels, and other measures identified in the VTCAC&SP.”
Energy waste from labs includes leaving open fume hood sashes, leaving equipment on, leaving lights on, etc. Simple methods for eliminating these actions can help Virginia Tech reduce energy waste and improve efficiency.

Point 12: “Virginia Tech will continue to develop and implement innovative sustainability-related academic programs in instruction, research, and outreach, and will coordinate and communicate these programs to the university community and external audiences.” In addition to items to be used around the labs to reduce energy consumption, the kits will also include educational materials that communicate energy use information to a wide audience of students and employees and serve as a reminder for sustainable use of resources.

This proposal also further supports Virginia Tech’s Five Year Energy Action Plan which was “developed to guide the operations of the university to achieve significant reduction in energy costs through the implementation of various policies, initiatives, and energy-retrofit projects by targeting major ‘energy hog’ buildings.”

C. What is the cost of your proposal? Please describe in adequate detail the basis for your cost estimate.

	Quantity	Individual Price ($)	Total Price ($)
Fume Hood Magnets	500	-	$120*
Aerators	300	$5	$1,500
Freezer Filters	200	$2.09	$418
Outlet Timers	100	$15.75	$1,575
Total			**$3,613**

*Fume Hood Magnets cost breakdown: $90 for 120 magnets, $10 for the artwork setup, and $20 for shipping.

D. Will your proposal produce cost savings for the University? If so, how much? Please describe in adequate detail the basis for your savings estimate.

Virginia Tech is a national leader in research and innovation. To continue as such, this requires the university to provide state of the art laboratories for scholars to conduct their progressive research. However, this comes at a cost. According to Ruben Avagyan, Virginia Tech’s Campus Energy Manager, lab buildings at Virginia Tech consume more energy than any other type of building on campus. Therefore, it is absolutely crucial that Virginia Tech explore ways to cut down energy usage in labs. To do so, we’ve proposed an initiative that would provide Virginia Tech lab buildings with tools and information to reduce energy usage that will eventually lead to cost savings. This initiative will have concrete cost savings, however, without first installing and monitoring energy use, we cannot predict exact savings. Therefore, we’ve listed case studies from other universities that show dramatic reductions in energy usage and costs after implementing similar initiatives. We also have included preliminary research conducted in 46 labs on campus. The information from the preliminary research can be found below in italics, and the full spreadsheet is attached as a supporting document.

Fume Hood Labels -> Encourage sustainable behavior, decrease energy consumption from excessive ventilation , increase safety measures

- According to Penn State, “it is estimated that closing such hoods at the end of the day could save approximately 10% of the energy costs. With several hundred fume hoods at Penn State, we could save $250,000 to $500,000 in energy costs if the sashes are closed when the fume hoods are not being used.”
- As a result of Harvard’s Shut the Sash fume hood competition, they found a 30% reduction in fume hood exhaust levels had been achieved (as of 2010). This led to annual energy savings of over $240,000 at $7/cfm.
- After their first Shut the Sash program, UVA saw savings of $4800 from just one lab.
- *Fume hood labels are still lacking across the VT campus, with only 42/54 hoods surveyed equipped with labels. Labels have already been distributed in all fume hoods in the Steger Hall and have had a substantial impact on lab user’s behavior. Labels were added in October of 2017 and by the following holiday break, all labs were observed to have left for the break with closed hoods.*

Freezer Filters -> Encourage better freezer maintenance, increase energy efficiency, increase freezer lifetime

- According to the University of Edinburgh, the removal of heat in freezers is less effective and the mechanisms for removal need to work much harder if the filters are not replaced twice a year.
- The National Institute of Health found that freezers with clean filters save an average of $300 per freezer.
- *There are hundreds of ultra low temperature (ULT) freezers (generally set at a temperature of -20 or -80 degrees celsius) in labs on VT campus, with 34 ULT freezers in Steger Hall alone. When surveyed, the vast majority of lab users do not do routine maintenance on freezers.*

Aerators -> Decrease water usage

- According to Clean Energy Resource Teams, “with the savings from these devices estimated at $110/year for each 0.5 gpm aerator, everyone ought to be installing a few faucet aerators.”
- Stanford’s aerator program in labs save up to 190,000 gallons of water per year
- *In a survey of 46 VT labs, only 11 labs had aerators. This equates to only 23/110 sinks with low flow technology for water conservation.*

Light Switch Labels -> Encourage sustainable behavior, decrease energy consumption from excessive light usage

- Although we don’t have specific data on light switch labels, Virginia Tech’s Office of Energy Management started an initiative to put labels in Robeson and Randolph Halls. So far, the program has been received very well with an expansion to McBryde, Patton, and Norris expected before the end of the semester.

Timers -> Decrease energy consumption from lab equipment

- Stanford found that outlet timers reduce equipment energy consumption up to 50%, resulting in energy cost savings.
- *40/46 surveyed VT labs had at least one piece of equipment that needs to be ‘ON’ for operation during working hours, but is left ‘ON’ 24 hours a day in order to ensure function at the beginning of each day. Timers will allow those pieces of equipment to be ‘OFF’ for 10 hours shorter.*

Lab Sustainability Poster -> Increase education and engagement

- There currently exists no official green lab program at Virginia Tech. Green lab education and engagement has become the core of many of other universities, including Harvard, CU Boulder, Yale and many others.
- *Appendix 1 contains the contents of the information on the poster.*

Sources

https://sustainability.psu.edu/sustainable-labs

https://green.harvard.edu/programs/green-labs/shut-sash-program
https://sustainability.virginia.edu/news/blog/shut-the-sash.html
https://www.ed.ac.uk/files/atoms/files/lab_case_study_-_freezers_best_practice.pdf
https://www.cleanenergyresourceteams.org/blog/faucet-aerators-are-great-water-and-energy-savings-when-should-you-use-them
http://sustainable.stanford.edu/content/aerator-program-offers-labs-significant-water-savings
https://sustainable.stanford.edu/cardinal-green/cardinal-green-labs/energy-programs

E. Is this funding request for a One-Time need or an Ongoing need (**please check one**)?

X One-time **Ongoing**

F. Is funding available for this request from another source? If yes, describe the funding (source, amount, etc.)

No, there is no available funding for this project from other sources. However, the Office of Energy Management has an existing supply of fume hood stickers and light switch stickers, and the Office of Sustainability will provide packaging for laboratory supplies in the form of a reusable bag for each lab. The Office of Sustainability Intern Program will also help with distribution of materials to labs. These combined efforts have helped offset total costs of the Green Lab Initiative.

STUDENT ORGANIZATION SUSTAINABILITY INITIATIVE PROPOSAL FORM (Continued)

Part IV- Requestors/Reviewers

Sean Starkey
Prepared By (Name of Contact for Student Organization) Date 11/1/2018

Karlee Siepierski - Sustainability Manager
Reviewed By (Name of Appropriate University Official) Date 11/1/2018

Karlee Siepierski - Sustainability Manager
Reviewed By (Name of Office of Sustainability Representative) Date 11/1/2018

Appendix 1: Contents of Lab Sustainability Poster

Energy Saving Tips
Part of the Green Lab Initiative at Virginia Tech

Cold Storage
- Chill up freezers (-80 to -70)
- Annually defrost and perform general maintenance procedures for freezers (i.e check door seals, vacuum coils, etc.)
- Replace air filters twice a year

Water
- Switch from water aspirators to vacuum aspirators (use house vacuum if available, if not request free standing vacuum pump)
- Install low-flow aerators (2.0 gpm)
- Report faucet drips/leaks immediately
- Run autoclave only when full (i.e do not autoclave one or two items)
- When new equipment is needed, seek EPA's "Water Sense" models
- Don't use water cooled refrigerators and coolers

Equipment
- Plug laboratory equipment in to timers- this is appropriate for equipment that needs to be on during the day but can be shut off at night, such as water baths and heating blocks
- Turn off after each use, unplug if possible
- Promote good practice with labels for turning off equipment
- Create an 'equipment bay' by rearranging lab equipment to plug into shared power strips
- When new equipment is needed, seek EPA's "Energy Star" models
- Set all computers and laptops to energy saving modes
- Use "Smart plugs" and "Smart Strips" to control power consumption for group loads

Lighting
- Always turn off lights when you are last to leave a room
- Promote good practice with 'turn the lights off' labels
- Only use the amount of light that is needed for the task
- Replace fluorescent task and fume hood lights with LED lights
- Install occupancy sensors to control overhead lights

Fume Hoods
- Shut the sash after every use
- Promote good practice with 'shut the sash' label
- Retrofit fume hoods with automated sash closing devices

Inventory
- Start and maintain an inventory of chemicals and supplies
- Before ordering anything new, first check inventory. If item is needed, then explore options to borrow items and check Hokie Swap
- Do not place orders under $100
- Ensure good labeling of reagents and samples
- Have an annual lab cleanup day

Waste Management
- Recycle whenever possible (single stream, cardboard, batteries, EPS, and specific vendor recycle programs)
- Designate appropriately sized hazardous waste containers for specific types of waste

Other
- Turn off vacuums after each use
- Appoint a green lab manager
- Decrease the amount of travel done for conferences and meetings (i.e prioritize local meetings over international ones)
- Keep lab doors and windows shut

Resources

Visit My Green Lab (https://www.mygreenlab.org/) for more information for more, best practices and data to support these actions. Contact Ellen Garcia (ebgarcia@vt.edu) to begin a green lab assessment and certification process

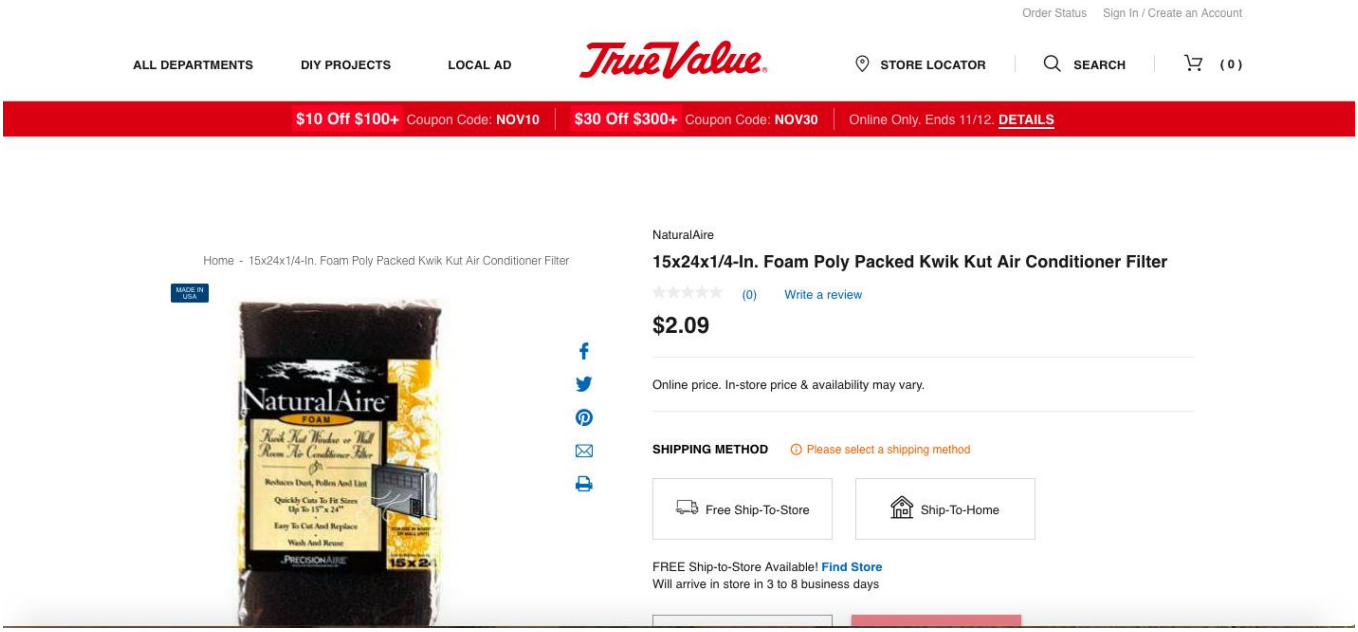
If you are interested in participating in specific recycling programs (Styrofoam, batteries, etc.) or have any other sustainability related questions contact:

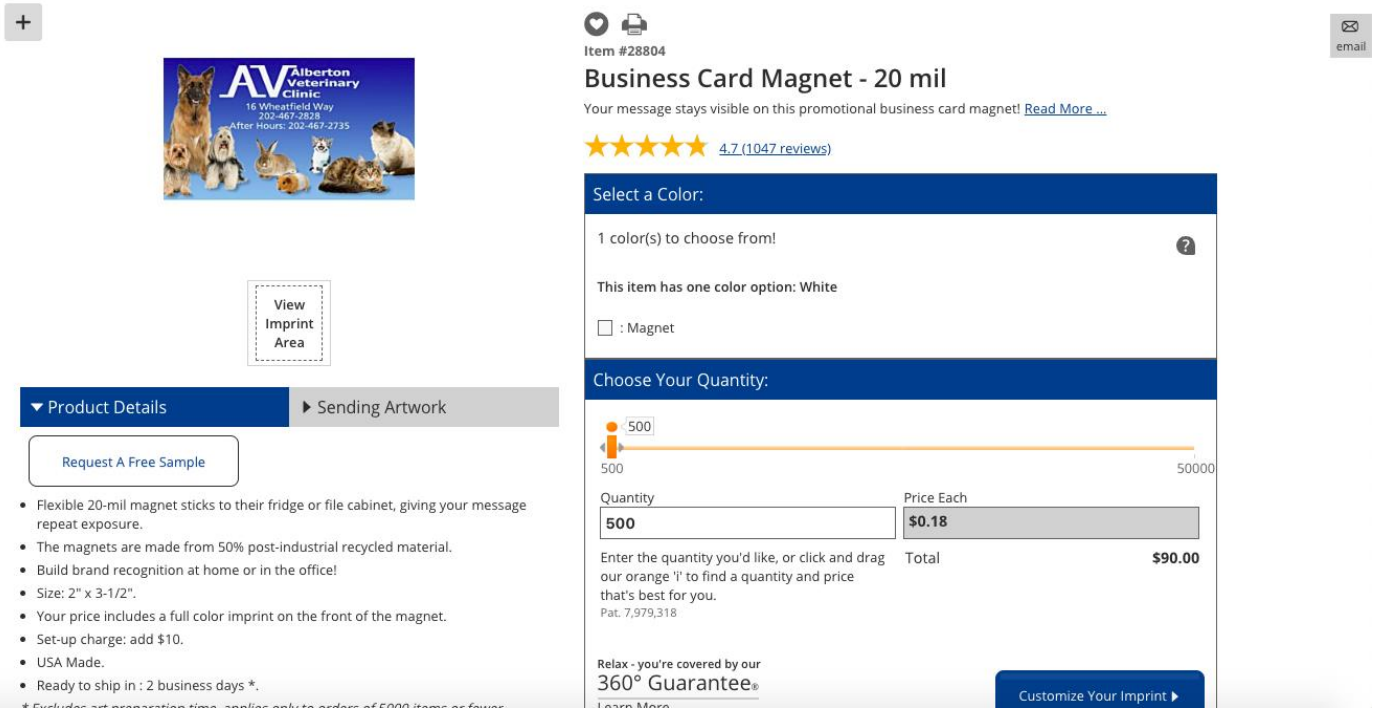
Karlee Siepierski
University Sustainability Manager
540-231-7358
skarlee3@vt.edu

If you have questions about energy use in labs or overall campus energy use contact:
Ruben Avagyan
Campus Energy Manager
540-231-6348
rubena@vt.edu

Useful links:
https://www.facilities.vt.edu/energy-utilities/energy-reduction-efforts.html
https://www.facilities.vt.edu/sustainability.html

Appendix 2: Product Pricing





1.5 GPM Water-Saving Small Male Thread Aerator

★★★★★ (1) Write a Review Ask the first question

$4.62 /each

Overview

This 1.5 GPM Water Saving Faucet Aerator by NEOPERL is WaterSense certified and can save you up to 30% water compared to using the standard 2.2 GPM aerator. It is a small size male aerator with attr... See Full Description

1.5 GPM Regular Female Water-Saving Faucet Aerator

★★★★☆ (6) Write a Review Questions & Answers (5)

$4.29 /each

Overview

This 1.5 GPM Water Saving Faucet Aerator by NEOPERL is WaterSense certified and can save you up to 30% water compared to using the standard 2.2 GPM aerator. It is a regular size female aerator with... See Full Description

GRAINGER

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Plug In Timer, White, Min. Time Setting: 1 min., Max. Time Setting: 7 days

Item # **45KM66** Mfr. Model # **455E** Catalog Page # **414** UNSPSC # **39121523**

Web Price
$15.75 / each

One Time Delivery
Auto Reorder

1 Add to Cart
+ Add to List

Shipping Pickup

Expected to arrive **Thu. Nov 15.**
Ship To **24060** (Change)

☆☆☆☆☆ Be the first to write a review

Shipping Weight **0.37 lbs.**

Country of Origin **China** | *Country of Origin is subject to change.*

Note: Product availability is real-time updated and adjusted continuously. The product will be reserved for you when you complete your order. More

How can we improve our Product Images?

Appendix 3: Examples of Equipment Magnets


PLEASE
TURN OFF
WHEN NOT
IN USE
GREEN LAB INITIATIVE