FY16 SUSTAINABILITY REPORT
Harvard Medical School

HARVARD UNIVERSITY | Sustainability

HARVARD MEDICAL SCHOOL

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SUSTAINABILITY PLAN

- Owner's Project Requirements
- Campus-wide water audits
- Waste bin standards development
- Green Lab Competition
- Freecycle events for labs and office
- Chemical Amnesty Day

- Bike Fair and Safety Summit
- Flame-retardant-free furniture
- Healthy and Sustainable Food Standards
- Take the Stairs Campaign

EMISSIONS AND ENERGY

- HMS Strategic Energy Plan '16-'21
- HU Lab Ventilation Study
- PI Coresight
- BAS QC Program
- Commissioning
- Training

CAMPUS OPERATIONS

NATURE AND ECOSYSTEMS

- Countway Community Garden
- Bi-Annual Arnold Arboretum Tour

HEALTH AND WELL-BEING

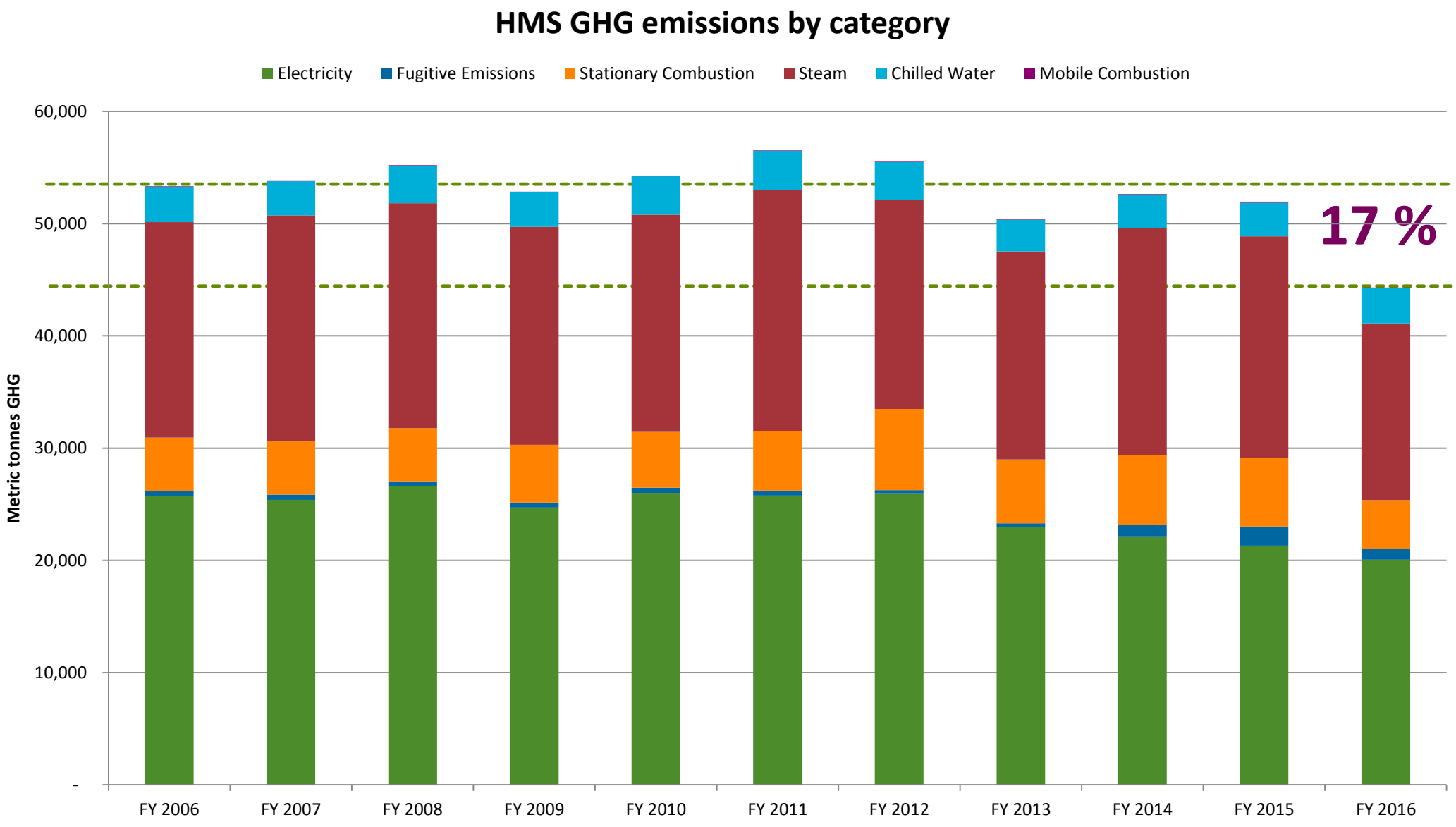
CULTURE AND LEARNING

- Earth Month Sustainability Fair
- EcoMosquito Newsletter
- Green Lab efforts: Researcher communication and outreach

LONGWOOD CAMPUS SUSTAINABILITY EVENTS

Description of Event	Plan Focus Area	Date	# of attendees
EcoMosquito Newsletter	Culture & Learning	Monthly Distribution	+250 person email list, Posted in +40 locations throughout campus
Harvard Longwood Bicyclists Newsletter	Culture & Learning	Monthly Distribution	1,200 person email list
Summer Garden Gathering	Nature & Eco., Culture & Learning	June 2016	35 Community Members
Commencement 2016 – Waste Diversion	Campus Operations	May 2016	25 Zero Waste Volunteers
Arnold Arboretum Student Trips	Nature & Ecosystems	Oct. 2015, May 2016	30 Chan School Students
Lab & Office Supply Freecycles, HMS and Harvard Chan School	Campus Operations	July, 2015, October 2015, May 2016	+200 community members at each
Chemical Amnesty & Swap	Campus Operations	May 2016	~50 labs participated
Take the Stairs	Health & Wellbeing	April 2016	+570 Community members, +177,000 flights of stairs
Earth Day Sustainability Fairs	Culture & Learning	April 2016	+250 Community members
Longwood Bicyclist Events: Bike Breakfast, Maintenance Classes, Safety Summit	Health & Wellbeing	Sept. 2015, April 2016	+300 Community members
Waste Reduction Ambassadors	Culture & Learning, Campus Operations	July & September 2015, March 2016	10 volunteers, reaches +150 community members each time
Green Labs Competition	Emissions & Energy, Campus Operations	October 2015	11 labs across Longwood
Dental School Special-Tea	Culture & Learning	September 2015	30 attendees
Annual Campus Bike Fair	Campus Operations	September 2015	+150 community members
Countway Garden Harvest Festival	Nature & Ecosystems	September 2015	30 Garden members
Countway Garden Social	Culture & Learning	August 2015	10
Energy Lighting Fairs	Emissions & Energy	December 2015, April 2016	68 and 51 Ratepayers respectively
Sustainability Signage on M2	Culture & Learning	Ongoing since July, 2015	Visible to 500 researchers/day
Sustainability Trivia	Culture & Learning	June & Oct. 2015, January 2016	~25 Staff

HMS GHG EMISSIONS REDUCTION PROGRESS



EMISSIONS AND ENERGY

AS OF FY16, HMS IS REPORTING A **17 PERCENT REDUCTION** FROM THE FY06 BASELINE YEAR.

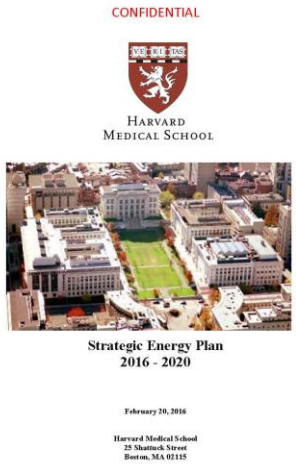
HMS's Longwood Base saw a 21 percent emissions reduction from 2006

Campus	**GHG**	**Energy Use**
Campus Gross Square Footage FY06: 2.91 Million ft^2 FY16: 3.05 Million ft^2 Δ in ft^2 since FY06: +140,000	**Total Emissions** FY06: 53,013 MTCDE FY16: 44,308 MTCDE 17% reduction total 21% reduction in 2006 Longwood Base buildings	**Total energy use, including growth** FY06: 716,145,888 kBtu FY16: 609,011,763 kBtu Approx. 15% reduction in kBtu
Water	**Waste**	**New Programs and Tools**
FY06: 16,854 CCF FY16: 15,738 CCF Reduction of ~1,116 CCF 6.6 % reduction in CCF	FY06: 1,075 tons FY16: *Not Available*	HMS Facilities Design Standard HMS Energy Strategic Plan PI Coresight (with app) Energy Accounting System

EMISSIONS AND ENERGY

ENERGY CONSERVATION MEASURES AND STRATEGIC ENERGY PROJECTS

HMS STRATEGIC ENERGY 5-YEAR PLAN '16-'21

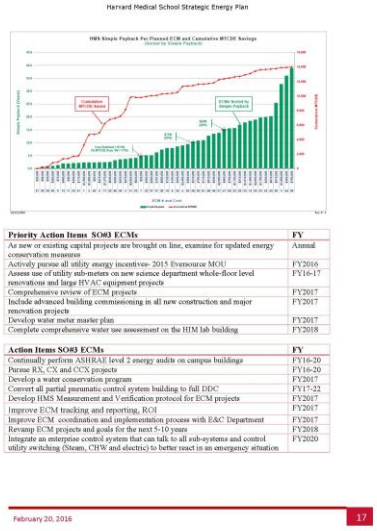

CONFIDENTIAL

HARVARD MEDICAL SCHOOL

Strategic Energy Plan
2016 - 2020

February 20, 2016

Harvard Medical School
25 Shattuck Street
Boston, MA 02115


Harvard Medical School Strategic Energy Plan

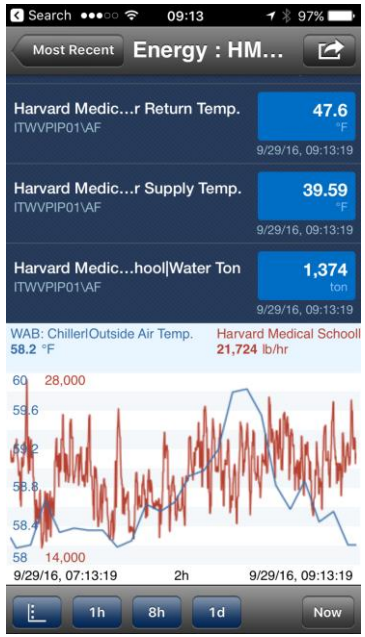
Priority Action Items SO#3 ECMs	FY
As new or existing capital projects are brought on line, examine for updated energy conservation measures	Annual
Actively pursue all utility energy incentives- 2015 Eversource MOU	FY2016
Assess use of utility sub-meters on new science department whole-floor level renovations and large HVAC equipment projects	FY16-17
Comprehensive review of ECM projects	FY2017
Include advanced building commissioning in all new construction and major renovation projects	FY2017
Develop water meter master plan	FY2017
Complete comprehensive water use assessment on the HIM lab building	FY2018

Action Items SO#3 ECMs	FY
Continually perform ASHRAE level 2 energy audits on campus buildings	FY16-20
Pursue RX, CX and CCX projects	FY16-20
Develop a water conservation program	FY2017
Convert all partial pneumatic control system building to full DDC	FY17-22
Develop HMS Measurement and Verification protocol for ECM projects	FY2017
Improve ECM tracking and reporting, ROI	FY2017
Improve ECM coordination and implementation process with E&C Department	FY2017
Revamp ECM projects and goals for the next 5-10 years	FY2018
Integrate an enterprise control system that can talk to all sub-systems and control utility switching (Steam, CHW and electric) to better react in an emergency situation	FY2020

February 20, 2016 17

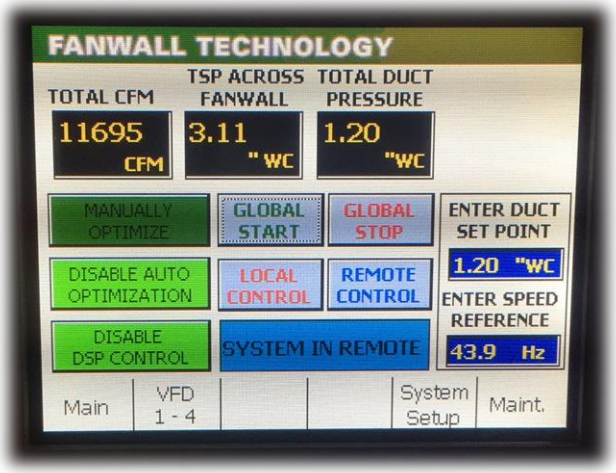
HU LAB VENTILATION STUDY

PI CORESIGHT



HMS ECMS AND STRATEGIC ENERGY PROJECTS

1. BUILDING AUTOMATION SYSTEM - QUALITY CONTROL PROGRAM
2. COMMISSIONING
    1. Continuous CX BAS
    2. Commission/re-commission custom code to ensure HU temperature standards compliance
    3. BAS Fault detection program – over 700 items identified
    4. BMS Master spreadsheet – baseline of BAS Readings
3. TRAINING
    1. Hot-Cold Protocol Operator training
4. Air Handler Coil Cleaning for improved efficiency

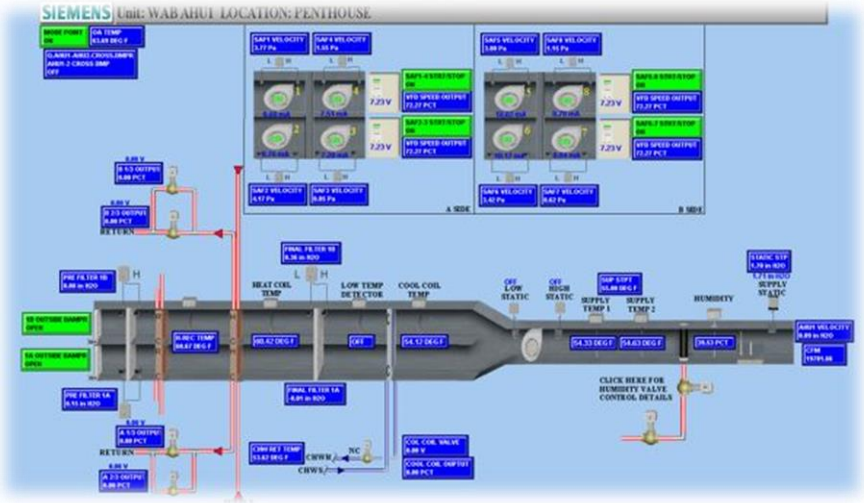


HMS ECMS AND STRATEGIC ENERGY PROJECTS

VENTILATION: AIR-CHANGE RATES/HOUR

AIR-CHANGE REDUCTIONS

- Vivarium Holding-Room spaces
- NRB
  - Supply Air Temperature Reset
  - Rebalance of non-lab spaces to current ASHRAE/IECC ventilation standards
- TMEC exhaust fan rebalance and consolidation



CAPITAL PROJECTS

AIR-HANDLER UPGRADES WITH FAN-ARRAY TECHNOLOGY

- Redundancies
- Decreased maintenance costs
- Increased ability for variable control

HMS ECMS AND STRATEGIC ENERGY PROJECTS

LED LIGHTING UPGRADES

- Warren Alpert Building Garage
- Vanderbilt Hall Exterior
- NRB - HCCM 4’ LED Tubes
- Campus-wide CFL→LED Lunera 4-pin
  - 2,000 lamps across HMS

HMS ECMS AND STRATEGIC ENERGY PROJECTS

FACILITIES CONSTRUCTION DESIGN STANDARDS DEVELOPED

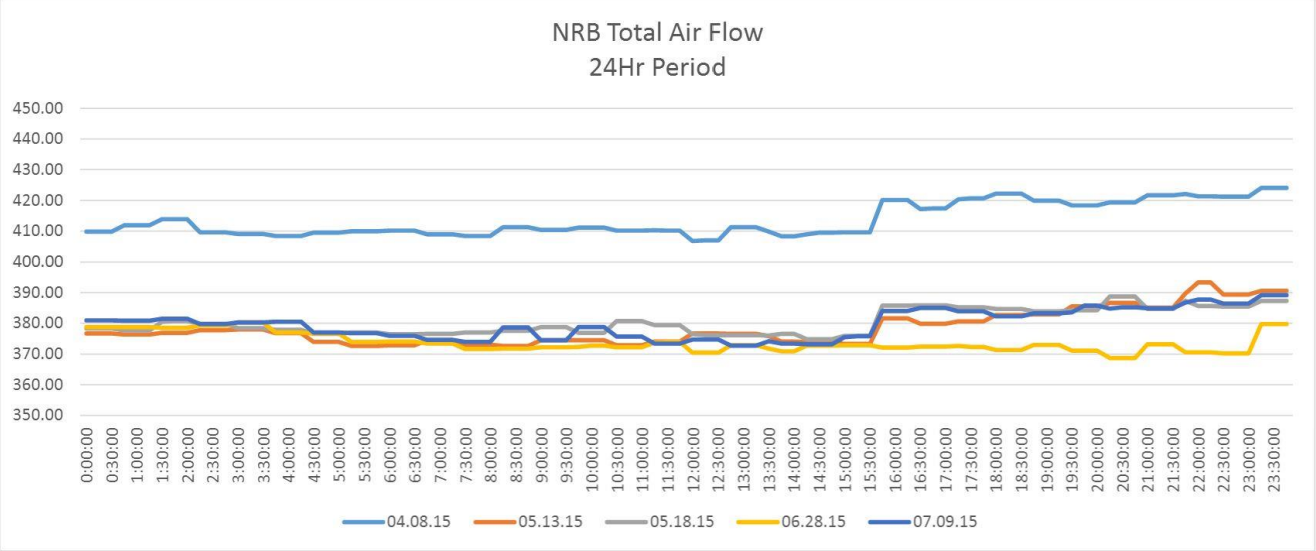
- Maintains internal consistency at HMS for construction and renovation projects

VENTILATION REDUCTION PROJECTS

- Discharge air temp (NRB)
- Revise ventilation rates to new Energy Code requirements

NRB - AIRFLOW ANALYSIS

07.20.15



HMS ECMS AND STRATEGIC ENERGY PROJECTS

AUTOMATED AND CONTINUOUS COMMISSIONING OF BUILDING AUTOMATION SYSTEM (BAS)

- Using Fault Detection and Diagnosis

ASHRAE LEVEL 2 ENERGY AUDITS COMPLETED: C BUILDING, WAB

- HMS performs at least 2 ASHRAE Level-2 audits per year.
- Lab buildings are audited at least every 5-years

FAN COIL UNIT (FCU) REPLACEMENT

- Units equipped with energy saving Electronically Commutated Motors (ECM) motors

HARVARD MEDICAL SCHOOL

Owner's Project Requirements (OPR)

OPR is a written document completed by the Owner or Owner's Representative.

This document will be used as the outline for the more detailed and technical Basis of Design (BOD) document.

Both the OPR and BOD inform, direct, and guide the design and construction process.

EMISSIONS AND ENERGY

ULT FREEZER PM PROGRAM

- HMS Facilities continued a preventative maintenance program on Harvard Owned Ultra Low Temperature freezers, which includes “-80” and “-140” degree freezers.

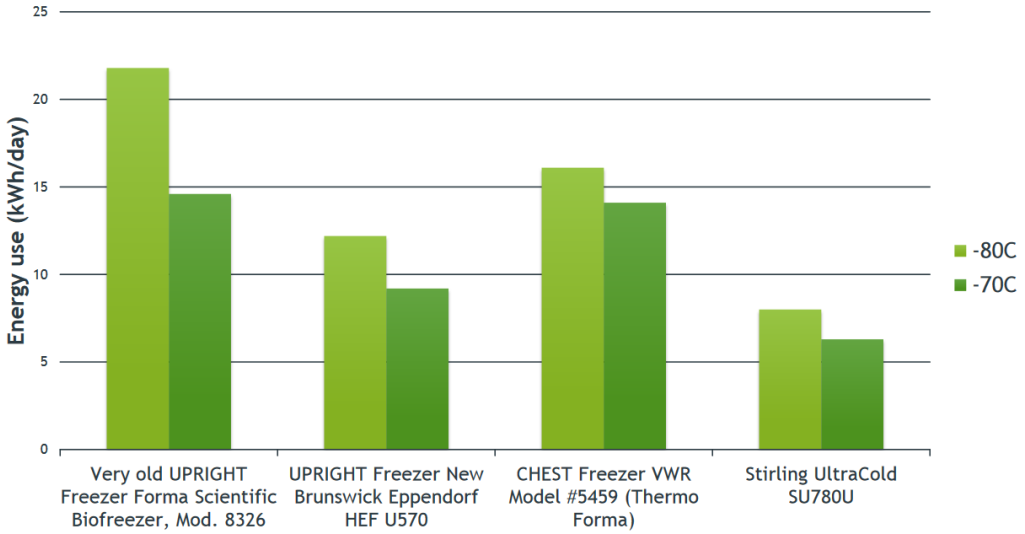
207 freezers were serviced, covering 331 issues, including connecting to Central Alarm, repairing gaskets/seals, and defrosting.

- Energy savings are associated with keeping freezer coils and filters free of dust, allowing for proper heat exchange.

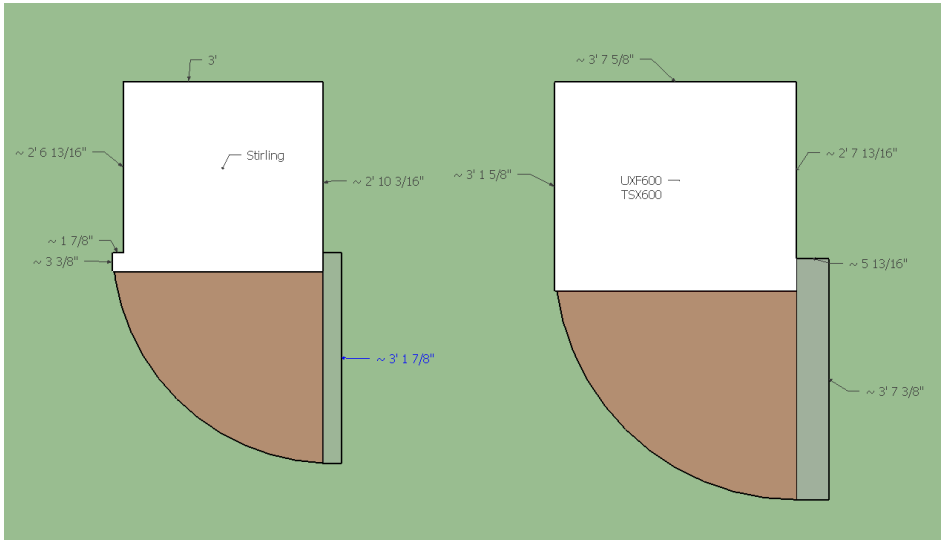
- The PM program saves energy while providing a more secure environment for research samples—a win-win situation for research labs and facilities teams alike.

EMISSIONS AND ENERGY

ULT FREEZER ENERGY BATTLES



Sterling Ultracold and Thermo TSX Footprint Analysis



- Eversource Rebate for both Sterling and TSX
- OFS efforts to address researcher concerns with Sterling QA/QC
- Next Steps:
  - Move away from “-80” to “ULT”
  - Advocate for temp. increase to -70 where appropriate

EMISSIONS AND ENERGY

LAB EQUIPMENT MONITORING

- Harvard iLab Start Up - Tetrascience
- HMS Laboratories in NRB and SJM actively monitoring over 30 piece of equipment – at no cost!

FREEZER, MEET CLOUD.

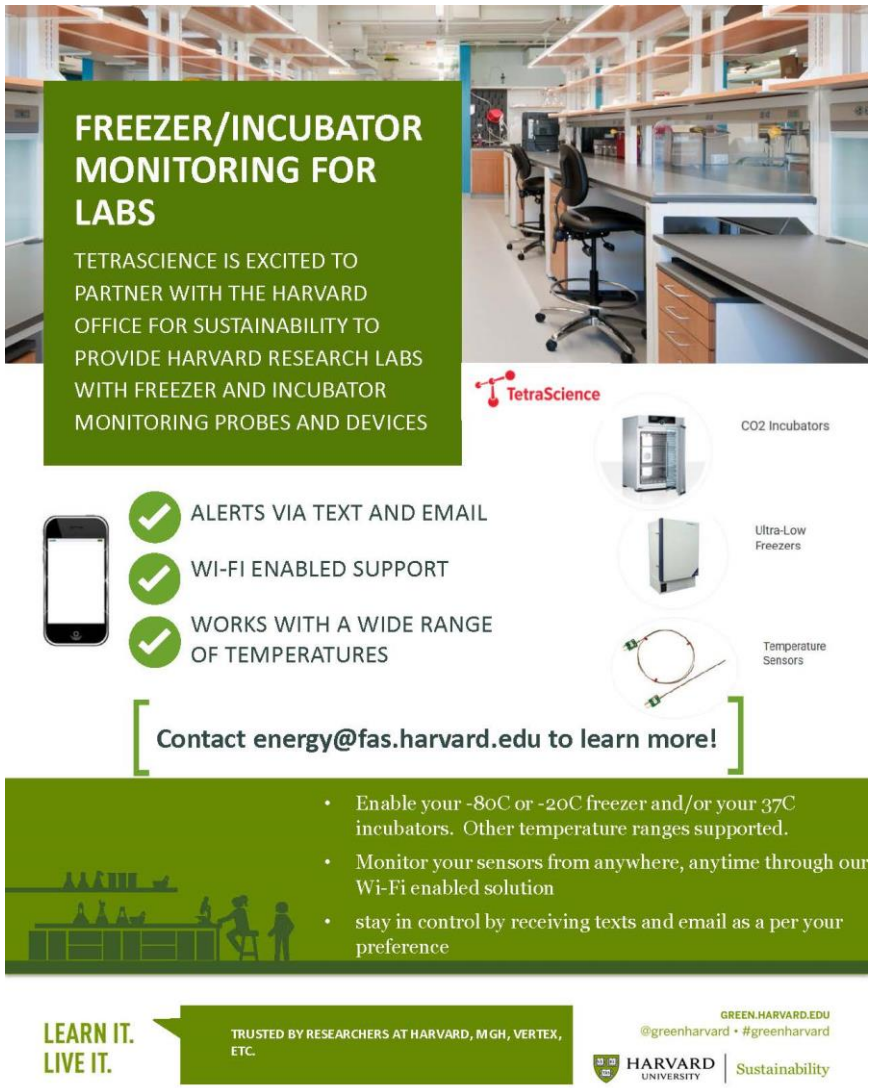
Get alerts, log data, and monitor your equipment remotely with the wi-fi enabled device from Harvard Innovation Lab start-up *TetraScience*.

TETRASCIENCE

Interested?
Email: **GREENLABS@HARVARD.EDU**

LEARN IT.
LIVE IT.
GREEN.HARVARD.EDU/LABS

HARVARD UNIVERSITY | Sustainability



CAMPUS OPERATIONS

WASTE ASSESSMENT AND BIN-STANDARD DEVELOPMENT

- Completed a waste assessment and review of current practices and procedures around the waste stream
- Identified priority locations for improvement and conducted onsite assessments
- Approved updated informational signage for waste, recycling, and compost

		Waste Bin Counts					
		High Profile Spaces	Low Profile Spaces				
	Building Name	Aristata # of bins	Waste Watcher 1 bin setup (Recycle only)	Waste Watcher 2 bin setup (No compost)	Waste Watcher 3 bin setup (With compost)	Waste Watcher XL 2 bin setup (No compost)	Waste Watcher XL 3 bin setup (With compost)
1	TMEC	10	5	20	9	0	0
2	C Building	6		53	14	0	0
3	Seeley Mudd	2		46	4	0	0
4	LHRRB	2		42	6	0	0
5	Gordon Hall	6		19	4	0	0
6	Goldenson	4		55	5	1	0
7	Armenise	2		57	7	0	0
8	Modell Center	6		1	0	0	0
9	Warren Alpert	2		77	8	0	1
10	Countway Library	8		10	4	0	0
11	Courtyard Café	3		0	0	0	0
12	Vanderbilt	9		10	6	0	12
13	HIM	6		125	8	0	0
14	REB-Dental	22		16	2	0	0
15	188 Longwood Dental	6		5	1	0	0
16	180 Longwood	2		9	7	0	0

LEARN IT.
LIVE IT.

WE'VE GOT A GOAL to reduce waste per capita 50% by 2020 from a 2006 baseline, with the aspirational goal of becoming a **zero-waste campus**

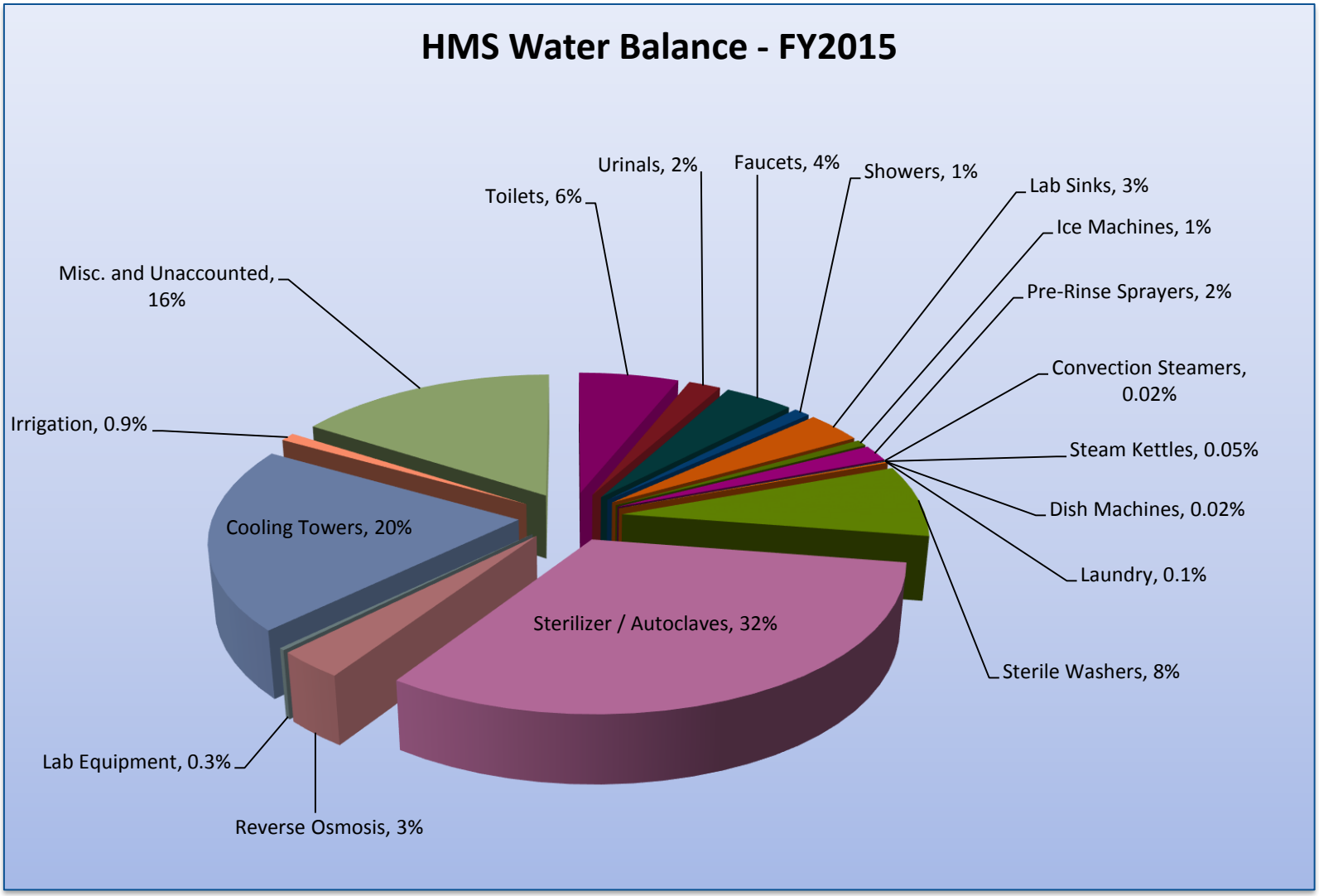
CAMPUS OPERATIONS

WATER CONSERVATION

CAMPUS-WIDE WATER AUDIT COMPLETED

Completed in June 2016.

Recommendations under consideration for implementation in future years.

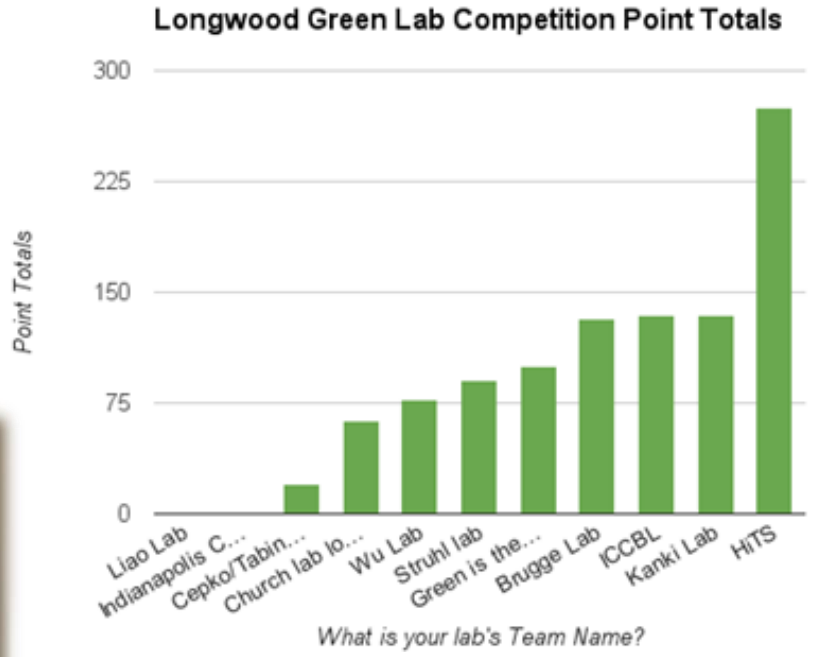


CAMPUS OPERATIONS

LONGWOOD GREEN LABS COMPETITION

The Longwood Campus held its second Green Lab Competition in 2015. The Harvard Program in Therapeutic Sciences (HiTS) won!

11 labs from HMS and Harvard Chan participated.



PI, Peter Sorger, helped clean out a -20 freezer with samples that were older than his graduate students!

CAMPUS OPERATIONS

OVER 6,000 CHEMICAL CONTAINERS COLLECTED ACROSS HARVARD'S LONGWOOD CAMPUS

Campus/School	Collected	"Swapped"
HSPH	900	4
HMS South/HSDM	2,600	--
HMS North	2,500	37
All locations total	**6,000**	**41**

The Longwood Campus held its second Chemical Amnesty Day, organized by HMS Operations in partnership with Environmental Health & Safety.

For approximately $28k, the coordinated series of events engaged about 50 labs and collected over 6,000 unwanted chemical containers for safe disposal and over 41 chemical containers were swapped to labs who needed them.

The event's success depended on engagement from a number of departments and stakeholders.

The elimination of unwanted chemical containers reduces the associated risks of storing them on campus and creates additional storage space in a limited real estate environment.

NATURE AND ECOSYSTEMS

COUNTWAY COMMUNITY GARDEN

- Reorganization of Community Garden plot management "sponsored" plots model – received more applications than plots available
- Annual Fall Harvest festival
- Annual Spring Garden Gathering
- Initiated Re(Design) Innovation Challenge

NATURE AND ECOSYSTEMS

INITIATED A BI-ANNUAL TOUR OF HARVARD'S ARNOLD ARBORETUM

Autumn Foliage '15

Spring Flowering '16

HEALTH AND WELL-BEING

HARVARD'S LONGWOOD CAMPUS RECEIVED THE CITY OF BOSTON'S **HIGHEST AWARD** FOR BIKE FRIENDLY BUSINESSES**, THE CHOCOLATE AWARD**

THE LONGWOOD CAMPUS WAS AWARDED **FIRST PLACE** FOR OUR CATEGORY IN THE MASSCOMMUTE BIKE CHALLENGE

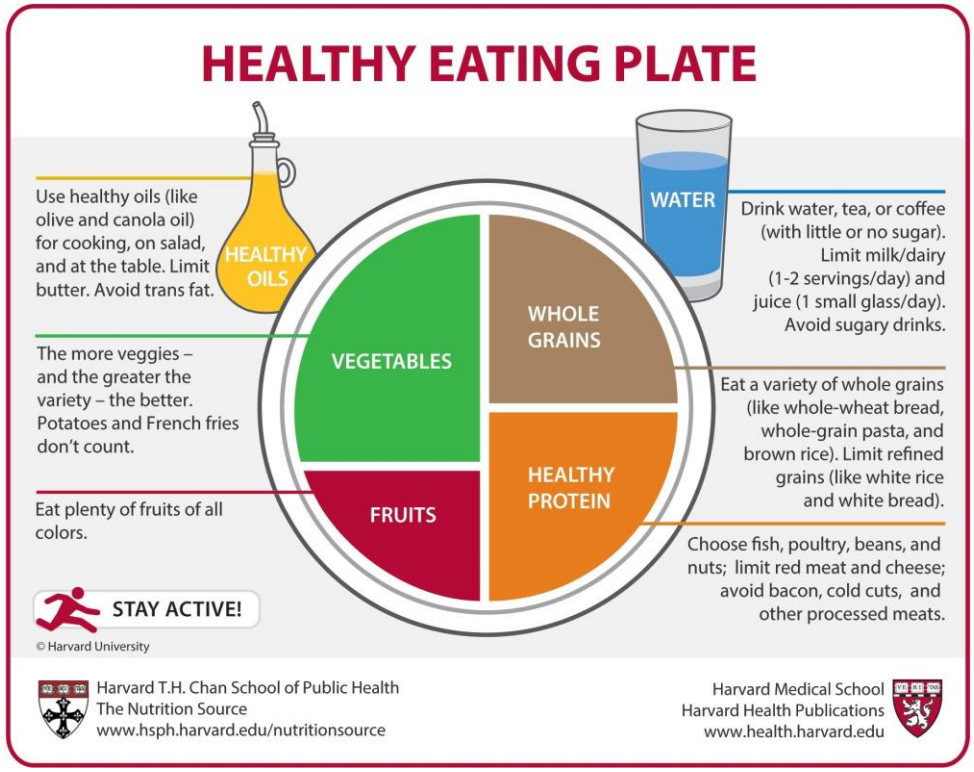
The Longwood Campus is home to about **850 bike racks!**

The Harvard Longwood Bicyclists group continues to engage with all stakeholders across the Longwood Campus with **over 1,500 members**. The group advocates for advancement in bike-friendly infrastructure and parking, provides safety and learn-to-bike lessons for the Harvard community,

- Safety, maintenance, and learn to bicycle classes
- New bike racks in bike cages
- Bicycle fair
- Bicycle breakfast
- "Handlebar" happy hours

HEALTH AND WELL-BEING

Healthy Eating: Nutrition and Sustainability



- **Sustainable and Healthful Food Standards Working Group**
- **Participation in MASCO's Farm to LMA**
- **Sustainable food sourcing through Restaurant Associates**
- **Harvard #FoodBetter Conference**

HEALTH AND WELL-BEING

Boston Fire Code Change

In partnership with Harvard's office for Sustainability and Green Building Services, HMS' campus Planning office has responded to the change in Boston's fire code by creating finishing standards, which include furniture standards, that aim to minimize exposure to chemicals of concern.

CITY OF BOSTON

IN THE YEAR TWO THOUSAND SIXTEEN

AN ORDINANCE AMENDING THE BOSTON FIRE PREVENTION CODE

WHEREAS, Over the years a significant amount of furniture, including furniture in Boston City Hall, has been manufactured to include flame retardant chemicals; and

WHEREAS, Many flame retardant chemicals are known carcinogens that are hazardous to the health of both fire fighters and the public they are sworn to serve; and

WHEREAS, New statewide fire prevention standards promote health and safety by eliminating the need for these harmful flame retardants; and

WHEREAS, The International Association of Fire Fighters supports these new statewide standards; and

WHEREAS, The Boston Fire Prevention Code does not currently align with these new statewide standards;

NOW THEREFORE,

Be it ordained by the City Council of Boston, as follows:

Section 1.
The Boston Fire Prevention Code, Section 9.04 shall be amended by adding the following Subsection 9.04(a)(1):
(1) Exclusively for the purposes of furnishings identified by the Fire Department Chemist as "Upholstered Furniture" or "Reupholstered Furniture", the classification determined by the Fire Department Chemist shall be made in accordance with the Massachusetts Comprehensive Fire Safety Code, 527 CMR 1.00, Section 12.6.3.

Section 2.
The provisions of this ordinance shall take effect ninety (90) days from the date of enactment.

Filed in Council: March 16, 2016

BUY FLAME RETARDANT-FREE FURNITURE

The best way to minimize risk is to choose flame retardant-free furniture for your next capital project, renovation, or office furniture purchase.

The Sustainability and Energy Management Council, Office for Sustainability, and Strategic Procurement recommend that the Harvard community specify and purchase cost-competitive furniture that is free of flame retardants and meets all new applicable fire safety regulations and flammability standards.

PROJECT MANAGERS

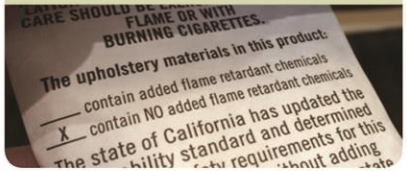
- ✓ Add language to your project's contract and specs stating you would like to purchase furniture free of chemical flame retardants that meets the TB117-2013 standard.
- ✓ Clearly communicate with all vendors that Harvard has a preference for products free of chemical flame retardants.
- ✓ Confirm that the project's code consultant clearly understands Harvard's preference for chemical flame retardant-free furniture when allowed by the updated fire safety code.

PURCHASERS

- ✓ Confirm with your retailer or manufacturer that chemical flame retardants have NOT been added to the product.
- ✓ Confirm that the product has a TB117-2013 label that says it does not contain flame retardant chemicals.
- ✓ Avoid any products with a TB117 or TB133 label.

BUYING TIPS:

- Check the label located under the product or seat cushion to confirm the upholstered material includes no added flame retardants.
- Because some fabrics may still contain chemicals, confirm with your retailer or manufacturer that flame retardants have NOT been added to the product (fabric or foam).
- In order to obtain fully flame retardant-free products, confirm with your manufacturer that flame retardants were not added to any plastic parts.



"Fire retardant foams did not offer a practically significant greater level of open flame safety than did the untreated foams."

–Consumer Product Safety Commission

EDUCATE YOURSELF AND YOUR COMMUNITY

Visit **green.harvard.edu/chemicalsofconcern** to access educational resources, research highlights, and additional information on how you can reduce exposure to flame retardants at home or in the office.

Contact the **Office for Sustainability** for Harvard-specific guidance, sample technical specifications, and assistance in purchasing flame retardant-free furniture at **617.495.3822**, **green.harvard.edu**, or **sustainability@harvard.edu**.

HEALTH AND WELL-BEING

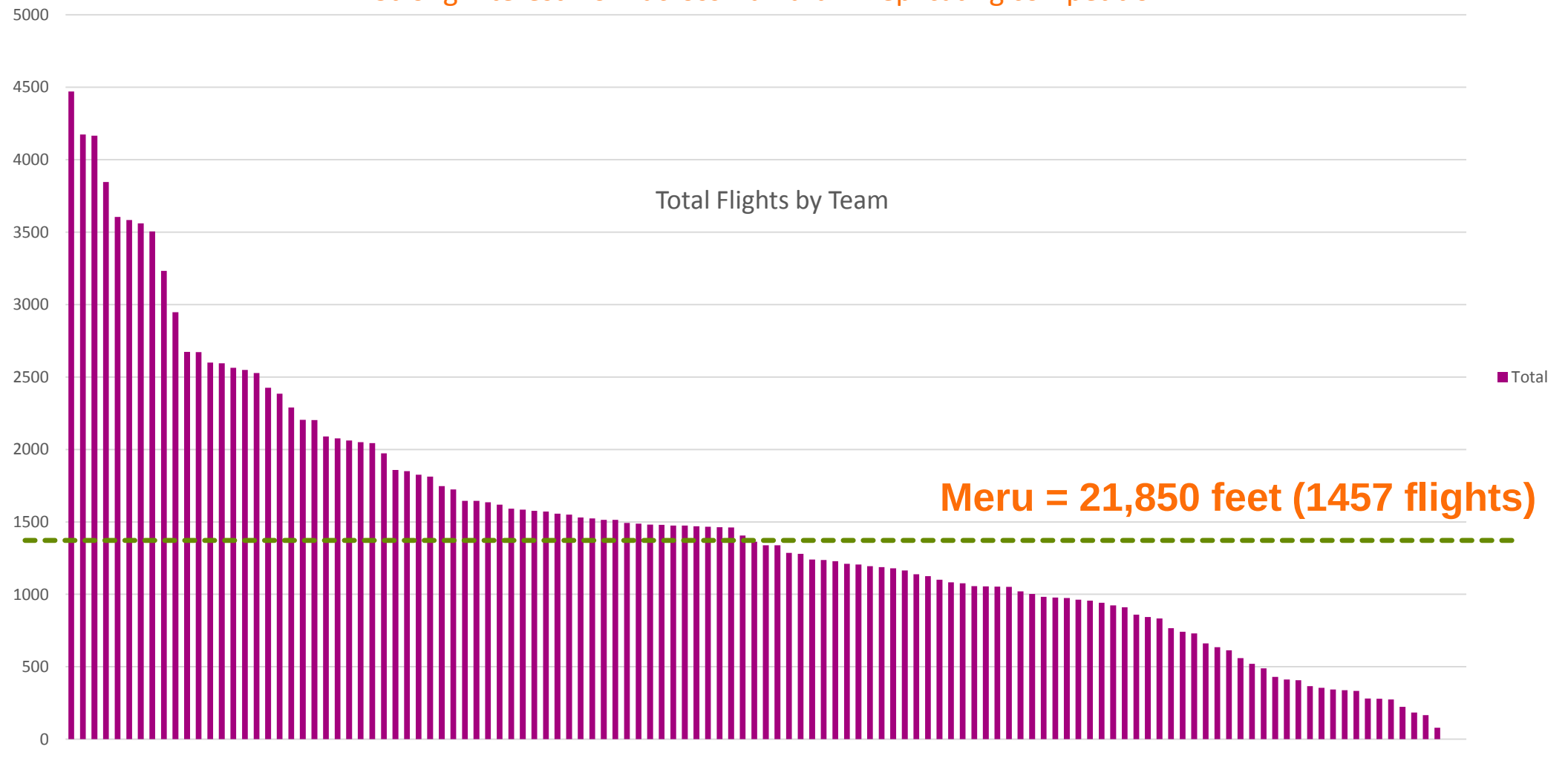
Take the Stairs

TAKE THE STAIRS EXPANDED TO ALL OF HARVARD'S LONGWOOD CAMPUS.

LARGEST NUMBER OF PARTICIPANTS YET!

577 Participants | 121 teams | 58 teams reached Meru!

Strong interest from across Harvard in replicating competition.



CULTURE AND LEARNING

RESEARCHER ENGAGEMENT

- New Signage on the M2 Shuttles are **seen by hundreds of Longwood researchers** each day
- 2nd Longwood **Green Labs Competition**
- **Over 7,500 unused chemicals** were removed from campus because of "Chemical Amnesty Day"

With the environmental footprint of labs being far greater per person than any other space type, engaging the researchers is a top priority. A collaboration between Longwood, MASCO, and the FAS Green team, established sustainability signage on the M2 shuttles that researchers and students ride every day.

CULTURE AND LEARNING

ECOOPPORTUNITY, LONGWOOD'S GREEN TEAM, LED EFFORTS THROUGHOUT THE YEAR THAT ENGAGED THE ENTIRE LONGWOOD CAMPUS COMMUNITY

20 of 27

For the first time, HMS implemented significant efforts to reduce waste on Class Day by using reusable, biodegradable or recyclable materials. Image: Bobbie Collins

- **Sustainability Fair**
- **Lighting Fair**
- **Waste Ambassadors**
- **Countway Garden**
- **Chemical Amnesty**
- **Take the Stairs**

CULTURE AND LEARNING

STAFF AND COMMUNITY ENGAGEMENT

THE ECO MOSQUITO

SUSTAINABILITY NEWS AND EVENTS AT HSPH AND BEYOND

ISSUE 19, MARCH 20

Spring is On the Way, Says Calendar

DID YOU KNOW?

DON'T MISS THIS

Do Revolving Doors Really Save Energy?

THE ECO MOSQUITO

SUSTAINABILITY NEWS AND EVENTS AT HSPH AND BEYOND

ISSUE 22, JUNE 2014

DID YOU KNOW?

Is it Really Worth it to Buy Organic Produce?

Let's Get Rrready to Rrreduce, Rrreuse and Rrrecycle!

THE DIRTY DOZEN

THE CLEAN FIFTEEN

- **EcoMosquito** newsletter provides **accessible and fresh sustainability content** to the Longwood community
- Inaugural Spring Garden Gathering
- EcoOp volunteers at Longwood Class Day events – waste ambassadors

As the controllers of many campus resources, staff members play a vital role in our campus and also have significant influence on the experiences of students. Giving them opportunities to get involved can have significant impacts in many areas. In addition, many of the programs we offer contribute to improving the work/life balance of these members of our community.

ORIGINAL CONTENT and SOCIAL ENGAGEMENT

Published content on green.harvard.edu in FY16:
Website engagement:

Unique visitors for your top **10** most visited pages totals over: **3,000**
Average time on page for top **10** most visited pages: **2 minutes, 21 seconds**

Top 10 pages:

1. Impact of green buildings on cognitive function (HCSPH research highlight)
2. HMS Landing Page
3. De-ice your freezer in 4 steps (HMS lab featured)
4. Empirical Case for a Plant-based Diet (HCSPH Research highlight)
5. 6 strategies to create more sustainable meals (HCSPH resource)
6. Healthy Eating Plate (HCSPH resource)
7. 5 tips for sustainable eating (HCSPH resource)
8. Encourage mindful eating with a mindful eating corner
9. Start an interoffice envelope reuse system (EcoOp)
10. HCSPH Landing Page

OFS sends a **monthly newsletter** to a list of **more than 10,000** students, staff, faculty, and members of the outside community.

HSPH/HMS is represented in each newsletter through **research**, shout outs, stories, tools or resources, or links to social media posts.

HCSPH/HMS provided **4 photos** of the **80** photos posted by OFS to Instagram. Including the awesome video of Donna Shalala giving EcoOp a shout out.

OFS tweets 6-8 times per day. On average, HSPH/HMS are mentioned in 10-12 tweets per week (heavily research-related content). OFS also retweets HCSPH, HSPH Nutrition, and CHGE frequently.

OFS posts once daily to Facebook. Generally, HCSPH/HMS (mostly research) are represented 2-3 times per month.