

Campus Sustainability Progress Report



MARCH 2014

2014

CAMPUS SUSTAINABILITY PROGRESS REPORT

In May 2013, Tufts' Campus Sustainability Council released a report containing recommendations in the areas of waste, water, and energy and emissions. A fourth section discussed cross-cutting issues that emerged as recurring themes across all three areas.

This document is a progress report containing sustainability highlights presented in the same four sections as the original report. Each section features notable areas of progress toward related goals and objectives from the report, graphical data from fiscal year 2013, and examples of upcoming projects.



Acknowledgments

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CROSS-CUTTING ISSUES

Integrating sustainability into planning capital projects



RELATED SUSTAINABILITY COUNCIL GOAL: Proactive planning that incorporates sustainability-related analysis emerged as a central theme in all working groups.

<< Rendering of 574 Boston Avenue Courtyard entry

Proactive planning that incorporates sustainability-related analysis emerged as a central theme in all of the Campus Sustainability Council's working groups. In this context, planning refers to making sure the decision makers are raising the right questions or issues early in the decision process, as well as connecting systems and stakeholder groups that do not typically interact. The timely and effective engagement of all key stakeholders fosters decisions that are guided by life-cycle costing and an understanding of the long-term use and operation of a building.

In presenting the draft five-year capital plan in early 2013, university leadership identified a number of basic principles for strategic capital projects related to proactive planning, which help to embed sustainability into future building projects. The principles include creating standards that lead to flexible spaces that can be right-sized according to the use, academic research type, and resource needs. These spaces can also be repurposed easily without extensive renovations, reducing the need for new construction materials.

Clustering research types not only fosters a dynamic, vibrant intellectual community for the scientists but also allows researchers to share equipment and resources, which can save money, energy, and space. The Project Sponsor Group for the conversion of 574 Boston Avenue to a collaborative research and teaching space has adopted a set of space use guidelines that embody this principle and will be used during the programming and design phases of the

project, marking an evolution in space planning at Tufts.

Another principle identified in the capital plan is to develop and implement university-wide standards for high performance buildings and to promote design excellence. High performance buildings are ones in which the occupants can work comfortably and efficiently, but are also very energy and resource efficient. Although traditional science buildings are "energy-hogs" due to their extensive use of specialized laboratory equipment and stringent temperature and ventilation controls, new expertise in building science has led to exceptional science buildings with significantly reduced energy use. The Science and Engineering Center (SEC), now in the design phase, is on track to become one of these high performing buildings due to the creation of a design team of architects and engineers with a proven track record of sustainable, energy efficient design.

Marc Rosenbaum, P.E., an award winning leader in the field of sustainable building design, assisted Tufts in selecting a collaborative project team that will foster an integrated systems design process that leverages the collective wisdom of Tufts' facilities and construction staff alongside contracted architects, engineers, and other specialists. The team's process for choosing materials and equipment will include life-cycle cost analyses for strategic items that allow the team to understand the costs over the full lifespan of each component and, in many cases, will lead to the selection of

equipment and construction practices that are energy efficient, more durable, and better for the environment.

The design team working on 574 Boston Avenue has made energy efficiency and sustainability priorities from the beginning of the project. The renovated building will have a well-insulated building envelope (windows, walls, roof, etc.) with triple-glazed windows (which reduce heat loss by 33%) that will eliminate the use of supplemental radiators near windows and hallways. Natural light is maximized in the interior design.

The 574 Boston Avenue building also exemplifies the principle of "minimizing footprint expansion" that is outlined in the capital plan, as many of the new building occupants will come from existing buildings that will be decommissioned, reducing Tufts' overall footprint. By reusing an existing building, Tufts reduces the amount of old construction materials that are thrown out and the amount of new materials purchased, saving not only the value of the materials themselves but also the embodied energy that went into producing them. The reuse of an existing building site also negates the need to take over greenspace, preserving land for wildlife, vegetation, and human enjoyment.

The principles and guidelines being used in these two building projects are a giant step toward the institutionalization of sustainable design principles and proactive planning at Tufts.

NOTABLE PROGRESS

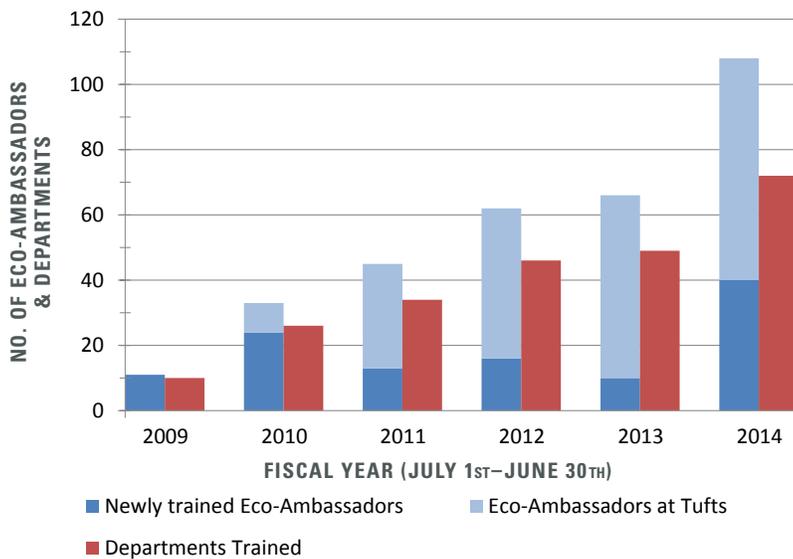
CULTURE CHANGE: Community-Based Social Marketing

A number of groups are at work to facilitate behavior change among students, staff, and faculty, including the Eco-Reps, Eco-Ambassadors, Green House, green teams (e.g. Tisch Library), and school sustainability councils (e.g. Fletcher) across the university. In addition, the class “Environmental Action: Shifting from Saying to Doing,” which allows students to practice acting as change agents on campus, was offered for the fourth time in Spring 2014.

CAMPUS AS LEARNING LAB: Create a searchable database where student projects can be archived and referenced

In Ming Chow’s Computer Science Senior Capstone course, students Josh Fishbein and Jillian Silver are building an online, searchable database to store student projects related to sustainability on campus. The database will serve as a repository for student research projects related to sustainability on campus. Students will be able to add their own projects to the database and build upon past projects by viewing previous students’ research. The internal database is expected to be complete by semester end of Spring 2014.

Figure 1. Tufts Eco-Ambassador Program



- A condensed version of the Eco-Ambassador sustainability training program for staff/faculty was launched in 2012 in Boston and has now been offered on all three campuses.
- There are currently Eco-Ambassadors in over 70 departments across the university who reach over 2,500 employees.

- In FY14, 40 staff and faculty completed the Eco-Ambassador training, bringing the total number of Eco-Ambassadors at Tufts to 108.

RELATED HIGHLIGHTS:

- All the staffed residence halls on the Medford/Somerville campus, including the Fletcher school residence hall, have at least one Eco-Rep, a student who educates residents about sustainable living.
- Eco-Reps collected nearly 100 green pledges at the “Jumbolicious” first-year orientation event in August 2013.
- At the start of the electronic requisition process, the purchasing website now



displays a reminder to “Buy Green.” The prompt links to a downloadable flier with recommendations and resources for eco-friendly products.

NEXT STEPS

- The Tufts Effectiveness in Administrative Management (TEAM) initiative has a working group on the Strategic Capital Delivery Process, which is dedicated to improving the integrated systems design process for planning capital projects. The group is currently investigating online project management tools that will streamline planning, capture key data on cost, and improve accountability.
- To provide recognition for offices engaged in sustainability practices, the Office of Sustainability is re-launching the Tufts Green Office Certification program in Spring 2014. The new program will feature a “smart” interactive Excel self-assessment checklist that provides users with instant feedback on their performance along with action items for improvement.

WASTE

Solid waste minimization program established



RELATED SUSTAINABILITY COUNCIL GOAL:
Reduce waste by 3% each year, on average, through source reduction, waste management strategies, and behavior change

<< The annual President's Picnic is a Zero Waste event.

In a transition away from contracting with separate trash and recycling haulers, Facilities Services and *Tufts Recycles!* announced a new partnership in September 2013 with waste contractor Save That Stuff, Inc., who is now responsible for both trash and recycling disposal. Save That Stuff, Inc. has a track record of innovation in waste diversion and will help Tufts assess total solid waste output, create a comprehensive minimization plan to reach Tufts' goal of reducing waste by 3% per year, and capture the remaining recyclables from the trash.

Waste audits began on the Medford/Somerville campus, and early results showed that recyclables, which could be captured and saved from the incinerator, made up 20% of the trash (as a comparison, the state of Massachusetts' trash contains 40% recyclables). Diverting trash decreases not only the amount but also the costs for disposal.

Over the four-year contract with Save That Stuff, Inc., waste audits will be performed on all campuses, and the results will inform waste profiles for each campus. The detailed waste profiles will then direct future zero waste efforts that can be customized for each campus.

To increase participation in recycling, *Tufts Recycles!* also

created a "Lift the Lid" campaign in November 2013 to encourage the recycling of bulky items that don't easily fit through recycling bin lids. Posters were circulated detailing the best way to recycle coffee cups, to-go containers, and other odd shaped items.



"Lift the Lid" campaign

Organic waste collection or "composting" is leading the path to zero waste around the country, particularly the collection of food waste. The US EPA estimates that food waste makes up close to 15% of curbside trash. Tufts Dining has been a pioneer in post- and pre-consumer

food waste collection in the dining centers since 1998¹. Today, additional infrastructure and practices are being put into place to expand food waste collection.

Building on the Eco-Reps' residence hall composting efforts, 11 central collection bins have been placed in close proximity to each participating hall, bringing the total number of compost drop-off bins on the Medford/Somerville campus to 15.



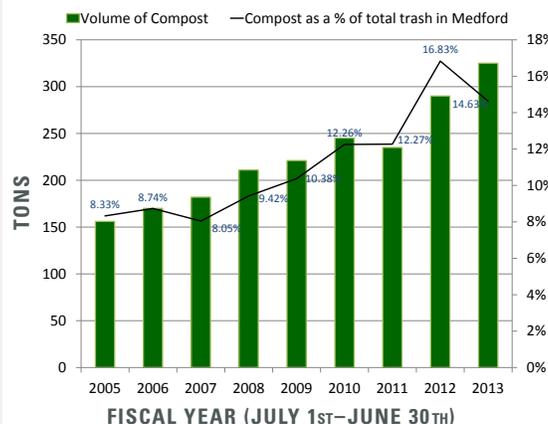
New compost totes at residence halls

All these initiatives contribute to the larger vision of the Sustainability Council's working

group on waste to have the entire Tufts community play "an intentional role in fostering a cradle-to-cradle economy." A cradle-to-cradle economy is one in which durable goods are sourced sustainably, ethically, and locally with highest reusability and recyclability. In the ideal scenario, these goods are not thrown away but are instead recycled into new products or turned into soil, negating the need for new extraction of raw materials.

¹ Tufts is already in compliance with the forthcoming MA DEP waste bans.

Figure 2. Medford Composting Rate



The volume of compost has increased steadily through the years

NOTABLE PROGRESS

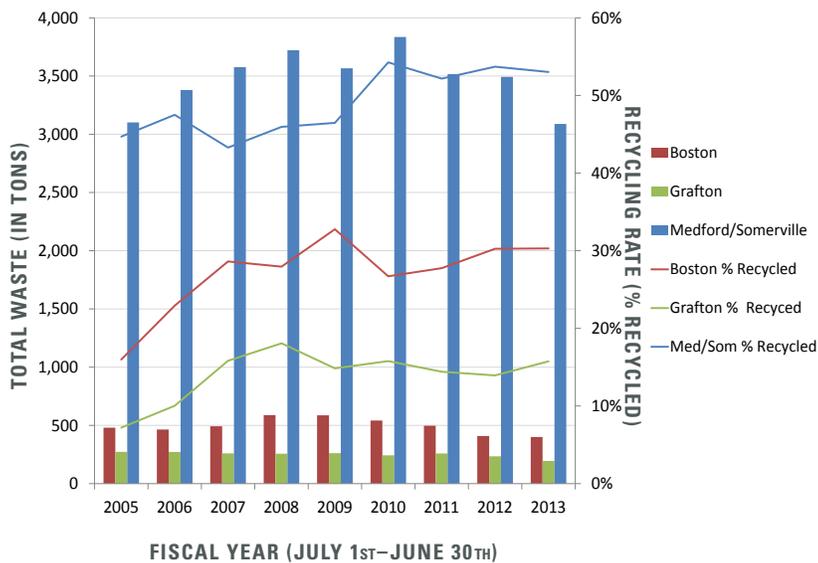
GOAL: Increase participation in recycling and diversion

During the Fall of 2013, residence halls, led by their Eco-Reps, collected a record 1,500 lbs (3/4 of a ton!) of compostable waste and upcycled over 20 lbs of chip bags and granola bar wrappers through the TerraCycle program. The Eco-Reps also organized the annual Zero Waste Week, where participants were challenged to carry all trash that they were unable to recycle or compost in a clear bag. The bags were then collected and displayed next to mountains of trash generated by a similar number of people who did not participate in the challenge.

GOAL: Improve waste management... by streamlining the disposal process through planning and communication

Eco-Ambassadors from the SciTech building partnered with *Tufts Recycles!* to create a custom “enhanced” recycling program to handle laboratory-specific material, particularly boxes from the many orders coming in each day. The program involved training and establishing stations for packing materials like styrofoam and cardboard. The effort resulted in 29 bags of styrofoam being recycled, which filled up an entire truckload!

Figure 3. Total Waste & Recycling Rate By Campus



“Recycling Rate (% Recycled)” is measured as the proportion of Total Waste (trash + recycling) that is diverted to the recycling stream (weight in tons of recycling divided by the total weight of all waste (trash + recycling)). It is not necessarily a representation of how well a population sorts its recycling. For example, a campus that uses and recycles a lot of paper could have a higher “recycling rate” than a campus that has switched to a paperless system.

RELATED HIGHLIGHTS:

- 75% of computers slated for recycling last year were instead donated to various community organizations thanks to Tufts Technology Center, a local non-profit, and Community Relations. In total, Tufts donated 57 computers.
- Dedicated “freecycle” areas that provide students a place to leave unwanted items for other people to take were added to the Wren and Haskell residence halls last year.
- Paper made of 95% sugarcane waste fiber (bagasse) is now being offered through Tufts’ online purchasing site. Sugarcane waste is a rapidly renewable resource that produces a high quality paper that is indistinguishable from wood-fiber based paper and cheaper than 30% recycled content paper.



NEXT STEPS

- The largest remaining generators of compost will be targeted next: auxiliary kitchens (daycare, fraternities with chefs, and the Tower Café) and apartment style residence halls where students cook.



Freecycle area in South Hall

- A freecycle station will be added during Hodgdon Hall’s renovation in the summer of 2014, bringing the total number of residence halls with a dedicated freecycle area to four.
- Waste audits on the Grafton campus are expected to start in Spring 2014.

WATER

Tufts rain garden makes a statement for the environment



RELATED SUSTAINABILITY COUNCIL OBJECTIVE: Reduce the environmental impact of runoff and discharge and improve water quality.

<< Rain garden between Hodgdon and Lewis Halls

In April 2013, the university's first rain garden was officially unveiled on the Medford/Somerville campus. Designed as an example of green infrastructure, also known as low impact design, the rain garden is located between Hodgdon and Lewis Halls. The garden is a collaboration between Facilities Services and Urban and Environmental Policy and Planning professor Scott Horsley. The project is part of an ongoing initiative to rehabilitate walkways.

Rain gardens are depressions in the landscape filled with permeable stones and native plants to capture and filter stormwater runoff from non-permeable surfaces like sidewalks and rooftops. Excessive runoff can not only cause erosion but also overwhelms stormwater drainage systems, causing flooding. Stormwater captured in the municipal storm drains travels to a body of water - in this case, the Mystic River system.

Tufts' rain garden reduces peak stormwater flooding by temporarily capturing and storing up to 5,000

gallons of stormwater from each rain storm.

Marc Mazzarelli Associates, LLC designed the rain garden, which features reclaimed boulders and sustainable fauna. Along with native plants that can endure local weather conditions, Mazzarelli included drought-tolerant and low-maintenance vegetation such as Japanese black pine, serviceberry, and juniper. The combination of plants, mulch, and stones acts as a natural filter for the runoff. Many pollutants picked up from the surrounding pavement are filtered out and break down over time in the soil. The cleaner stormwater is then stored and slowly released back into the native underlying soils to help restore and maintain the natural hydrologic system.

The rain garden is a visually appealing creation that represents tangible progress toward Tufts' sustainability goal related to stormwater: reducing the environmental impact of runoff and discharge while improving water

quality. Its location in a high traffic area between two residence halls also serves to increase student, faculty, and staff knowledge of water ecosystems and human impacts on water systems, another goal expressed in the sustainability report.

Plans for another rain garden behind the Baronian Field House have already been created and await future landscape improvement initiatives. In the meantime, smaller sustainable landscaping projects have been completed, such as the installation of rain barrels and drought-resistant plants at 520 Boston Avenue. In addition, students from Scott Horsley's Low Impact Development (LID) course have examined and designed LID stormwater plans for a wide variety of locations on the Medford/Somerville campus from the residential quad to Professors Row. These plans are available to the Facilities department to review when the areas are next under construction.

NOTABLE PROGRESS

GOAL: Employ Integrated Pest Management

The landscaping crew on the Medford/Somerville campus has been working to address a goose infestation problem at Tufts' athletic fields in a way that is not harmful to the animals or humans. Goose excrement causes grass to grow unevenly and makes fields unsanitary for athletes.



Eagle Kite

Instead of using chemicals that make the geese nauseous, the landscaping crew discourages birds from congregating on the fields by shining lasers in an erratic sweeping pattern on the ground or flying kites shaped like eagles.

OBJECTIVE: Deploy water management strategies

Permeable pavement was installed as a pilot test, along with a new bike shelter, outside Miller Hall in September 2013. Water drains through the asphalt to a stone bed and slowly infiltrates into the soil, reducing the amount of stormwater runoff that enters the storm sewer.



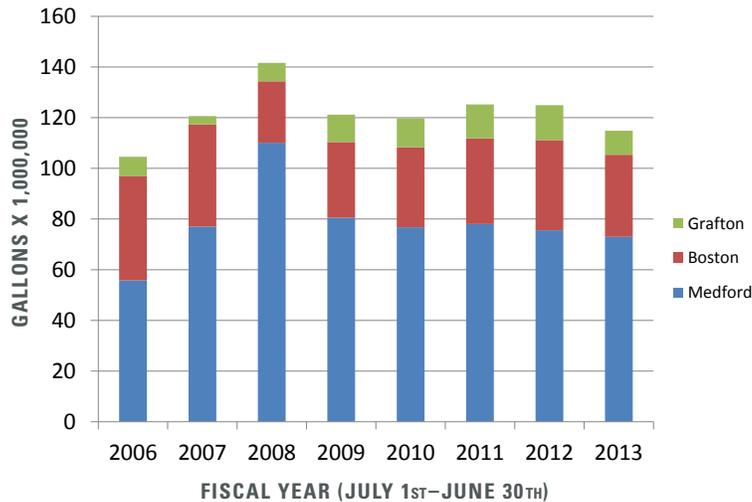
Bike shelter at Miller Hall featuring permeable pavement

RELATED HIGHLIGHTS:

- After a pilot installation of low-flow 1.5-1.75 gallons-per-minute (GPM) shower heads was well-received at the Chi Omega residence hall in Somerville, replacements have been scheduled for all other Medford/Somerville campus residences (with mostly 2.5 GPM shower heads).
- Two deep wells began operating in Alumni Field in 2012, which irrigate the athletic field and replace the need to use potable water.
- The Cummings School of Veterinary Medicine produced a stormwater management plan incorporating low impact development (LID) opportunities for future construction. The plan is a key component of the Amended Grafton Campus Master Plan, which was submitted to the Town of Grafton for approval in February 2014.



Figure 4. Water Consumption by Campus



- Water consumption across all three campuses decreased in 2013.
- Grafton saw the largest reduction in water use from 14 million to 9 million gallons, its lowest level of consumption since 2009.

NEXT STEPS

- Two out of seven wells excavated in Baronian Field yielded the 40 gallons/minute flow required for irrigation. After the installation of a pump shed and water lines, these wells will irrigate the fields, replacing the use of potable water.
- Shower timers were installed by Eco-Reps in West, Hill, and Carmichael Halls to encourage residents to take shorter showers. Additional timers will be added to Miller, Metcalf, Bush, and Hodgdon Halls.
- Currently, the condensate left over after the steam is finished heating the buildings on the Boston campus is mixed with cold water before being discharged. A heat recovery system is planned to reduce the temperature of the condensate leaving the Biomedical Research and Public Health building, avoiding the addition of cold water.
- Although significant progress has been made in the last year in relation to water conservation, a plan has yet to be created to evaluate and prioritize targets to reduce consumption.

ENERGY & EMISSIONS

Energy master plan targets savings & reduced emissions



RELATED SUSTAINABILITY COUNCIL OBJECTIVE:
Pursue energy efficiency, energy conservation,
and renewable energy opportunities

<< Buildings served by the Medford/Somerville campus' Central Heating Plant (inset)

One of the strategies identified to facilitate the reduction of greenhouse gas emissions was to “develop a campus energy and utility master plan that provides a comprehensive overview of systems and loads, supports intelligent decision making, and ensures that every decision is made in the context of larger system.”

In the summer of 2013, a high-level utility and energy master plan for the Medford/Somerville campus was developed by Van Zelm Engineers in close collaboration with Facilities Services and the TEAM² Energy and Campus Sustainability working group. Randy Preston joined Tufts in Fall 2013 as Director of the University Energy Programs to manage projects identified by the energy master plan.

The plan, approved in concept by the Board of Trustees in February 2014, includes upgrades to the electrical distribution system and targets a total of approximately 20% reduction in greenhouse gas emissions on the Medford/Somerville campus. The plan recommends four key energy initiatives, namely the installation of:

- A campus-wide integrated metering system,
- A cogeneration plant,
- A central chilled water plant to serve the air conditioning

needs of the southeast portion of campus, and

- Building energy audits and energy conservation measures.

A **metering system** that will measure energy use in each building is currently in the Request for Proposal process. Having real-time data on electricity and heat consumption will not only allow the university to identify more energy-saving initiatives but also evaluate and measure their effectiveness with greater ease. The first phase will target structures that consume the most energy on the Medford/Somerville campus, but metering will eventually be expanded to the Boston and Grafton campuses.

Feasibility studies are in progress to explore cogeneration as well as a centralized chilled water system at Tufts. **Cogeneration**, also known as combined heat and power (CHP), is the simultaneous production of electricity and heat from a heating plant. The process captures the waste heat produced from electricity generation and uses it to make steam for heating and cooling, replacing the need to generate steam independently.

Tufts saw an 8% reduction of carbon (CO₂) emissions at the Central Heating Plant in 2012-13 by switching from oil to natural gas.

Cogeneration further reduces carbon emissions by approximately 19% because the steam is essentially generated without creating additional carbon. Since the plant will be onsite, cogeneration also increases the campus' resilience by improving Tufts' ability to function during grid power outages.

A **central chilled water plant** might join Tufts' central heating plant on the hill soon. The cooling system works by piping cold water to surrounding buildings to meet their air conditioning needs. It has many benefits over Tufts' current system of maintaining independent cooling systems in each building. The advantages include improved energy efficiency, the flexibility to accommodate future cooling needs economically, lower life-cycle costs, lower energy and maintenance costs, and a very modest emissions reduction. Centralizing a chilled water system in a free standing building also frees up space in the buildings it serves and provides for a quieter learning and working environment.

An additional 1% or greater greenhouse gas emissions reduction will be achieved through other master plan initiatives.

² Tufts Effectiveness in Administrative Management (TEAM)

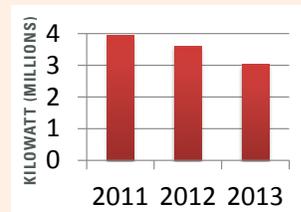
NOTABLE PROGRESS

GOAL: Develop transportation initiatives to reduce impacts of campus vehicles, commuting, and business travel

A transportation working group was convened in the Fall of 2013 to begin work to reduce the impact of Tufts-related travel and improve access to multiple modes of transportation to the Tufts community. One task force focuses on fleet management, while the other addresses transportation demand management. A clear set of protocols and policies surrounding the use of Tufts vehicles and a transportation demand management plan are expected deliverables to emerge from the process.

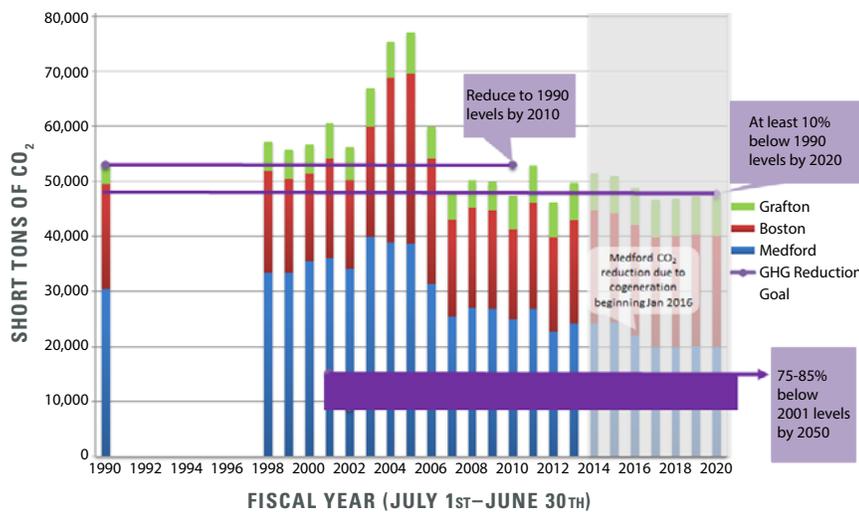
GOAL: Reduce greenhouse gas emissions and energy consumption

Tufts' investment in the infrastructure for server virtualization at the Data Center paid off with some impressive savings: its energy bill dropped 11% (576,000 kilowatt hours) from 2012 to 2013. The transition to virtual servers increased the center's maximum capacity by 2.5 times while reducing overall power, cooling, and lighting requirements use.



Decreasing energy consumption at the Data Center

Figure 5. Tufts Greenhouse Gas Emissions



- The New England Governors and Eastern Canadian Premiers Climate Change Action Plan was formally adopted by Tufts in 2003. The goals of the Plan are represented by the purple lines, namely to reduce emissions to: (1) 1990 levels by 2010; (2) At least 10% below 1990 levels by 2020; and (3) 75-85% below 2001 levels by 2050. The Campus Sustainability Council reaffirmed these goals by committing to Massachusetts' Greenhouse Gas reduction goals which include a 2050 target of 80% below 1990 levels - a target that falls within the wide purple bar.
- The shaded area represents projected emissions levels. The addition of cogeneration on the Medford/Somerville campus is expected to reduce the campus' emissions by 19% (approximately 4,668 short tons) of CO₂ per year beginning in January of 2016.
- Transportation fuel data collection did not begin until 2010 and is not included in this chart.
- Since 1990, Tufts' built environment grew by about 38%. In the same timeframe, greenhouse gas emissions (excluding transportation fuel) per gross square foot have decreased by about 27%.

RELATED HIGHLIGHTS:

- Two additional construction projects were recognized in 2013 for their sustainable building features: the Biology Collaborative Cluster on the 4th floor of 200 Boston Avenue in Medford earned LEED® Gold certification and the Sackler building in Boston became LEED Certified. The ongoing redevelopment of 574 Boston Avenue is on track to be LEED certified to at least the Silver level.
- Last September, Tufts' first electric vehicle charging station was installed free of charge to Tufts in Dowling garage. National Grid owns the station and covers the cost of networking to Chargepoint's online map of station locations and availability.



NEXT STEPS

- A 99kW solar array that will generate 125,000kWh of power for the Medford/Somerville campus is being installed on the roof of Dowling Hall. The project is part of the Solarize Massachusetts Medford program, which is supported by the Massachusetts Clean Energy Center and the Department of Energy Resources.
- A large 3.9 MW DC solar installation for the Grafton campus is currently in the permitting phase. Regulatory changes in Massachusetts have delayed the project, but when the installation is complete, two solar fields will produce the equivalent of approximately 45% of the annual electricity consumption of the Grafton campus.



Tufts gets green

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