From glass-made concrete to North Dakota wind: Boston universities find new ways to slash carbon emissions

Harvard is attacking climate change by reducing on-campus emissions and banding together with Boston cultural institutions to fund wind and solar farms in Texas and North Dakota.

By Sabrina Shankman Globe Staff, Updated December 3, 2024, 7:13 p.m.

A rendering of the outside of the David Rubenstein Treehouse Conference Center at Harvard University, which is expected to finish construction in the summer of 2025. AESTHETICA STUDIOS/STUDIO-GANG

The thing about carbon dioxide emissions is that once you really start looking around for them, you can find them just about everywhere: not just in the combustion of fossil fuels used for powering cars

and heating buildings, but in the creation of most electrons on our electricity grid, and the very foundation of most buildings — aluminum, steel, and cement.

Last month, Harvard University showed it was looking in every nook and cranny, tripling its financial commitment to take on green projects on campus. That spans from the conventional (stripping out oil and gas burners and replacing with electric heat pumps) to the cutting edge (erecting new buildings made not from cement, which comes from fossil fuels, but from concrete made from crushed glass).

To fund these projects, the university is increasing its so-called "green revolving fund" to $37 million. With this investment, Harvard can now boast the biggest such fund at any university in the nation.

The goal: to ensure that old buildings are moved off fossil fuels and that new ones won't run on them or be constructed with materials made from burning them. The idea is to address what's known as "embodied carbon" — the emissions associated with the supplies used to construct a building.

"There's some real cost" to aspects of what Harvard is doing, said Sean Caron, vice president for campus services at the university. "So how do we make sure the university is putting our money where our mouth is and really prioritizing some of these important investments in future-proofing our community?"

The work is in line with Harvard's target of being fossil fuel-free on campus by 2050.

In another innovative move, Harvard, MIT, and Mass General Brigham are leading a new Consortium for Climate Solutions — a renewable energy collaboration of higher education, health care, cultural institutions, and state and local government entities to band together to purchase clean energy.

"The science is telling us that we need to triple the amount of renewable energy on the power grids by 2030 and it's not happening fast enough," said Joe Higgins, MIT's vice president for campus services and stewardship.

About four years ago, he and his colleagues started working on how they could address that. "It really came down to, we need new models … and how do we come together to do that with much greater impact, at a much greater speed?"

The consortium also includes several nonprofits, such as the Dana-Farber Cancer Institute, the Museum of Fine Arts, GBH, and the city of Cambridge, all brought together by the energy consulting group PowerOptions. The effort leans on the idea that by banding together, entities can pool their resources and support bigger renewable projects.

In this case, it means teaming up to purchase power from a recently built solar farm in Bell County, Texas, and a wind farm in Bowman County, N.D., that will be completed in 2026.

In all, the projects will provide more than 1.3 million megawatt-hours of clean energy per year, which equates to taking roughly a quarter-million gas-powered cars off the road annually, according to the EPA's Greenhouse Gas Equivalencies Calculator.

In both cases — with Harvard's green revolving fund and with the new consortium — the idea is to make an impact locally, and also to help inspire similar action elsewhere.

The consortium reviewed 125 potential projects before ultimately choosing the North Dakota and Texas projects. "We wanted big projects that reduce the greatest amount of carbon for the investments that are made, and that automatically took us to the dirtiest local, regional grids in the United States," Higgins said.

Harvard was among the first universities to establish a green revolving fund, which it launched in 2002. Then in 2011, Harvard and several leading universities banded together for what was known as the Billion Dollar Green Challenge to promote the idea.

Other universities followed suit, drawn to zero-interest loans from endowments to fund campus projects for energy-efficiency and carbon-reducing upgrades, said Mark Orlowski, executive director of the Sustainable Endowments Institute, a Boston-based nonprofit that has spearheaded the concept. Those loans result in both long-term energy savings and progress toward internal climate goals.

Harvard's revolving fund has provided $43 million in funding since 2002 and saved $110 million in estimated energy costs. It played a key role in the university achieving its initial 2016 climate goal, which reduced net emissions by 30 percent against a 2006 baseline.

Across the country, there are now more than 100 such revolving funds, Orlowski said.

At Harvard, the goal is that beyond the funding model, some of the innovations used on campus will spread, too, said Heather Henriksen, Harvard's chief sustainability officer. The new David Rubenstein Treehouse Conference Center, which is under construction, uses a new, climate-friendly form of concrete made from recycled glass that will drive down the building's embodied carbon.

The hope is that by using innovative materials on a high-profile project, Harvard can help create a marketplace for them. "We're really trying to scale a healthier, more sustainable supply chain — using our campus, and capital projects, as a test bed to translate the multidisciplinary research and ideas into practice for results that can be scaled beyond Harvard," Henriksen said.

The same is true about funding wind turbines 2,000 miles away in North Dakota. This idea of purchasing renewable energy beyond Massachusetts to meet campus sustainability goals was hatched by MIT in 2016 when it invested in a North Carolina solar farm.

Bigger power purchases in North Dakota and Texas represent the next stage in the evolution.

Already, the Consortium for Climate Solutions is looking to go even bigger for its next projects and to expand its membership to make that happen. "We're still knocking on doors and people are still opening them," Higgins said. "Obviously, these are good projects for everyone."

A previous version of this story identified the cities of Boston and Cambridge as participating in the Consortium for Climate Solutions. Only Cambridge is involved. The projects in North Dakota and Texas will provide more than 1.3 million megawatt-hours of clean energy per year.

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