

Cool Innovators

**Massachusetts Companies Embracing Game-Changing Ideas
to Cut Carbon Emissions and Grow the Economy**

**Ben St. Laurent
Ben Hellerstein**

Environment Massachusetts Research & Policy Center

August 2015



Table of Contents

- Introduction..... 1**
- 1: Solar Photovoltaics 2**
 - EnergySage
 - Yeloha
 - Nexamp
- 2: Offshore Wind..... 5**
 - Deepwater Wind
 - Blount Boats
 - Rhode Island Fast Ferry – Atlantic Wind Transfers
 - Vineyard Power
- 3: Energy Storage 9**
 - Sparkplug Power
- 4: New Energy Efficiency Tools..... 10**
 - Next Step Living
- 5: Renewable Heating and Cooling..... 12**
 - Boston Solar
- 6: Zero Net-Energy Buildings 13**
 - ZeroEnergy Design
- 7: Urbanization and Smart Growth 14**
 - Fenway Center
- 8: Reinventing Public Transportation 15**
 - Green Line Extension
- 9: New Transportation Tools 16**
 - Zipcar
- 10: Electric Vehicles 17**
 - Voltrek

Introduction

Massachusetts has long been a leader in the fight against global warming, and the state has made major progress in reducing greenhouse gas emissions. But Massachusetts must go even further to cut carbon emissions to the level scientists say is necessary to avoid the worst impacts of global warming.

Fortunately, the tools and technologies to rapidly cut carbon emissions are at our fingertips. *Cool Solutions*, a report from the Environment Massachusetts Research & Policy Center and Frontier Group, describes ten game-changing opportunities to reduce emissions in the areas of renewable energy, building design, and transportation. Together, these “game-changers” will help Massachusetts cut its global warming emissions to at least 45% below 1990 levels by 2030, putting the state on track to meet the target of 80% emission reductions by 2050 required under the Global Warming Solutions Act.

This document profiles Massachusetts-based companies and projects that are embracing each of the ten innovative, game-changing trends identified in *Cool Solutions*. The businesses profiled here are just a handful of the thousands of Massachusetts companies making a difference in the fight against global warming while creating jobs and boosting the state’s economy.

According to the Massachusetts Clean Energy Center, clean energy companies employ more than 88,000 people in Massachusetts — an increase of 28,000 jobs since 2010.¹ Those figures don’t include Massachusetts residents working in other sectors that contribute to reducing carbon emissions, such as public transportation, nonmotorized transportation, and green architecture. A strong commitment to cutting Massachusetts’ carbon emissions will help ensure that clean tech companies continue to grow.

For most categories, it was relatively straightforward to find Massachusetts companies leading the way in implementing these game-changing technologies. For offshore wind, a technology that has not yet taken root in Massachusetts but for which there is ample potential off our shores, we profile Rhode Island businesses that are taking part in the nation’s first-ever offshore wind farm near Block Island, as well as a Massachusetts-based cooperative aiming to capture the benefits of offshore wind for local residents.

Together, these companies and projects are showing that fighting global warming and growing Massachusetts’ economy go hand in hand. Our state officials should support policies and programs that enable game-changing companies like these to thrive.

1: Solar Photovoltaics

Nexamp

Nexamp is a fully integrated solar company that designs, builds, owns, and operates solar energy facilities throughout New England. Founded in 2008 by two U.S. Army captains and hometown friends, Nexamp's more than 50 megawatts of installed solar and more than 35 megawatts under asset management make it one of the largest commercial solar providers in the Northeast.

Nexamp is headquartered in Boston, and today the company directly employs 50 workers in categories including project development, design and engineering, construction and operations, and project finance. Additionally, Nexamp employs hundreds of subcontractors every year, including construction workers, electricians, and environmental, civil, and structural engineers. According to John Murphy, Director of Corporate Development, Nexamp aims to make going solar simple and profitable for all through a vertically integrated approach.

"As a growing company in a competitive industry, we've needed to build off our early successes with an obsessive focus on executing on behalf of our customers. From being awarded the Commonwealth's first large-scale procurement of solar facilities to owning and operating the region's largest community solar project, Nexamp has proven its ability to adapt and remain at the forefront of solar development in the Northeast" says Murphy. "In the process, we've become experts in developing quality projects, designed to deliver maximum value for our clients and partners."

According to Murphy, forward-thinking state policies have been crucial in facilitating Nexamp's rapid growth. Massachusetts' net metering program allows solar owners to receive fair compensation for the electricity they provide to the grid and pass along significant savings to customers throughout the Commonwealth.

The SREC (solar renewable energy credit) program, now in its second iteration, encourages the cost-effective development of solar projects, and allows customers who couldn't otherwise install their own project to benefit through programs like community shared solar.

Nexamp recently installed a large solar array in Charlton that saves the Town of Westford over \$300,000 on their annual utility costs. The project makes use of the state's virtual net metering program, which allows the town government to receive credits for solar power on its electric bills in the same way as if the solar installation was located on municipal property.

Current legislation limits the amount of solar power eligible for net metering. The caps for 171 cities and towns, covering many parts of the state with the greatest potential to host solar installations, were hit in March. The net metering caps have brought many proposed solar projects to a halt, and may discourage further investment in areas of the state not yet impacted.

“Net metering has been absolutely critical for the efficient growth of solar in Massachusetts,” says Murphy. “Now, through community solar, we’re just beginning to see the true potential of a smart net metering program to share the benefits of solar to all customers.

Nexamp has completed projects in other states, including New England’s largest rooftop solar installation in North Kingstown, Rhode Island. Massachusetts, however, has remained the core focus of the company, and the vast majority of their employees and projects remain in the Commonwealth. Murphy says that Nexamp intends to continue to create jobs as a major player in the Massachusetts market, but that the company depends on a stable policy framework to grow confidently.

EnergySage

EnergySage is an independent, unbiased comparison-shopping website for solar energy systems and financing options. The company provides consumers with access to hundreds of vetted solar installers and financiers, as well as free information about solar technology and financing solutions.

Visitors to EnergySage’s website enter their property address, and the company then assesses the solar potential of homes using satellite technology, matching each homeowner with the best solar installers in their area. The website provides quotes from each installer in a standardized format that allows for easy comparison between competing installers.

Vikram Aggarwal founded EnergySage in 2010. Aggarwal is a former vice president at Fidelity Investments, where he reviewed many loan applications from solar companies. As the cost of solar dropped and the efficiency of the panels continued to increase, he became interested in getting into the industry himself.

As Aggarwal puts it, “Information is the biggest barrier to going solar.” EnergySage aims to put more information in the hands of customers, with a database that includes nearly 300 pre-screened solar installers in 30 states.

Aggarwal compares buying solar without EnergySage to buying a car without one of the dozens of online price comparison tools, or booking a vacation without the use of an online travel site like Expedia. EnergySage aims to enable competition, reduce costs, and give first-time consumers more confidence when considering a purchase or lease of solar panels.

At the time of its founding, EnergySage employed five part-time workers. The company has since expanded to include 20 full-time employees, and is based in downtown Boston. Aggarwal would like to eventually diversify EnergySage to offer price comparisons for other renewable energy products, such as wind energy and geothermal heating and cooling.

Aggarwal points out that as electricity prices rise, the price of solar energy remains stable, while the initial cost of installing solar panels steadily decreases. As more consumers become aware of the benefits of solar, he expects to see the rate of installations continue to increase.

“Although utilities make you think solar is more expensive than fossil fuels, it’s actually much cheaper over the long term,” says Aggarwal. “If it weren’t, the solar industry would never have gotten started.”

Yeloha

Yeloha is a solar sharing network that aims to make solar electricity accessible to all, by connecting homeowners whose rooftops are right for solar panels with those who lack such a roof. It offers a unique third way to enter the solar market without buying or leasing the panels, and also makes solar accessible to Massachusetts residents who are renting an apartment.

Joel Gamoran, the Regional Director of Yeloha, says that the company has successfully removed the obstacles of going solar for many Massachusetts residents, and the distributed solar sharing platform is helping the solar market evolve.

Yeloha provides “sun hosts” with free panels, removing the burden of the initial cost of going solar. A portion of the energy produced is consumed by the sun hosts, reducing their electricity bills. The remainder is then transferred over the existing utility grid to “sun partners” who have signed up online. Yeloha’s checkout page displays the price of becoming a sun partner, and the company is offering plans starting at one year.

Prior to launching Yeloha, the team worked to build Generaytor, an online, global solar community that allows owners of solar panels to monitor panel performance, compare energy production, and discover solar potential. In a preliminary round of funding for Yeloha, the company raised \$3.5 million, allowing for the development of a software platform, matching and forecasting algorithms, and operations to install and subscribe thousands of solar panels on Massachusetts roofs. Since launching, Yeloha has seen a steady growth in interest and the company has expanded to employ about 20 individuals, with a goal of unlocking access to clean energy for everyone.

Yeloha’s customers include homeowners, renters, and businesses, and the company works with a variety of solar installers throughout Massachusetts, helping to promote the growth of the solar industry.

Gamoran says that CEO Amit Rosner and the original Yeloha team were lucky to be in Boston in the midst of the solar boom when they had the idea of founding the company. Massachusetts ranks among the states with the most installed solar capacity, which attracts businesses like Yeloha and allows them to prosper.

Yeloha expects to grow in the near future as electricity prices continue to rise and solar becomes increasingly attractive to residents in many states, including Massachusetts. Gamoran says the company is excited to hire more employees, allowing it to expand into other states with smart solar policies.

2: Offshore Wind

Deepwater Wind

Members of Deepwater Wind's executive team have been developing clean energy projects for most of their careers. Between 2005 and 2007, team members traveled to Europe to see the development of the offshore wind industry. Offshore wind in Europe currently supports 75,000 jobs, a number expected to grow to 178,000 by 2030.²

After seeing the success of Europe's wind industry, Deepwater Wind was selected in a competitive bid process to be Rhode Island's preferred offshore wind developer.

In July 2015, Deepwater Wind began offshore construction on the Block Island Wind Farm, the nation's first offshore wind project. The 30-megawatt wind farm, located three miles off the coast of Block Island, will include five turbines and produce enough electricity to meet the needs of roughly 17,000 homes, providing nearly all of Block Island's electricity.

Deepwater Wind sees the Block Island Wind Farm as "a pilot project, the first project that will catalyze the rest of this market," according to Vice President of Development Clint Plummer. "The first projects are going to be the ones that build out the infrastructure, the supply chain, and the ports."

As Plummer explains, Deepwater Wind believes that offshore wind farms serve a fundamental need in New England, a region that sits at the end of most oil and natural gas pipelines. Because fossil fuels are not produced in Massachusetts, money is exported to other states and countries for those resources.

The shallow Atlantic continental shelf and high wind speeds make areas off the coast of New England ideal for offshore wind farms. Tapping into Massachusetts' offshore wind potential would reduce carbon emissions and other harmful forms of air pollution while supporting the state's economy. The U.S. Department of Energy projects that under supportive policies and the right circumstances, the North Atlantic region could see 70,000 jobs supported by offshore wind activity by 2030.³ In January, the Department of the Interior held an auction for offshore wind areas off the coast of Massachusetts that could produce enough electricity to power 1.4 million homes.⁴

Several Rhode Island companies are assisting in the construction of the Block Island Wind Farm, including Atlantic Wind Transfers and Blount Boats. Although no Massachusetts-based companies are currently involved, Plummer pointed out that Massachusetts has made significant investments in infrastructure like the New Bedford Marine Commerce Terminal, which will help bring many wind energy jobs to Massachusetts as the industry matures.

Plummer says the company made a concerted effort to listen to environmental concerns starting at an early stage of the process, and put in place a voluntary set of restrictions that went beyond federal restrictions. For example, to avoid interfering with the migration patterns of the

endangered North Atlantic right whale, installation of the turbines has been voluntarily restricted to certain times of the year. Other protocols for marine mammal observation have been implemented as well in order to protect those animals.

Deepwater Wind and its partners began installing the first foundations off Block Island in July 2015. All five foundations will be installed by the end of the summer. The submarine electric cables will be put in place next spring, and the turbines will be installed and operational by the end of 2016.

Deepwater Wind hopes to build more projects in New England, including in an area off the coast of Massachusetts that they recently won the rights to develop in a federal auction. The 200-turbine project known as Deepwater ONE is expected to generate 1,000 megawatts of electricity for both Long Island and New England, and will be virtually invisible from shore.

“Block Island will demonstrate the commercial viability of this technology,” says Plummer. “For Massachusetts and all of the New England region, this is a technology that can be built cost-effectively and locally. It will have major positive impacts on local communities and the local economy.”

Blount Boats

Luther H. Blount was born in Rhode Island and graduated from the Wentworth Institute of Technology in Boston, before entering the Army during World War II. After the war he returned home to Warren, Rhode Island, where he started Blount Boats, a boat design and manufacturing business, in 1949. Since then, the company has undertaken several notable projects including building *Spirit of Boston*, one of Boston’s most iconic dinner boats.

Blount Boats is now managed by Luther’s daughter, Marcia Blount. Along with other family members, she has expanded the business from its original team of 20 employees to about 70 employees. The business operates on a six-acre shipyard on the Warren River, the original plot of land where her father started the business. Blount says that the company strives to “build quality vessels that will run efficiently and safely for years to come.”

Currently, Blount Boats is engaged in a project to support the Block Island Wind Farm. The company is building a specialized offshore support vessel that will transport technicians to maintain the turbines once they are installed. The contract to build the vessel was valued at \$4 million.

Blount hopes that as technology advances, wind turbines and their service equipment will become more cost-effective.

Manufacturing a boat has many stages, starting with the design, assembly and high precision welding. Once the superstructure is completed, the propulsion and electrical systems are installed. The offshore support vessel is a catamaran with a greater width to length ratio, giving it more stability. It is also fitted with a rugged rubber bumper on the square bow, allowing it to push

against the turbine and secure its position so the technicians can jump across to a ladder on the turbine.

Blount says that her company would “love to build more of these,” as more offshore wind farms are constructed. “Financially, it’s a great thing,” she adds.

Rhode Island Fast Ferry – Atlantic Wind Transfers

Charles A. Donadio, Jr., has worked in the ferry business for 20 years, transporting tourists between Rhode Island and popular destinations like Martha’s Vineyard and Block Island. In 2003 he founded Rhode Island Fast Ferry, based in North Kingstown, Rhode Island. His crew ranges from about eight or nine workers in the off-season to up to fifty during the summer.

As offshore wind projects inched closer to reality, Donadio formed Atlantic Wind Transfers, a subsidiary of Rhode Island Fast Ferry. Atlantic Wind Transfers will be responsible for operating the offshore support vessel, currently being built by Blount Boats, that will transfer crew and equipment to the Block Island Wind Farm.

Atlantic Wind Transfers will be equipped to handle construction, underwater surveying, dive support, and cable-laying. The company will also offer ongoing support and maintenance to the turbines throughout the life of the wind farm.

Donadio says he is “investing millions of dollars in building these vessels in order to become a leader of this industry in the United States.”

According to Donadio, environmental concerns have been very important to the development of his company. He aims to operate vessels that go above and beyond general emissions compliance requirements and are as environmentally friendly as possible.

“Although the United States is in last place in the offshore wind industry, we can catch up very quickly,” says Donadio. “As the offshore wind industry grows, Atlantic Wind Transfers will grow while providing year-round, good-paying jobs.”

Vineyard Power

In January 2009, the federal government announced that it would begin to lease parts of the outer continental shelf for wind development, including areas off the coast of Massachusetts. On Martha’s Vineyard, a group of community leaders, business owners, and concerned residents formed Vineyard Power to help capture the benefits of offshore wind for local residents.

Vineyard Power Cooperative is a 501(c)(12) non-profit utility cooperative. Unlike investor-owned utility companies, Vineyard Power is owned by residents and businesses on Martha’s Vineyard.

Vineyard Power has already installed three commercial-scale solar arrays on the island, and now the cooperative has turned its sights towards offshore wind.

Vineyard Power sees offshore wind as an untapped resource that has even greater potential than land-based wind in New England. As an island, Martha's Vineyard is uniquely positioned to take advantage of offshore wind, with open seas to its south and east. As the development of offshore wind off the coast of New England moves forward, Vineyard Power aims to harness some of these benefits for residents of Martha's Vineyard.

In January 2015, Vineyard Power partnered with OffshoreMW, a New Jersey-based company that won the rights to develop a wind farm on 166,000 acres of ocean south of Martha's Vineyard. Vineyard Power estimates that an offshore wind project with OffshoreMW could power around 250,000 homes in Massachusetts. Vineyard Power and OffshoreMW entered into a Community Benefit Agreement, aimed at guaranteeing that the investment and job-creation benefits of offshore wind development are realized by residents of Martha's Vineyard. Additionally, the Community Benefit Agreement would ensure that residents see the benefits of the price stabilization mechanism that offshore wind creates. Offshore wind is also expected to have a wholesale price suppression effect: as fossil fuels are replaced by offshore wind, the price of wholesale electricity will decrease.

Currently, Vineyard Power is advocating for state officials to enable communities to enter into long-term contracts to purchase renewable energy from wind, solar, and other sources, a concept they call "Community Empowerment." According to Vineyard Power, these long-term contracts would help communities to reduce their carbon emissions while shielding residents from the fluctuating cost of fossil fuels.

3: Energy Storage

Sparkplug Power

Sean Becker, an avid outdoorsman and environmentalist, founded Sparkplug Power in 2009 to provide “cheaper, more efficient, and more reliable” energy storage options.

Becker says he has always been interested in protecting the environment and preserving clean air and water. He received his undergraduate degree at Cornell University before joining the Navy, where he received training in engineering. In the Navy, Becker ran gas turbine engines and managed the propeller systems during the construction of a new destroyer.

Around 2008, with the emergence of major improvements in energy storage technology, Becker decided to get involved in the industry. In 2009, he founded Sparkplug Power in Somerville. The company operates out of shared office space for green technology startups at Greentown Labs.

Sparkplug Power offers lithium-ion batteries equipped with software that enables peak demand shaving. The batteries charge during the night, when electricity prices are cheaper, and discharge during the day, when demand on the grid is highest and electricity is more expensive. Those peak-demand hours are typically when the oldest and dirtiest power plants are turned on. By releasing energy to the grid during times of high demand, energy storage solutions like those offered by Sparkplug Power can cut Massachusetts’ reliance on the dirtiest sources of energy while avoiding the need to invest in new fossil fuel infrastructure.

Additionally, storing energy close to the place where it is produced and consumed can reduce the cost of building and maintaining transmission infrastructure. As Becker puts it, “Distributed storage is going to be a huge benefit to the grid that’s coming soon to a state near you.”

This fall Sparkplug Power will be installing energy storage devices, which will be centrally controlled by the municipal utility, at residential locations in Holyoke. Becker plans to hire more staff in September and expand his business to work in other New England states, New York, and the Mid-Atlantic.

Becker says that Massachusetts is a hotbed for battery innovation. New technologies are reducing the size and cost of batteries and improving battery chemistry. In May, Governor Charlie Baker’s administration announced the launch of a \$10 million Energy Storage Initiative aimed at making the state a national leader in the industry.⁵ Sparkplug Power is also the beneficiary of an Innovate Mass Grant from the Massachusetts Clean Energy Center.

“Massachusetts has an ecosystem for storage — a lot of it was invented here,” says Becker. “But we’re lagging behind states like California and New York in deployment of it. Massachusetts, as well as the rest of New England, is constrained by peak electric demand in the summer and peak gas demand in the winter. Deploying storage on the grid helps us in both of these cases, and anything the state can do to support this industry is important.”

4: New Energy Efficiency Tools

Next Step Living

Geoff Chapin founded Next Step Living in 2008 to address the 21 percent of U.S. carbon emissions that come from residential energy use.⁶ The company's mission is to provide homeowners with resources to lead more sustainable and comfortable lives by adopting energy-efficient solutions. The company has expanded since its founding to serve Connecticut and New York in addition to Massachusetts, and recently introduced a new product aimed at the commercial sector, the EcoThermal Filter System.

"When I started Next Step Living, I knew I wanted to do something different," says Chapin. "Residential energy efficiency hadn't been tackled at such a large scale, and it was time to do my part to address the climate crisis."

Chapin, together with three other employees who remain at the company seven years later, launched Next Step Living's work in energy efficiency by partnering with Mass Save as an approved contractor for its Home Energy Services program. Since then, Next Step Living has served more than 115,000 homeowners and employs more than 650 workers, with its headquarters in Boston's Innovation District. Chapin has used his experience at a strategic consulting firm for public entities and nonprofits to expand the business beyond residential energy efficiency.

To date, some of the products the company has offered include its home energy assessments, a top-to-bottom evaluation of how a home uses energy; home weatherization, or insulation and air sealing; and rooftop and community shared solar. Chapin explains that at the center of Next Step Living's action is its whole-home approach, which allows for a tailored look at individual homes in order to make informed recommendations for further energy measures, such as efficient heating and cooling systems or increased insulation.

"No home is alike, and our home energy advisors are motivated by that," Chapin says. "We're in thousands of homes each month educating homeowners on how to save energy and money with simple changes to their routines." The company reaches out to homeowners through in-person field canvassing, as well as in-store education through its corporate partners such as Stop & Shop and Staples.

Chapin says that Next Step Living customers are motivated by several factors, including the economic return on their investments, increased comfort in their home and the ability to help the environment with choices that lower their carbon footprints. One choice the company often recommends is for customers to swap out their incandescent bulbs with LED or CFL bulbs, which are available at no cost or at a discounted cost, depending on the customer's utility company, during a home energy assessment. According to Energy Star, switching a single incandescent bulb to a more efficient CFL or LED bulb can save between \$30-80 over the lifetime of the bulb.⁷

Next Step Living estimates that minor adjustments like switching to energy-efficient bulbs or using a programmable thermostat, along with energy-efficient heating and cooling choices, insulation and air sealing, and renewable energy, have led Next Step Living customers to reduce their collective carbon emissions by 110,000 metric tons annually — the equivalent of removing more than 20,000 fossil fuel-burning cars from the road.⁸

In the past year, Next Step Living introduced its first product for the commercial market, the EcoThermal Filter System. This technology recovers waste heat from cook lines in commercial kitchens and uses it to preheat water. The adoption of the EcoThermal Filter System can substantially decrease the amount of natural gas needed to heat water for tasks like washing dishes or cleaning. The company estimates that the system can save restaurants \$4,000 to \$6,000 annually and reduce carbon dioxide emissions by up to 19 metric tons per year in each location.

Chapin explains that Next Step Living is looking to continue its track record of fighting climate change by expanding to new markets in the coming months with its partners. He adds that fighting climate change will always be at the forefront of the company's goals.

"Massachusetts is at the forefront of energy efficiency and we're proud to be a part of the state's success," says Chapin. "As we expand our footprint, our commitment to helping homeowners live more sustainably and affordably will always be our priority."

5: Renewable Heating and Cooling

Boston Solar

Boston Solar was founded in 2011 by college roommates Romain Strecker and Daniel Mello Guimaraes, who met at Davidson College in North Carolina. The company began physical operations in 2012 out of Strecker's kitchen in Lynn, primarily as a solar installer working in eastern Massachusetts.

Today, the company has grown to employ 139 individuals who work on solar and home efficiency projects throughout the Commonwealth. In addition to solar photovoltaic installations, Boston Solar also offers energy-efficient heating and cooling services, an expanding department within the company.

According to the company's founders, Boston Solar's goal is to become New England's energy efficiency specialist. The company plans to expand into more New England states. Guimaraes says that Boston Solar takes a holistic approach towards energy efficiency, taking into account all of the opportunities to make buildings more energy-efficient.

"We believe everyone has the right to clean energy," says Strecker. "Our vision is a smart and sustainable world powered by clean energy. We have always recognized the importance of addressing global warming, and we're more and more convinced every day that we're in the right business, doing the right thing."

One of the newest technologies offered by Boston Solar is ultra-energy-efficient heat pumps. Heat pumps transfer heat between the interior and exterior of a home, and can either heat or cool the home depending on the season. The latest developments have made air source heat pumps able to run efficiently at temperatures well below freezing, making them economical during New England's brutal winters and hot summers. According to a study done by the Rocky Mountain Institute, Northeast residents can save up around 40% on heating costs when switching from oil to air source heat pumps.⁹

Boston Solar currently serves residential, non-profit, and business customers. Guimaraes says that the company aims to help customers save money and increase their property values, while keeping money in the local economy, cutting dependence on out-of-state energy supplies, reducing demand on the electricity grid, and protecting the planet.

6: Zero Net-Energy Buildings

ZeroEnergy Design

ZeroEnergy Design is a green architecture firm focused on the design of high-performance homes and buildings, with offices in Boston and on Cape Cod.

According to Adam Prince, ZeroEnergy Design's Business Development Principal, the firm's leaders made a decision early on to design only homes and buildings that exceeded minimum standards for energy performance. ZeroEnergy Design's leaders saw climate change as the biggest challenge of their generation, and set a minimum threshold of designing buildings with an energy performance of at least 50% better than code. In the firm's first ten years, the average actual energy performance of its projects is 80% better than code.

The company has also added standards to improve the environmental performance of their designs in other ways, including water efficiency, resilience and durability, and indoor air quality. Prince says that although some of these standards are less easily measured, the firm still considers them essential — for example, healthy indoor air quality is viewed as an ethical obligation to all homeowners and building occupants.

Prince says that ZeroEnergy Design's strong environmental values have resonated with their clients, each of whom seeks out the firm for a different reason but in the end gains the full spectrum of benefits, including energy, air, water, and resilience. The firm has even branched out to assist other architects with the improvement of the energy performance of their projects, expanding their impact to hundreds of homes and buildings.

ZeroEnergy Design's clients have benefited in minor ways from existing state and federal programs, but Prince emphasizes that the creation of significant incentives for super-insulated homes and buildings would help encourage more construction with exceptional energy performance. Prince says that such a program would reduce the consumption of fossil fuels, save energy for the entire life of a building, and help firms like ZeroEnergy Design become a larger part of the Massachusetts economy.

"We feel that incentives focused on the building envelope offer the greatest opportunity for the government to boost an entire industry — helping business, people, and the planet, all at the same time," says Prince.

7: Urbanization and Smart Growth

Fenway Center

Yawkey Station, a commuter rail station on the Framingham/Worcester Line, has offered service to Fenway Park on Red Sox game days since 1988 and regular weekday service since 2001. When the MBTA decided to renovate the station in 2007, after finding that it would result in a significant increase in ridership, it created an opportunity for new development on underutilized land around the station.¹⁰

Fenway Center, a 4.5-acre development by Meredith Management, will consist of more than 550 apartments in three buildings, a grocery store, and retail and office space. The project is being built on a former surface parking lot and a deck over the Massachusetts Turnpike.¹¹

By creating new housing and office space in a location close to downtown, with access to several transportation options including commuter rail and the Green Line, Fenway Center will reduce the need for residents and workers to own and drive cars. The availability of a grocery store and other shops within walking distance will also cut down on car trips.

In addition to transportation improvements, Fenway Center will also help to reduce carbon emissions through renewable energy and energy efficiency measures. The development will generate a significant portion of its electricity through an on-site solar installation, which will be one of the largest privately-owned solar projects in the state, according to Meredith Management.¹²

Two more stations on the Framingham/Worcester Line, Boston Landing and West Station, are expected to open in 2016 and 2020, respectively. Similar development efforts are planned near those stations in order to maximize the amount of transit-accessible housing, retail, and office space in Boston.^{13, 14}

8. Reinventing Public Transportation

Green Line Extension

The MBTA's Green Line serves densely populated neighborhoods in Boston, Cambridge, Brookline, and Newton. As far back as the 1920s, state and local officials discussed extending the Green Line into Somerville and Medford, communities that are underserved by transit given their population density and proximity to Boston, but funding for the effort never materialized.¹⁵

To offset the pollution caused by the Big Dig megaproject, the state government promised to extend the Green Line to Somerville and Medford in 1990, but the project fell behind schedule. Following a 2006 lawsuit from the City of Somerville and the Conservation Law Foundation, the state agreed to move forward.¹⁶ The cost of the \$2.3 billion project is being split between Massachusetts and the Federal Transit Administration.¹⁷

Construction began in 2012, and the line's six new stations are projected to be fully operational by 2020.¹⁸ Currently, the last Green Line stop is Lechmere Station, which will be relocated as part of the project. New stations along the Green Line will be located at Union Square, Washington Street, Gilman Square, Lowell Street, Ball Square, and College Avenue near Tufts University.

According to the Massachusetts Department of Transportation, the Green Line Extension will reduce daily vehicle travel by 25,728 miles, which will reduce carbon emissions, improve air quality, and cut down on traffic congestion.¹⁹

The Green Line Extension is expected to create opportunities for walkable, transit-accessible development on underutilized land near the station sites, increasing the number of Boston-area residents able to commute to work or run errands without using a car. Union Square Station Associates, a team of developers working in partnership with the City of Somerville, is planning to construct hundreds of new residential units, along with commercial and retail space, near the Union Square stop.²⁰

9: New Transportation Tools

Zipcar

Zipcar was founded in Cambridge by Antje Danielson and Robin Chase, with a mission of giving urban residents the convenience of driving a car without the need to buy or lease one. Over the years, the company has expanded to offer its services to 43 states and Washington, D.C., as well as countries like Canada, the United Kingdom, Spain, France, Austria, and Turkey. The company has grown since its founding in 2000 to employ over 700 workers, about 350 of whom are based in Boston. The company's headquarters are in an office near Fort Point Channel in Boston.

Zipcar members reserve vehicles online and use a card to lock and unlock vehicles. Vehicles can be checked out by the hour or for a full day, at a price varying by the make and model of the car. In Massachusetts, Zipcar operates over 1,000 vehicles, available at locations like grocery stores, train stations, airports, and college campuses.

According to Lindsay Wester, Public Relations Manager at Zipcar, a single Zipcar vehicle can meet the driving needs of approximately 50 people and eliminate the need for 15 individually owned cars.

Carsharing helps reduce carbon emissions and traffic congestion by decreasing the number of vehicles on the road. An independent study from the Mineta Transportation Institute showed that carsharing members reduce their household's greenhouse gas emissions by 1,100-1,600 pounds per year.²¹

Zipcar partners with universities to offer carsharing to students aged 18 and older. Some schools, such as Boston University, offer discounted driving rates to students, faculty, staff, and alumni. Recently, Zipcar expanded access to its platform by offering a new service, "Zipcar for Business," that allows companies to offer carsharing services to their employees.

According to a study from the Transportation Sustainability Research Center at the University of California Berkeley, Zipcar for Business has not only enabled 20% of the program's members to avoid buying a car, but also resulted in another 20% selling their personally owned car. Zipcar estimates that there are now approximately 33,000 fewer private vehicles in North America because of Zipcar for Business.²²

10: Electric Vehicles

Voltrek

In 2010, Kathleen Connors founded Voltrek with a vision to create infrastructure for the age of electric vehicles. Her company has since become a leader in Electric Vehicle Supply Equipment, or electric vehicle charging stations.

The company offers a broad range of services to help with the installation of charging stations, including site assessment, budgeting, installation, and ongoing maintenance. Voltrek serves homes, office buildings, universities, hospitals, and hotels. Some of the company's notable clients include Boston University, Massachusetts Institute of Technology, Beth Israel Deaconess Medical Center, Boston Children's Hospital, and the Lenox Hotel.

Voltrek has worked with the City of Melrose to install a dual charging station, aiding in the city's efforts to reduce carbon emissions. The company also installed two charging stations at the Chelmsford Public Library.

Suzanne Griffin, Director of Marketing and Operations at Voltrek, says that as electric vehicle infrastructure comes into place, more consumers will feel comfortable buying those vehicles.

While most of Voltrek's business comes from Massachusetts, the company is looking to build electric vehicle infrastructure as far south as Pennsylvania. In Massachusetts, state-level policies like the Massachusetts Electric Vehicle Incentive Program (MASS EVIP) provide incentives to acquire electric vehicles and install charging stations.

Electric vehicle charging stations are classified by the U.S. Department of Energy into three levels. An AC Level 1 charger has three prongs and plugs into a typical wall outlet. It fully charges an electric vehicle in eight to twelve hours. An AC Level 2 charger resembles a gas pump and is commonly installed in parking garages and other public locations. These stations are capable of fully charging an electric vehicle in about three to five hours.²³ Voltrek maintains a service contract to clean and test three Level 2 chargers at MBTA stations. The third level is a DC Fast Charging station, which can fully charge a vehicle in as little as 30 minutes. Griffin says once these stations are installed in rest stops and along major highways, electric vehicles will become practical for long-distance travel.

As the popularity of electric vehicles takes off, demand for charging stations will grow accordingly. Griffin says the company expects to expand, and is excited to be a part of the electric vehicle revolution.

Notes

- ¹ Massachusetts Clean Energy Center, *2014 Clean Energy Industry Report*, <http://www.masscec.com/content/2014-clean-energy-industry-report>.
- ² European Wind Energy Association, "Offshore Wind | Economic Benefits," <http://www.ewea.org/policy-issues/offshore/>.
- ³ Navigant Consulting, Inc., prepared for U.S. Department of Energy, *U.S. Offshore Wind Market and Economic Analysis*, 22 February 2013, p. 119, http://www1.eere.energy.gov/wind/pdfs/offshore_wind_market_and_economic_analysis.pdf.
- ⁴ U.S. Department of the Interior, "Interior to Auction More Than 742,000 Acres Offshore Massachusetts for Wind Energy Development," 24 November 2014, <http://www.doi.gov/news/pressreleases/interior-to-auction-more-than-742-thousand-acres-offshore-massachusetts-for-wind-energy-development.cfm>.
- ⁵ Commonwealth of Massachusetts, Executive Office of Energy and Environmental Affairs, "Baker-Polito Administration Announces \$10 Million Energy Storage Initiative," 28 May 2015, <http://www.mass.gov/eea/pr-2015/10-million-energy-storage-initiative-announced.html>.
- ⁶ U.S. Energy Information Administration, *Monthly Energy Review*, Section 12: Environment, <http://www.eia.gov/totalenergy/data/monthly/pdf/sec12.pdf>. Calculated using data for the full 2014 calendar year.
- ⁷ ENERGY STAR, "CFL Savings," https://www.energystar.gov/index.cfm?c=cfls.pr_cfls_savings.
- ⁸ Emissions equivalent in cars calculated using "Greenhouse Gas Equivalencies Calculator," U.S. Environmental Protection Agency, <http://www.epa.gov/cleanenergy/energy-resources/calculator.html>.
- ⁹ Ryan Matley, Rocky Mountain Institute, *Heat Pumps: An alternative to oil heat for the Northeast — input for planners and policy-makers*, March 2013, p. 11, http://www.rmi.org/Knowledge-Center/Library/2013-05_HeatPumps.
- ¹⁰ Trustees of Boston University, prepared by Tetra Tech, *Boston University Charles River Campus 2012–2022 Transportation Master Plan*, 12 August 2012, p. 51, <http://www.bu.edu/community/files/2012/09/Final-Transportation-Master-Plan-with-Appendices.pdf>.
- ¹¹ Meredith Management, "Project Overviews | Fenway Center," <http://fenwaycenter.com/project-overviews/>.
- ¹² Meredith Management, "Massachusetts Turnpike Parcel 7 / Fenway Center," <http://www.meredithmanagement.com/1kenmore.php>.
- ¹³ Nicole Dungca, "New Balance, MBTA break ground on Allston-Brighton station," *The Boston Globe*, 12 May 2015, <https://www.bostonglobe.com/metro/2015/05/12/new-balance-and-mbta-break-ground-new-allston-brighton-commuter-rail-station/SL2q0Wg009me10lowaaF10/story.html>.
- ¹⁴ Nicole Dungca, "New transit station could transform Allston area," *The Boston Globe*, 30 September 2014, <https://www.bostonglobe.com/metro/2014/09/30/weststation/ZB4d0trnj1VG066u7kkkZP/story.html>.
- ¹⁵ City of Somerville, Office of Strategic Planning and Community Development, "OSPCD – Green Line Extension," <http://www.somervillema.gov/departments/ospcd/green-line-extension>.
- ¹⁶ Ibid.
- ¹⁷ Abby Elizabeth Conway, "Federal Government Commits Nearly \$1 Billion To Green Line Extension," *WBUR News*, 2 December 2014, <http://www.wbur.org/2014/12/02/federal-government-green-line-extension-funding>.
- ¹⁸ Nicole Dungca, "US pledges nearly \$1b for Green Line extension," *The Boston Globe*, 2 December 2014, <https://www.bostonglobe.com/metro/2014/12/02/federal-officials-pledge-nearly-help-extend-green-line-into-somerville-and-medford/WstVh8Ywfh6dbL6toVIWNI/story.html>
- ¹⁹ Massachusetts Department of Transportation, "Green Line Extension Overview," <http://greenlineextension.eot.state.ma.us/about.html>.
- ²⁰ Danielle McLean, "Developer calls for 925 residential units next to Somerville's Union Square T station," *Wicked Local Somerville*, 4 March 2015, <http://somerville.wickedlocal.com/article/20150227/news/150226780>.
- ²¹ Elliot Martin and Susan Shaheen. Mineta Transportation Institute, "Greenhouse Gas Emission Impacts of Car Sharing in North America," June 2010, p. 3, <http://transweb.sjsu.edu/MTIportal/research/publications/documents/Carsharing%20and%20Co2%20%286.23.2010%29.pdf>.
- ²² Zipcar. "New research finds business use of Zipcar reduces car ownership," 27 July 2015, <http://www.zipcar.com/press/releases/z4breducescarownership>.
- ²³ U.S. Department of Energy, "Developing Infrastructure to Charge Plug-In Electric Vehicles," http://www.afdc.energy.gov/fuels/electricity_infrastructure.html.