BUILDINGS

How Electrification Contributes to Decarbonization Goals

April 1, 2022 Janelle Penny

The Architectural Team (TAT) is building an all-electric multifamily development on the site of a former textile mill. Domestic hot water, heating and cooling are all electric. The four-story, 59-unit development is designed to consume zero net energy thanks to on-site renewables. Courtesy of The Architectural Team (TAT).

Whether your building is utilizing steam, natural gas, propane or fuel oil, you're probably feeling the pressure to electrify.

Building electrification is gaining steam because the grid is getting greener. As the grid mix shifts to include more solar, wind power and other sources of renewable energy, electricity is responsible for increasingly lower carbon emissions compared to directly burning fossil fuels for power, as many buildings are still doing. As states, cities and even individual buildings set decarbonization goals, it's worth looking at how buildings contribute to carbon emissions—and how they can contribute to solutions.

"The shift to more electrical uses of energy is essential to reduce carbon emissions and prepare infrastructure for a grid that is powered by distributed renewable energy sources," said John Vernacchia, energy transition segment director at Eaton. "The most important focus is on creating a low-carbon future so that we can improve the quality of life and protect the environment for people everywhere."

The benefits of electrifying new construction, aside from generating fewer emissions, are obvious. You can eliminate the infrastructure necessary to accommodate non-electrical sources of energy, like gas piping, which reduces the costs to build your building. But how can existing buildings benefit? To understand the pressure for today's existing buildings to electrify, it's important to understand the factors behind the shift to all-electric operation.

[Related: Top Tips for Integrating Solar Panel Systems on Your Commercial Building]

What's Driving the Push Toward Electrifica on?

The move to electrify buildings is rooted in a larger effort toward decarbonization. Cities and states—and in some cases, individual real estate owners—have set carbon emissions targets and are looking at different ways to achieve those goals. Because buildings are such major players when it comes to

energy use and greenhouse gas emissions, they're a big piece of this puzzle, which is why regulations and incentive programs are increasingly targeting buildings.

For example, in New York City—where buildings account for roughly two-thirds of greenhouse gas emissions, according to the city—Local Law 97 requires most buildings over 25,000 square feet to meet new energy efficiency and greenhouse gas emissions limits by 2024, with even stricter limits coming into effect in 2030. The goal of the law, passed in 2019, is to reduce the emissions of the city's largest buildings 40% by 2030 and 80% by 2050. Building performance standards targeting the existing building sector, like Local Law 97, are likely to become more commonplace and make beneficial electrification an essential strategy for building owners, said Mark Lessans, senior director, sustainability and regulatory affairs for Johnson Controls.

Other factors driving increased electricity adoption are focusing on incentivizing good behavior. In Rhode Island, the Zero Energy for the Ocean State (ZEOS) pilot program supports the construction of highly energy-efficient buildings with zero net energy consumption, said Matt Duggan, AIA, project manager for The Architectural Team (TAT).

The firm converted a neglected 1881 textile mill into mixed-income rental housing and is now constructing another multifamily development on the same campus with the help of a grant from ZEOS. The project features photovoltaic panels on the carport and building roof, electric cooktops and ovens for residents and a central air source heat pump domestic hot water system, Duggan said.

An executive order signed by President Joe Biden last August encouraging the adoption of electric vehicles may also push building owners to electrify, Vernacchia said. The executive order sets a target of 50% of passenger vehicles sold by 2030 being electric. A shift to electric vehicles would require updated electrical infrastructure in both homes and commercial buildings.

"With EV adoption on the rise, many states are challenging building owners to develop EV-ready power distribution systems that have the electrical infrastructure capacity, dedicated branch circuits and other equipment to distribute power to EV parking spots and support future installation of charging stations," Vernacchia explained.

[Related: The Critical Relationship Between Buildings and Sustainability for the Future]

Electrification and Resiliency Planning

Building electrification can advance resiliency, Vernacchia said, especially when building owners and managers are able to create electrical systems that both meet today's challenges and anticipate what's ahead. As you electrify your building, plan for your future capacity needs, which can help avoid elevated costs later. Opt for infrastructure that keeps the power flowing to essential loads while helping you gain control over consumption.

"For example, optimizing electric vehicle charging will be especially essential to meet increasing electricity demand with existing capacity," Vernacchia said. "Smart circuit breakers and charge management software will enable more installed chargers that deliver the optimal amount of power that chargers need. When available capacity is reached, charge management software limits electricity consumption and reduces the available power. This integral approach to load management avoids exceeding the incoming service capacity."

Buildings are increasingly incorporating microgrids to prepare for the unexpected, Vernacchia added. Microgrids that incorporate solar and storage help improve resilience during grid outage events.

How to Get Started

Ready to electrify? Start by having the electrical infrastructure of your building assessed to make sure it can handle additional loads, Vernacchia advised. Consider starting with on-site renewables, energy storage or software solutions that help boost your capacity and make better use of the existing infrastructure.

"These upgrades open the door for a building to become a revenue-generating engine that's intelligent, efficient and resilient—in short, a good grid citizen—all while providing essential protection to ensure the power is always on," Vernacchia said.

Next, look at where you can phase out older fossil fuel-powered equipment with an electricity-powered version when it's time for a replacement or upgrade. Using a heat pump for domestic hot water is a good first step, Duggan explained. Replacing heating and cooling systems with air source heat pumps can also be extremely efficient, but work best when your envelope and windows are tight. "If you have an existing building that doesn't have continuous insulation, or the windows are located such that there's thermal bridging, there will be challenges with retrofitting the insulation to get it to where it needs to be," Duggan said. "Domestic hot water can be done separately from that."

As you shift away from older fossil fuel-powered equipment, you'll reap the benefits of electrification, Lessans said—in particular, the core benefits of carbon emissions reductions and significant operating cost savings.

For the end uses in your building that can be efficiently electrified with heat pumps, you should see significant reductions in both site and source emissions, Lessans said: "You're going to have an easier path to decarbonization targets, regulatory complianc and lower utility bills as a result."