Shaping Tomorrow's Built Environment Today

BUILDING ELECTRIFICATION

THE ISSUE

Building electrification is often viewed as an essential strategy for building decarbonization, but electrification, in and of itself, does not necessarily guarantee decarbonization. Building electrification refers to transitioning all or portions of building systems to electricity instead of on-site fossil fuel-based, non-electric energy. Space and water heating, some chilled water generation, snow melt, cooking, laundry, and emergency power backup commonly use on-site fossil fuel-based energy.

Electrification contributes to decarbonization when: (1) the electricity comes from low- or zero-carbon energy sources such as solar, wind, tidal/wave, hydro, and nuclear; or (2) when the efficiency of the new electric equipment results in overall GHG emissions reductions compared to on-site combustion. Therefore, action is needed by both the buildings and the electric grid sectors. Utilities must achieve their grid decarbonization goals by transitioning to low- or zero-carbon generation. Some regional grids have already decarbonized significantly, putting building electrification on a "fast track" toward total building decarbonization.

The growth of building (and transportation) electrification could require a significant increase in electrical grid capacity, emphasizing the need for energy efficiency, energy storage, grid interactive building design, and alignment of consumption with carbon-free generation (i.e., demand flexibility) to minimize the increase in peak demand. Building electrification can present embodied carbon, capital and operating cost, and retrofit challenges; it also provides an opportunity to improve air quality, especially in densely populated areas, by reducing particulate pollution and ground-level ozone from fossil fuel combustion. Many innovative energy efficient buildings with all-electric systems are already being built and occupied. Existing buildings' ability to electrify cost-effectively will accelerate with technological improvements and local and national policy incentives.

ASHRAE's ROLE

ASHRAE stands at the forefront in supplying standards, guidance, and education for the design, manufacturing, installation, and operation of building systems. These resources can also provide governments with a technical foundation for beneficial building electrification policies. ASHRAE's relevant consensus-based standards include new proposed standards and those being updated to specifically reflect decarbonization:

- Standard 90.1, *Energy Standard for Buildings Except Low-Rise Residential Buildings*
- Standard 90.2, *Energy-Efficient Design of Low-Rise Residential Buildings*
- Standard 100, *Energy Efficiency in Existing Buildings* (Note: This Standard is being updated as the *Energy and Emissions Building Performance Standard)*
- Standard 105, *Standard Methods for Determining, Expressing and Comparing Building Energy Performance and Greenhouse Gas Emissions*
- Standard 211, *Standard for Commercial Building Energy Audits*

- Proposed Standard 228P, *Standard Method of Evaluating Zero Net Energy and Zero Net Carbon Building Performance*
- Proposed Standard 240P, *Evaluating Greenhouse Gas (GHG) and Carbon Emissions in Building Design, Construction and Operation*
- Proposed Decarbonization Guide, *Heat Pump Application, Design, and Operation*
- Multiple technical resource guides being developed by ASHRAE's Task Force for Building Decarbonization

ASHRAE's VIEW

ASHRAE supports the global need to reduce emissions from buildings, including through beneficial electrification. ASHRAE encourages policymakers to consider the following:

1. Transitioning from fossil-fueled appliances to high-efficiency all-electric appliances and technologies can significantly reduce greenhouse gas (GHG) emissions from buildings using low-carbon intensity electricity.
2. Hybrid (partial) electrification retrofits can be beneficial where heating load profiles currently make complete electrification uneconomical.
3. Replacement of fossil-fuel heating equipment before end-of-life can have a negative impact on embodied carbon and refrigerant emissions, therefore, electrification retrofits should be analyzed from a whole life cycle carbon perspective and transitions phased over time if necessary.
4. This shift towards high-efficiency all-electric appliances, combined with an increasingly clean grid, has the potential to improve indoor and outdoor air quality.
5. Widespread electrification of building heating and domestic hot-water systems could require a substantially larger electrical grid infrastructure, unless there are commensurate reductions in building energy demand through energy efficiency, energy storage, and smart building-grid integration.
6. Future equipment will utilize much lower global warming potential (GWP) refrigerants. While existing equipment may still use high GWP refrigerants, supporting and implementing phase-out plans and refrigerant management will dramatically reduce the impact of refrigerant leakage on overall building GHG emissions.
7. The ability of buildings to interact with the electric grid can help maximize the use of low- or no-carbon electricity and optimize the use of on-site energy storage. Two-way communication between the electrical grid and the building can reduce costs, decrease emissions and improve system reliability.
8. Heat pumps have become more energy efficient and capable of generating much higher temperatures across wider ranges of outdoor ambient temperatures, improving compatibility with existing heating distribution systems and improving their effectiveness in more climates.
9. Building electrification and decarbonization requires support for workforce training for all who create and operate buildings.

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