Shaping Tomorrow's Built Environment Today

BUILDING DECARBONIZATION

THE ISSUE

Buildings provide many benefits to society but have a significant worldwide environmental impact due to their greenhouse gas emissions (GHGs). The building industry accounts for roughly 40 percent of global GHGs and the global building stock is expected to double by 2060 due to urbanization, population growth, and related economic trends. The standard metric used to quantify GHGs is carbon dioxide equivalent (CO_2-eq). Using a common metric helps evaluate different sources of GHGs in terms of their potential to impact the atmosphere—also referred to as their global warming potential. As governmental bodies and jurisdictions across the planet confront climate change, the term "decarbonization" is used to describe practices or policies that reduce GHG emissions. Building decarbonization encompasses a building's entire life cycle, including building design, construction, operation, occupancy, and end of life.

Many governmental bodies and jurisdictions are requiring new buildings to be low carbon or net-zero energy in the near-term and other policies are requiring retrofits of existing building stock in the medium to long term to decarbonize. Some decarbonization policies also advance building electrification when coupled with a renewable electricity source or other low-carbon technologies. Decarbonization efforts will require large public sector and private sector investments while at the same time creating jobs and business opportunities in the HVAC&R, construction materials, and design sectors.

ASHRAE's ROLE

ASHRAE stands at the forefront in supplying standards, guidance and education for the design, manufacturing, installation, and operation of building systems. With respect to building decarbonization, ASHRAE's historical focus has been on energy efficiency, which has resulted in significant GHG emission reductions. ASHRAE is expanding its technical resources, education and training and other initiatives so that they address building decarbonization. ASHRAE's Task Force for Building Decarbonization is advancing numerous efforts and updates that can be found at www.ashrae.org/decarb

ASHRAE's consensus-based standards with potential reference to carbon include:[1]

- 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*
- *Standard 105-2021, Standard Methods for Determining, Expressing and Comparing Building Energy Performance and Greenhouse Gas Emissions*
- Standard 189.1, *Standard for the Design of High-Performance Green Buildings Except Low-Rise Residential Buildings*
- Standard 189.3, *Design, Construction, and Operation of Sustainable High-Performance Health Care Facilities*

[1] The most up-to-date list can be found at: https://www.ashrae.org/about/tfbd-technical-resources

- Standard 228, *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*

ASHRAE's VIEW

ASHRAE's position is that eliminating GHG emissions from the built environment is essential to addressing climate change. To do this, it is ASHRAE's position that:

- Decarbonization of buildings and their systems must be based on a holistic analysis including healthy, safe, and comfortable environments; energy efficiency; environmental impacts; sustainability; operational security; and economics.
- By 2030, the global built environment must at least halve its 2015 GHG emissions, whereby:
  - all new buildings are net-zero GHG emissions in operation,
  - widespread energy efficiency retrofit of existing assets are well underway, and
  - embodied carbon of new construction is reduced by at least 40 percent.
- By 2050, at the latest, all new and existing assets must be net zero GHG emissions across the whole building life cycle.
- Building decarbonization provides benefits beyond reducing GHGs, including reduced indoor and outdoor air pollution, improved energy savings, improved community health and wellbeing, enhanced social responsibility, and increased property valuation.
- Operational energy-related GHG emissions can be reduced by implementing efficiency measures and building electrification; improving O&M; using low-GWP refrigerants and minimizing refrigerant volume while maintaining energy efficiency; improving refrigerant management; and increasing use of renewable energy sources both on site and off site, energy storage, and building-grid integration.
- Building design and operations should be able to respond to real-time carbon signals from the power grid to reduce GHG emissions.
- Increasing stringency and enforcement of energy codes are critical for decarbonization.
- Whole-building life-cycle assessment must be considered in future building codes to reduce embodied and operational GHG emissions related to buildings and their HVAC&R systems.
- Building performance standards (BPS) should be considered as a policy tool for existing building decarbonization.
- Decarbonization policies must consider and mitigate impacts on disadvantaged communities and less-developed nations.