Shaping Tomorrow's Global Built Environment Today

BUILDING DECARBONIZATION

THE ISSUE

Buildings benefit society but have a significant worldwide environmental impact including the effects of their greenhouse gas (GHG) emissions. Buildings account 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_2e). Using a common metric helps to 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" describes practices or policies that reduce GHG emissions. Building decarbonization may encompass 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 to decarbonize in the medium to long term. Some decarbonization policies also advance building electrification when coupled with renewable electricity source or other low-carbon technologies. Decarbonization will require large public and private sector investments, leading to job creation and business opportunities in the HVAC&R, construction materials, and design sectors.

ASHRAE's ROLE

ASHRAE stands at the forefront in providing standards, guidance, technical resources, and education for building systems design, manufacturing, installation, and operation. 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 Center of Excellence for Building Decarbonization is advancing numerous resources and making them available at www.ashrae.org/decarb

ASHRAE's consensus-based standards that address building decarbonization include:[1]

- Standard 90.1-2022, *Energy Standard for Buildings Except Low-Rise Residential Buildings*
- Standard 100-2024, *Energy and Emissions Building Performance for Existing Buildings*
- *Standard 105-2021, Standard Methods for Determining, Expressing and Comparing Building Energy Performance and Greenhouse Gas Emissions*
- Standard 189.1-2023, *Standard for the Design of High-Performance Green Buildings Except Low-Rise Residential Buildings*
- Standard 228-2023, *Standard Method of Evaluating Zero Net Energy and Zero Net Carbon Building Performance*
- Proposed Standard 240P, *Evaluating Greenhouse Gas (GHG) and Carbon Emissions*

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

in Building Design, Construction and Operation – for full building lifecycle analysis

- Proposed Standard 242P*, Standard Method for Calculation of Building Operational Greenhouse Gas Emissions*

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:

- Decarbonizing 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, requiring that:
  - all new buildings are net-zero GHG emissions in operation;
  - widespread energy efficiency retrofit of existing assets is 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 improved indoor and outdoor air quality, 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 lower-GWP refrigerants and minimizing refrigerant volume while maintaining energy efficiency; improving refrigerant management; safe disposal of refrigerants; 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 signals from the power grid to reduce GHG emissions.
- Increasing adoption of current energy codes and their effective implementation 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 to improve energy efficiency and reduce emissions in existing buildings.
- Decarbonization policies should consider and mitigate impacts such as increased costs on disadvantaged communities and less-developed nations.
- Development of community energy systems, district heating and cooling, and other collaborative approaches that contribute to lower carbon emissions across entire neighborhoods or districts through integrated urban planning such as smart and sustainable cities.
- Collaboration with global organizations, governments, and industry bodies to harmonize standards and policies drive decarbonization across the building sector.
- Training, certification, resources, and tools are needed for building professionals to implement low-carbon design and operations, supporting the workforce transition to sustainable practices.
- Investing in research to support new decarbonization technologies and methodologies, including advancements in renewable energy systems, low-GWP refrigerants, and innovative HVAC design.