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# Closing the Gap: Priorities for the U.S. Department of Energy's Building RD&D Portfolio

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## EXECUTIVE SUMMARY

The building sector is not on track to reach net-zero emissions by 2050. Federal RD&D investments have been disproportionately low, while national strategies that address the key hurdles of decarbonizing the building sector have been lacking.

The full report identifies major gaps in the current federal RD&D portfolio in the building (residential & commercial) sector, the hurdles the Department of Energy (DOE) faces in addressing the deficiencies identified, and the policies needed to close these gaps—and ultimately—decarbonize the building sector.

### Building Sector Emissions

**Figures 1 & 2: Greenhouse gas emissions, and direct CO2 emissions from energy-related activities**

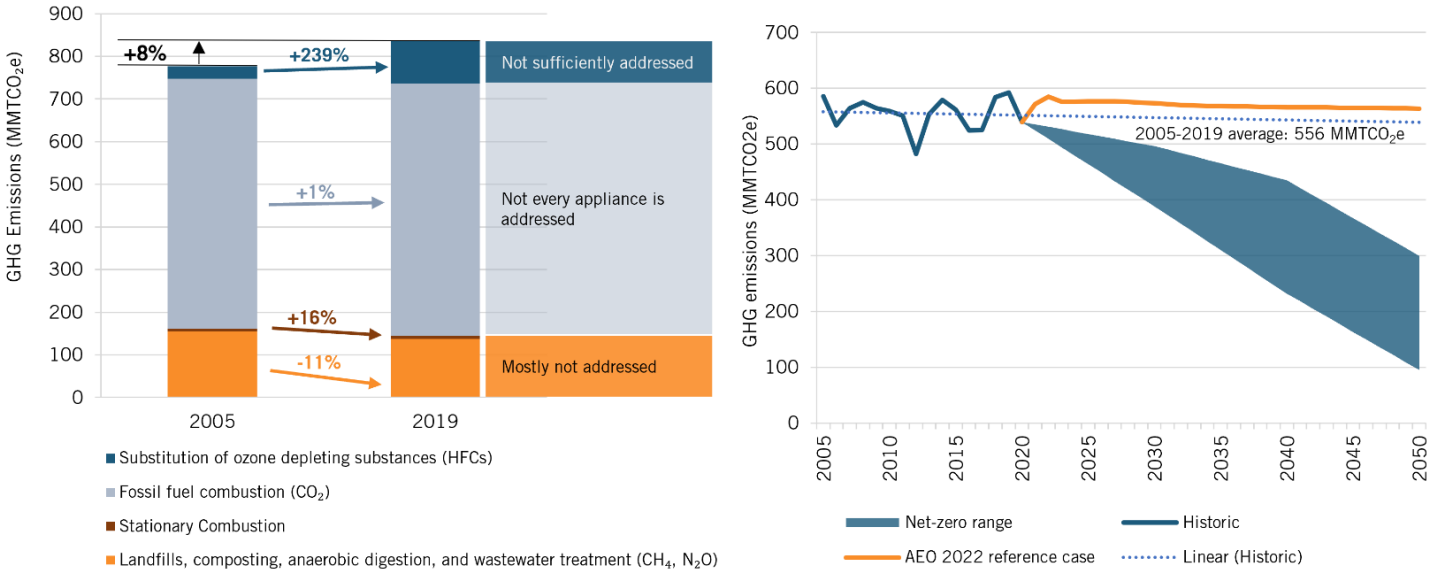



**Figure 1 (left):** The building sector is the only energy-related sector where GHG emissions rose between 2005 and 2019. The use of HFCs for air conditioning and refrigeration is the main driver of the increasing GHGs.

**Figure 2 (right):** Fossil fuel combustion activities make up a lion's share of building's GHG emissions. However, assuming improvements in known energy production, delivery, and consumption technologies as well as taking the 2021infrastructure law into account, the U.S. Energy Information Administration projects a flat trend in direct CO2 emissions from these activities to 2050.

## Building Sector R&D Gaps

The report identifies five areas where the current federal RD&D portfolio for the building sector is deficient. Each gap is summarized below:

**Table 1: DOE RD&D portfolio deficiencies**

| Deficiency | Description |
|---|---|
| Chronic underfunding | The building sector receives 7 percent of DOE's RD&D investments but makes up 14 percent of GHG emissions. The proposed FY 2023 budget will not change the trend. |
| Gaps in HVAC&R Technologies | DOE's Building Technologies Office (BTO) has identified innovation in heating, ventilation, air conditioning, and refrigeration (HVAC&R) and refrigerant technologies with lower global warming potentials as major goals. Amid rising GHGs from HFCs (+239% from 2005 to 2019), this priority should be of utmost importance and deserves unwavering support. |
| Limited Scope for Other Appliances | Water heating, cooking, clothes drying, and other activities generate significant emissions, yet only a few RD&D projects have been conducted to phase down emissions on these gas-fired appliances. These activities collectively consumed 11.7 percent of energy from fossil fuel sources in 2021. |
| Near-Absence of Waste Management Activities | Waste management activities comprise 1/6 of the building sector's GHG emissions. BTO has no subprogram that specifically addresses emissions from these activities. Congress has directed DOE and EPA to identify opportunities and challenges for technologies that capture GHGs from municipal landfills. |
| Embodied Carbon: Need for Life- Cycle Perspective | There are no federal directives on embodied carbon RD&D, and no mention of the subject was made in the final FY 2022 budget or the president's FY 2023 proposal. DOE's ARPA-E has a few current RD&D projects in this area, but the topic focus is primarily on carbon emissions due to operations. Outside of DOE, the U.S. Army Corp of Engineers (USACE) has been conducting RD&D on cement alternatives.<br><br>However, industry practitioners are eager and ready to tackle embodied carbon. At DOE's July 2022 National Energy Codes Conference, embodied carbon is a top 3 key innovative approaches that attendees feel that has not yet been covered in the discussion. |

## Read the Full Report

Hoyu Chong, "Closing the Gap: Priorities for the U.S. Department of Energy's Building RD&D Portfolio" (ITIF, August 2020), https://itif.org/publications/2022/08/22/priorities-for-department-energy-building-rdd-portfolio/.

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