RETROFITTING

OVERVIEW OF A HIGH-IMPACT DRAWDOWN SOLUTION

Buildings use electricity and natural gas for heating, ventilation and cooling (HVAC), water heating, lighting, and to power appliances and electronic devices. Retrofitting existing buildings to reduce energy demand can lower the GHG emissions due to these energy uses. This solution considers several key retrofitting options:

- Improving insulation/air sealing of existing buildings
- Replacing conventional lighting with LED lighting in both residential and commercial buildings
- Replacing conventional HVAC systems and gas- and oil-fired furnaces with high-efficiency heat pumps
- Installing water-saving devices such as low-flow fixtures and efficient appliances
- Replacing conventional thermostats with smart thermostats
- Using automated control systems in existing commercial buildings that can regulate heating, cooling, lighting, appliances, and more to maximize energy efficiency
- Using alternative roof designs such as green roofs, which line a roof with soil and vegetation, as well as cool roofs, which reflect solar energy to reduce a building's electricity demand and therefore reduce emissions

In addition, solutions that were not originally considered by Project Drawdown®, including replacing conventional windows and water heaters with high-efficiency units, recommissioning / retro-commissioning of existing commercial buildings, and dead band range expansion / human factors will also be considered under the Retrofitting bundle for the Drawdown Georgia project.

TECHNOLOGY AND MARKET READINESS

The technologies are mature and market ready, innovations continue to improve efficiency of retrofitting technologies. Historically in Georgia, retrofitting rates have been relatively low due to market barriers including high upfront costs, information asymmetry, transaction and administrative costs, and split/misplaced incentives and subsidies. However, policy improvements could make the solution workable by 2030.

LOCAL EXPERIENCE AND DATA AVAILABILITY

There is state-level data available for some solutions, and nationwide data available for many of the solutions that can be projected down to the state level. There is ample local experience available with retrofitting projects (both commercial and residential) in the state. There are also several state-level studies (including one performed by Nexant for Georgia Power) highlighting the cost-effective energy savings potential of retrofitting in Georgia.

TECHNICALLY ACHIEVABLE GHG REDUCTION POTENTIAL

Preliminary analysis based on NEMS data as obtained from EIA's Annual Energy Outlook 2018 (reference case vs. new-efficiency case, with U.S. level results proportioned for Georgia), suggests that many of the individual solutions do not necessarily meet the threshold of 1 Mt CO2 annual reduction. However, strategic combination of technologies (for both residential and commercial sectors) as part of a retrofit bundle can provide CO2 reduction potential well beyond the 1 Mt threshold. The CO2 reduction potential can be further increased by promoting replacement strategies that favor more efficient solutions relative to the baseline alternatives for technologies that have reached end-of-life and are in need to replacement.

COST COMPETITIVENESS

Review of literature and expert survey feedback indicate that the individual solutions that make up a retrofit are typically cost-effective, with heat pumps being potentially not cost effective depending on the type of retrofit (Nadel & Ungar, 2019). However, the bundles can be selected with emphasis on cost-effective solutions, and highly cost-effective solutions like smart thermostats and LED lighting can be used to offset less cost-effective solutions like heat pumps. We will explore Georgia-specific cost effectiveness during the next phase of research

BEYOND CARBON ATTRIBUTES

According to the 2017 American Housing Survey, Georgia has an estimated 4.2 million homes, with 2.8 million of these being single-family detached residential units [4].

The greatest social benefits from the implementation of retrofitting can be seen through air quality improvements [5]. These improvements are a result of an increase in energy efficiency and reduction in energy demand from residential and commercial buildings [6,7,8]. Improved building health can lead to increased productivity and lower absenteeism particularly in commercial buildings and office environments. However, Atlanta ranks fourth highest in median energy burden levels and third highest among low income household populations compared to other major cities in the United States [3]. This indicates that there is a "beyond energy" benefit to retrofitting residential homes to decrease economic hardship of families [4]. However, access to retrofits is often cost-prohibitive for low income communities without external financing and support. Without inclusion of lower income residents, retrofitted home value increases can contribute to neighborhood gentrification and a reduction in affordable housing [9].

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