



ENERGY SAVINGS WHITEPAPER

An analysis of the unique 75F[®] Outside Air Optimization[™] solution in U.S. stand-alone retail, both new construction and retrofit.

INTRODUCTION

This report comprehensively quantifies the potential energy savings of 75F® Outside Air Optimization™ in U.S. stand-alone retail buildings. It leverages U.S. Department of Energy (DOE) benchmarks and characteristics and independent research from the National Renewable Energy Lab (NREL) across multiple cities, annualized to capture total building, HVAC electricity, and natural gas EUI reductions across all U.S. climate zones, at multiple utility rates.

The data in this report reflects the current savings potential of 75F's proprietary outside air sequences in retrofit and new construction retail facilities. While 75F's IoT-based applications may be combined in many buildings based on the equipment and needs of the space, this data stands alone for each application type. Buildings with combined application types will have the potential for higher energy savings than those modeled here.

- ▶ **Total building** energy savings of up to **19%** in both retrofit and new construction stand-alone retail
- ▶ Energy savings potential is **even across the U.S.**, with **15%** total building energy reductions common for the middle and southern regions of the country

METHODOLOGY

The U.S. Department of Energy (DOE) is responsible for conducting research about commercial building systems and energy efficiency in coordination with national laboratories, private industry, and universities, with a stated goal of developing more energy efficient buildings and eventually reaching zero energy buildings. This research relies heavily on standardized benchmarks developed and shared by Lawrence Berkeley National Laboratory (LBNL), Pacific Northwest National Laboratory (PNNL), and the National Renewable Energy Laboratory (NREL), the nation's primary laboratory for renewable energy and energy efficiency research and development.

CLIMATE ZONES

The retail facilities analyzed in this report are in 16 cities representing all U.S. climate zones: Honolulu, HI; Tampa, FL; Tucson, AZ; Atlanta, GA; El Paso, TX; San Diego, CA; New York, NY; Albuquerque, NM; Seattle, WA; Buffalo, NY; Denver, CO; Port Angeles, WA; Rochester, MN; Great Falls, MT; International Falls, MN; and Fairbanks, AK. Efficiencies are based on the American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) Standard 90.1-2016 for new construction buildings, and Standard 90.1-2004 for retrofit buildings. All buildings have varying schedules, occupancy, component efficiency, locations and orientation, lighting loads, plug loads, HVAC sequences and varying ventilation requirements based on zone use.

STAND-ALONE RETAIL

Stand-alone retail facility HVAC energy consumption is based on a single-story building with 24,695 square feet; a packaged air conditioning unit for cooling of back spaces, core retail area, point of sale, and front retail area. Front entry does not have cooling. A gas furnace inside the packaged air conditioning unit heats the main building, and a stand-alone gas furnace heats the front entry. Distribution and terminal units include constant air volume air distribution and four single-zone RTUs.

RESULTS | [Stand-Alone Retail, Retrofit](#)

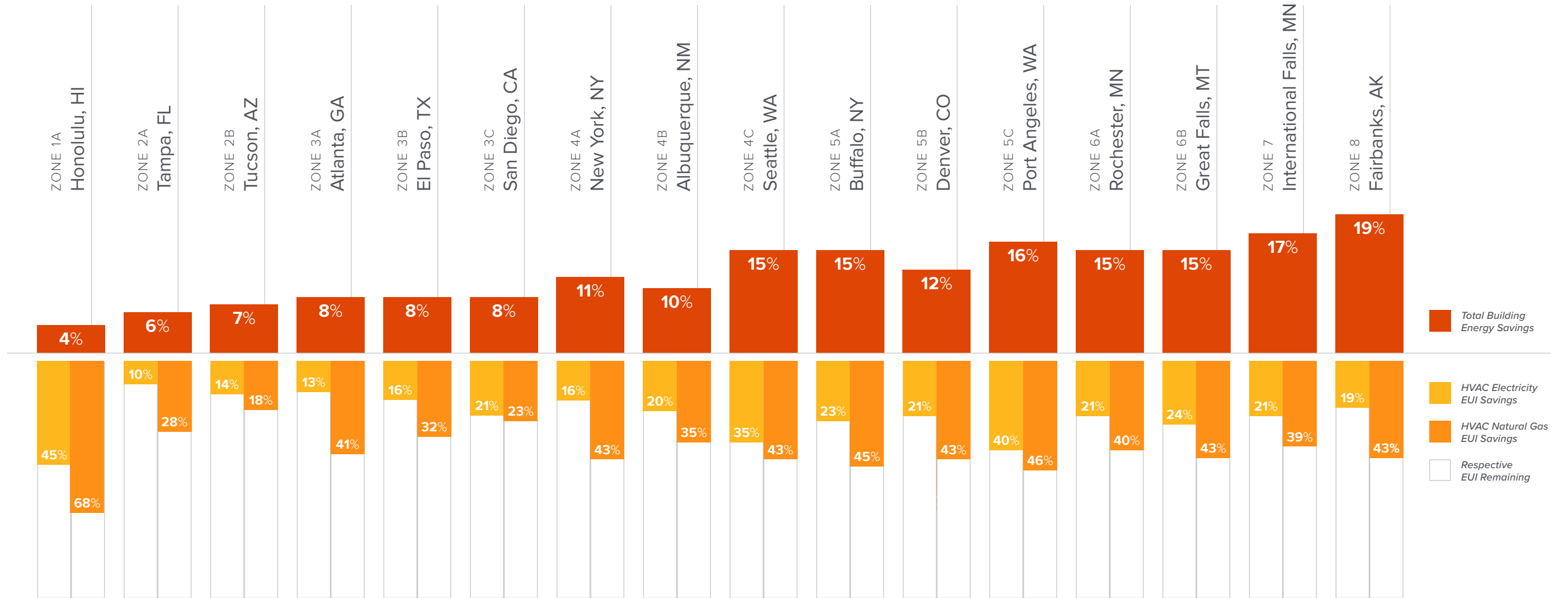
RESULTS | [Stand-Alone Retail, New Construction](#)

APPLICATION

75F® Outside Air Optimization™ (OAO) is an application that combines hardware, software, and real-time weather data providing advanced sequences of operation from rooftop economizers to built-up air handlers in a wide range of commercial buildings. While OAO's three primary benefits are improved efficiency, comfort and indoor air quality, this report will focus on OAO's efficiency potential. NREL's study includes three OAO control strategies: OAO, OAO Interval Modulation (IM), and OAO Smart Demand Control Ventilation (DCV). This report focuses exclusively on OAO IM data, though specific control strategy descriptions are available for all three.

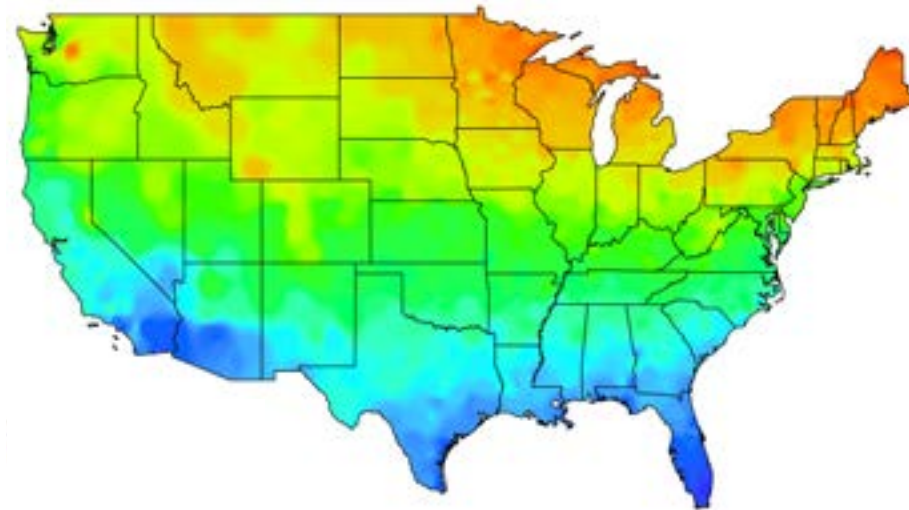
- ▶ **OAO** reduces the required ventilation outdoor air leveraging additional sensors and optimized setpoints.
- ▶ **OAO IM** cycles the fan to maintain minimum outdoor air ventilation. Applied in any building with constant-speed fans in the HVAC equipment that provides ventilation to occupants.
- ▶ **OAO Smart DCV** uses CO2 sensors to detect occupancy and adjusts ventilation by room in VAV systems. Applied in buildings with central HVAC systems serving multiple zones leveraging traditional VAV terminal units.

RESULTS | STAND-ALONE RETAIL, RETROFIT

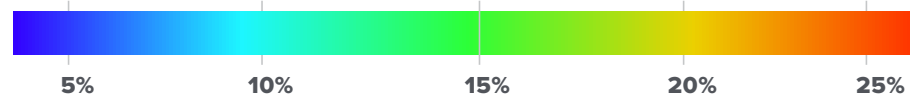


HIGHLIGHTS | STAND-ALONE RETAIL, RETROFIT

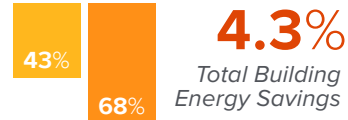
ANNUAL SAVINGS BY CLIMATE ZONE



% Annual Savings



ZONE 1A
Honolulu, HI



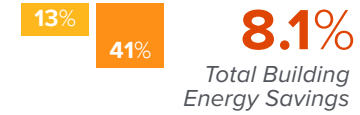
ZONE 2A
Tampa, FL



ZONE 2B
Tucson, AZ



ZONE 3A
Atlanta, GA



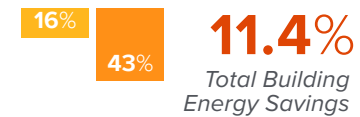
ZONE 3B
El Paso, TX



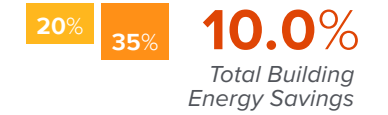
ZONE 3C
San Diego, CA



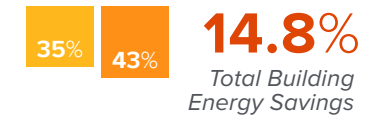
ZONE 4A
New York, NY



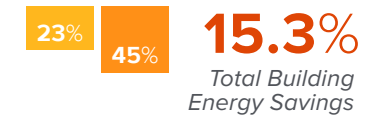
ZONE 4B
Albuquerque, NM



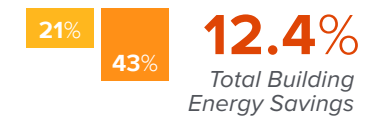
ZONE 4C
Seattle, WA



ZONE 5A
Buffalo, NY

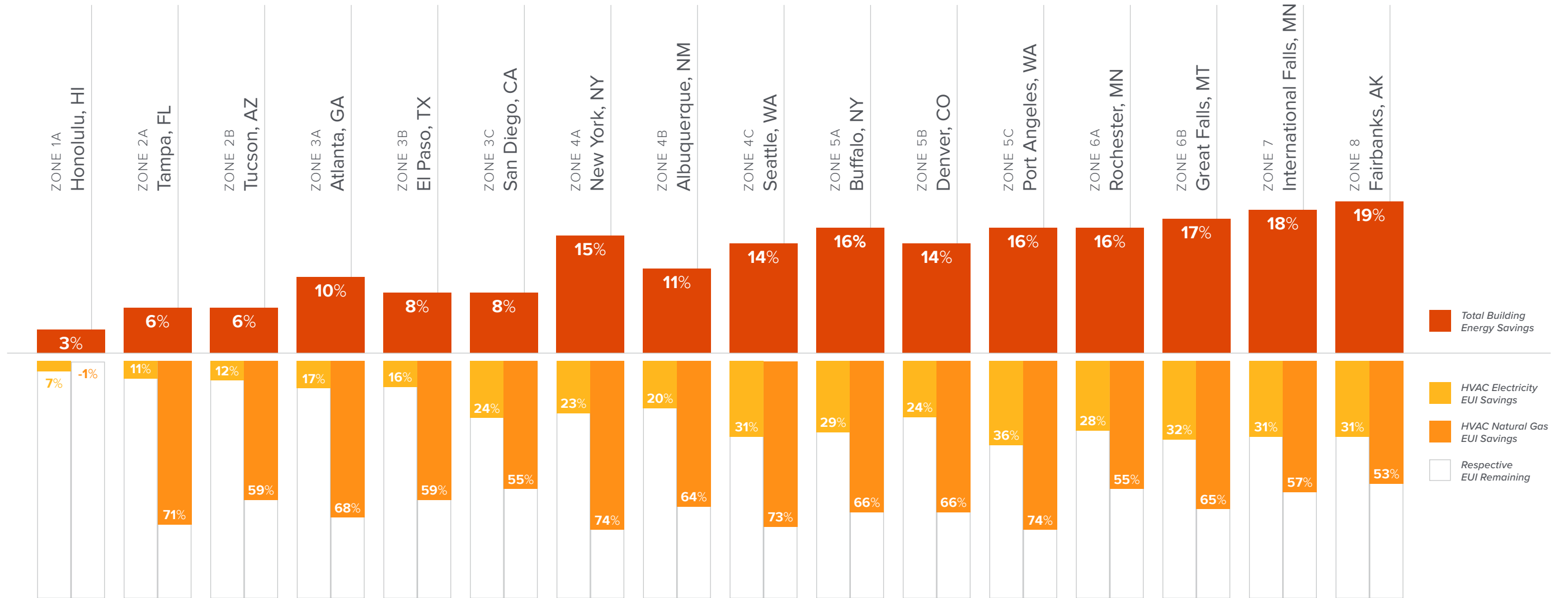


ZONE 5B
Denver, CO



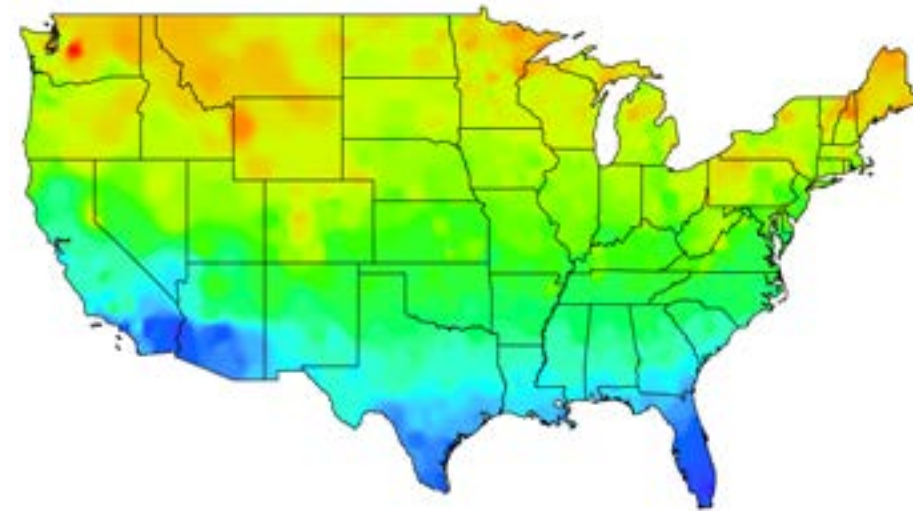
■ HVAC Electricity EUI Savings
 ■ HVAC Natural Gas EUI Savings

RESULTS | STAND-ALONE RETAIL, NEW CONSTRUCTION



HIGHLIGHTS | STAND-ALONE RETAIL, NEW CONSTRUCTION

ANNUAL SAVINGS BY CLIMATE ZONE



% Annual Savings



ZONE 1A
Honolulu, HI

7% **-1%** **3.5%**
Total Building Energy Savings

ZONE 2A
Tampa, FL

11% **5.9%**
Total Building Energy Savings

ZONE 2B
Tucson, AZ

12% **5.9%**
Total Building Energy Savings

ZONE 3A
Atlanta, GA

17% **9.8%**
Total Building Energy Savings

ZONE 3B
El Paso, TX

16% **8.2%**
Total Building Energy Savings

ZONE 3C
San Diego, CA

24% **8.4%**
Total Building Energy Savings

ZONE 4A
New York, NY

23% **14.8%**
Total Building Energy Savings

ZONE 4B
Albuquerque, NM

20% **10.6%**
Total Building Energy Savings

ZONE 4C
Seattle, WA

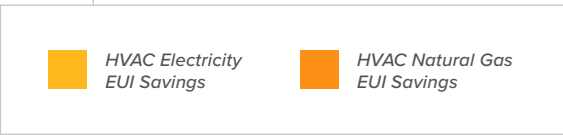
31% **14.2%**
Total Building Energy Savings

ZONE 5A
Buffalo, NY

29% **16.3%**
Total Building Energy Savings

ZONE 5B
Denver, CO

24% **14.5%**
Total Building Energy Savings



CONCLUSION

This analysis shows significant savings from 75F® Outside Air Optimization™ sequences in stand-alone retail buildings, particularly in the northern portions of the country where savings begin around 15% and climb from there. Both new construction and retrofit retail buildings have the potential for up to 19% total building energy savings in representative cities, though energy reduction is higher in counties not explicitly

documented in this report. Both vintages consistently demonstrate savings between 10% and 15% in the middle and lower regions of the U.S. Where savings are the lowest in areas such as Florida, southern California, and southern Texas, the data still evens out around 6% and 10% total building energy reductions.