

ENERGY SAVINGS WHITEPAPER

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



INTRODUCTION

This report comprehensively quantifies the potential energy savings of 75F® Outside Air Optimization™ in U.S. strip malls. 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 strip malls. 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 **18%** in retrofit strip malls
- ▶ **Total building** energy savings of up to **26%** for new construction strip malls
- ▶ Energy savings potential is **even across the U.S.**, with climate zones 4C and 5B seeing the highest savings

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 strip malls 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.

STRIP MALLS

Strip mall HVAC energy consumption is based on a single-story building with 22,500 square feet, a packaged air-conditioning unit for back spaces, core retail, point of sale, and front retail for cooling and a gas furnace inside the packaged air-conditioning unit for heating. Distribution and terminal units include 10 single-zone rooftop units with constant-air volume air distribution with one unit serving one store.

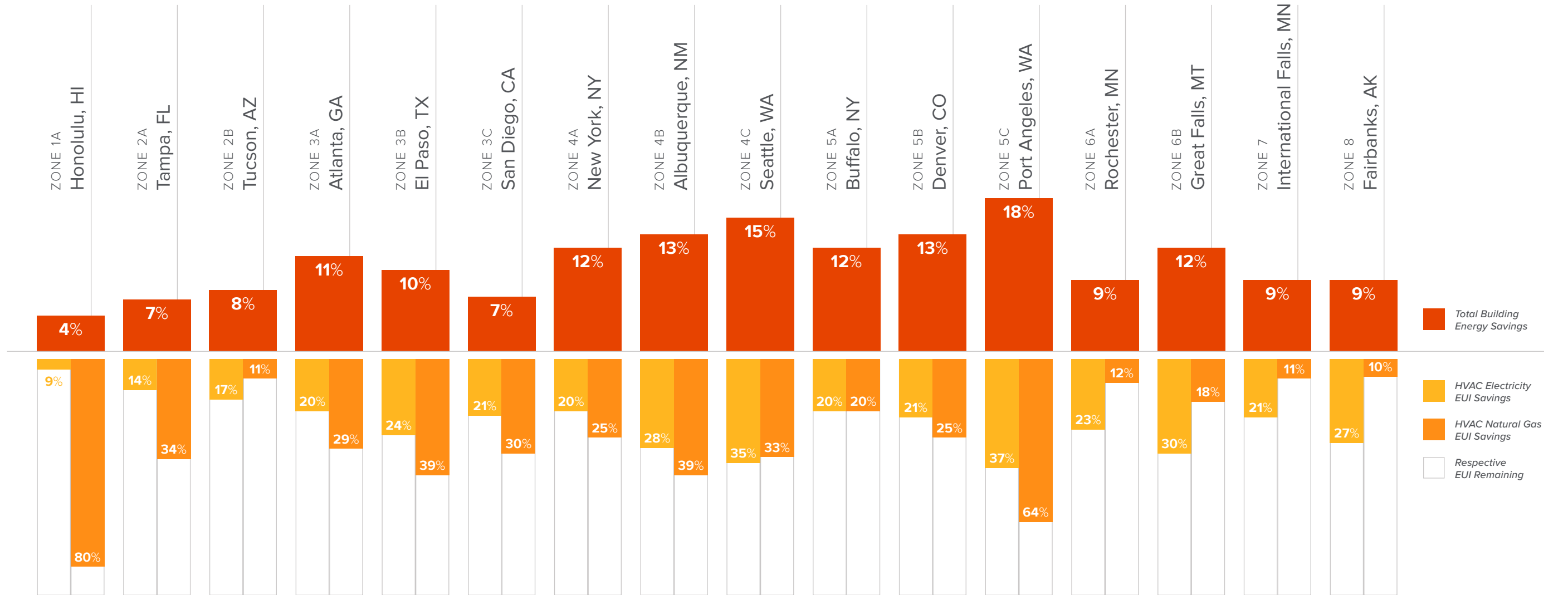
RESULTS | [Strip Malls, Retrofit](#)

RESULTS | [Strip Malls, New Construction](#)

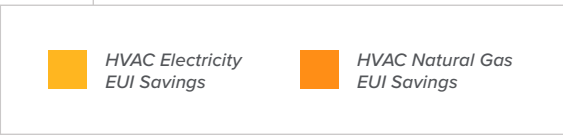
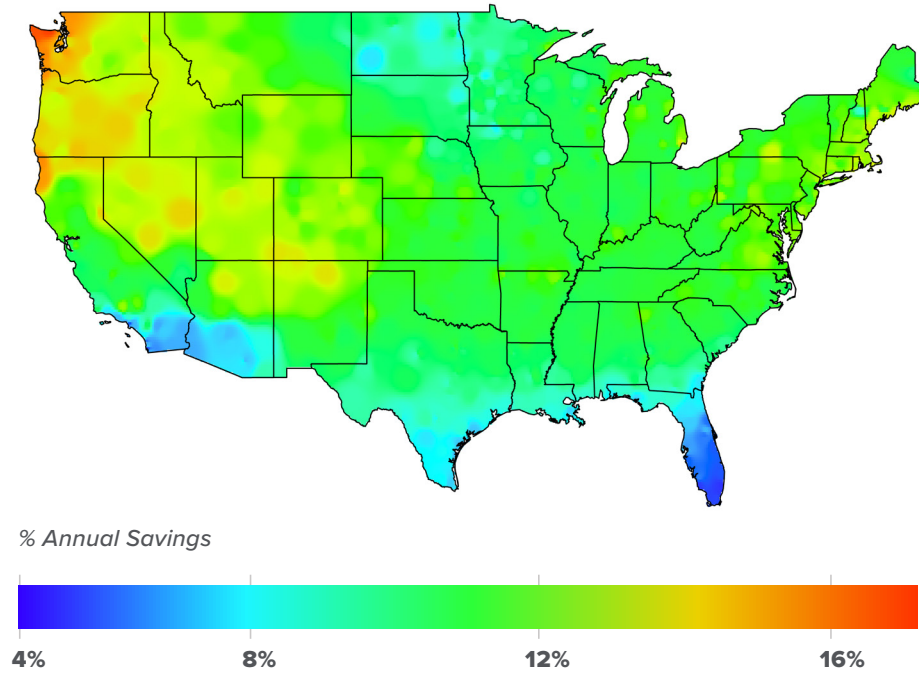
75F[®] Outside Air Optimization[™]

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.



ANNUAL SAVINGS BY CLIMATE ZONE



ZONE 1A
Honolulu, HI

9% 80% **4.3%**
Total Building Energy Savings

ZONE 2A
Tampa, FL

14% 34% **6.6%**
Total Building Energy Savings

ZONE 2B
Tucson, AZ

17% 11% **9.1%**
Total Building Energy Savings

ZONE 3A
Atlanta, GA

20% 29% **10.7%**
Total Building Energy Savings

ZONE 3B
El Paso, TX

24% 39% **10.1%**
Total Building Energy Savings

ZONE 3C
San Diego, CA

21% 30% **7.3%**
Total Building Energy Savings

ZONE 4A
New York, NY

20% 25% **12.2%**
Total Building Energy Savings

ZONE 4B
Albuquerque, NM

28% 39% **12.8%**
Total Building Energy Savings

ZONE 4C
Seattle, WA

35% 33% **14.5%**
Total Building Energy Savings

ZONE 5A
Buffalo, NY

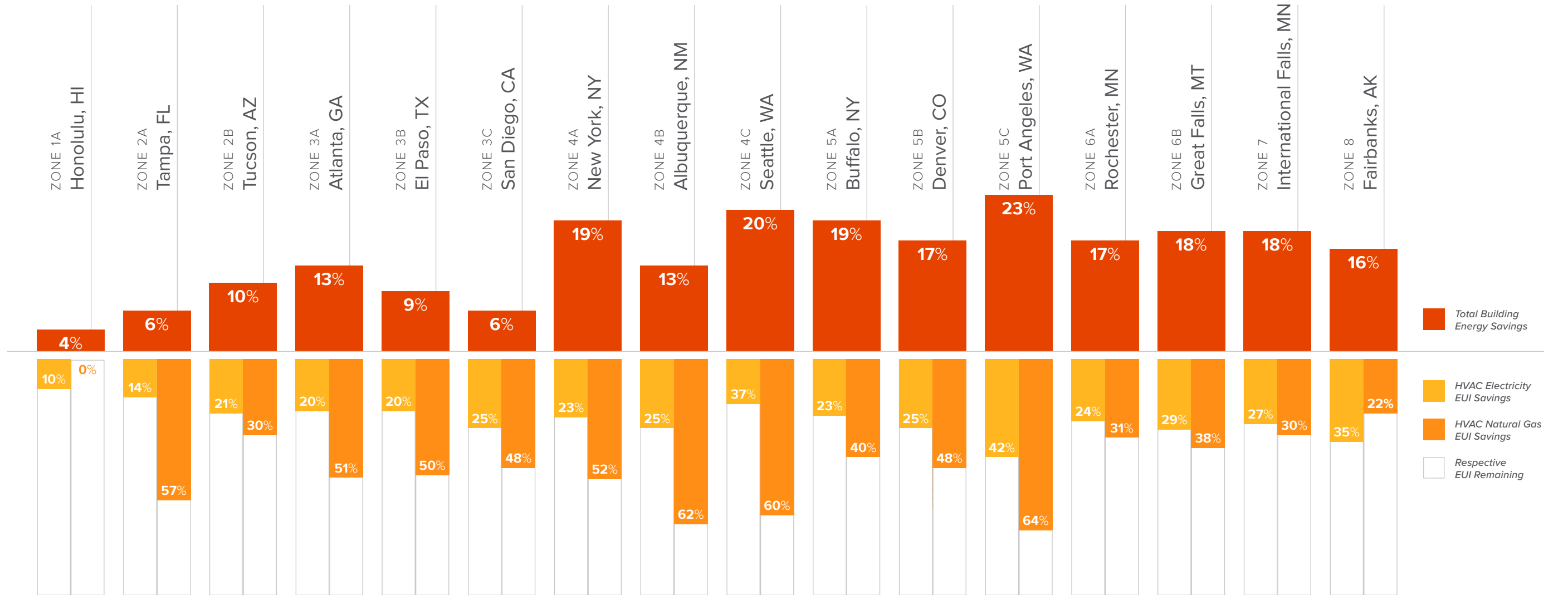
20% 20% **11.6%**
Total Building Energy Savings

ZONE 5B
Denver, CO

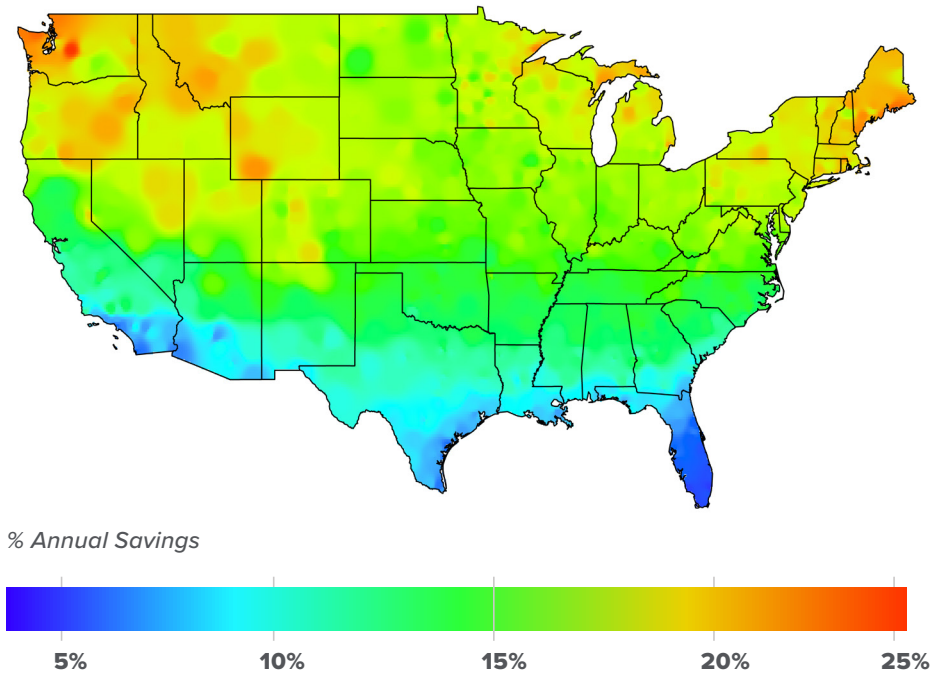
21% 25% **13.1%**
Total Building Energy Savings

RESULTS | STRIP MALLS, NEW CONSTRUCTION

◀ Methodology



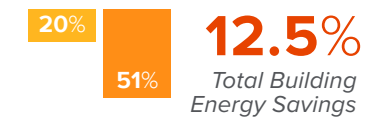
ANNUAL SAVINGS BY CLIMATE ZONE



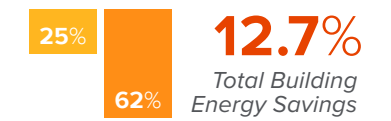
ZONE 1A
Honolulu, HI



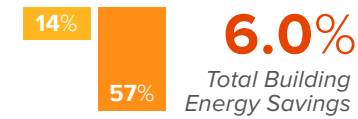
ZONE 3A
Atlanta, GA



ZONE 4B
Albuquerque, NM



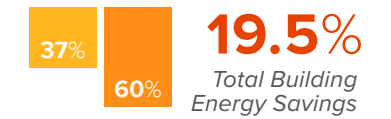
ZONE 2A
Tampa, FL



ZONE 3B
El Paso, TX



ZONE 4C
Seattle, WA



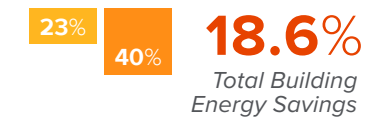
ZONE 2B
Tucson, AZ



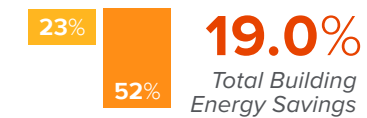
ZONE 3C
San Diego, CA



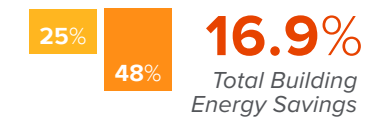
ZONE 5A
Buffalo, NY



ZONE 4A
New York, NY



ZONE 5B
Denver, CO



■ HVAC Electricity
EUI Savings ■ HVAC Natural Gas
EUI Savings

CONCLUSION

This analysis shows significant savings from 75F® Outside Air Optimization™ sequences, particularly in the Pacific northwest (climate zone 4C and parts of 5B) and parts of the Rocky Mountain range in climate zone 5B. New construction strip malls have the potential for greatest efficiency improvements in this report with savings of up to 26% total building energy use compared to 18% in retrofit use cases. These higher numbers

are typically found in the aforementioned climate zones, though new builds also see high savings on the upper east coast and midwest. Total building energy savings of 10% to 12% are common across much of the country in retrofits, and 12% to 20% in new construction. Where total building energy savings are below 10%, building operators can still reliably expect reductions in HVAC electricity and natural gas EUIs.

