



# SUSTAINABILITY SAVANTS

## ASHRAE LowDown Showdown

### ASHRAE 2017 Building Performance Analysis Conference

Building Type: Office/Warehouse  
Total Floor Area: 61,268 ft<sup>2</sup>  
Location: Virginia

#### Total Energy Usage

**1,800** MBtu

#### Site EUI

**18.6** kBtu/sf/year

#### Source EUI

**55.3** kBtu/sf/year

#### Annual Electricity Usage

**0** Therms

#### Annual NG Usage

**0** Therms

#### Annual Water Usage

**12,500** gal

#### Annual Electricity Cost

**\$25,500**

#### Annual NG Cost

**\$0**

#### Annual Water Costs

**\$500**

#### Total Annual Costs

**\$26,000**

#### CPSF

**\$0.42**

#### Total Energy Generation

**724,000** kBtu

#### Net Zero Energy

**1,078,000** kBtu

#### Carbon Equivalent

**220** tons CO<sub>2</sub>/per year

#### Team

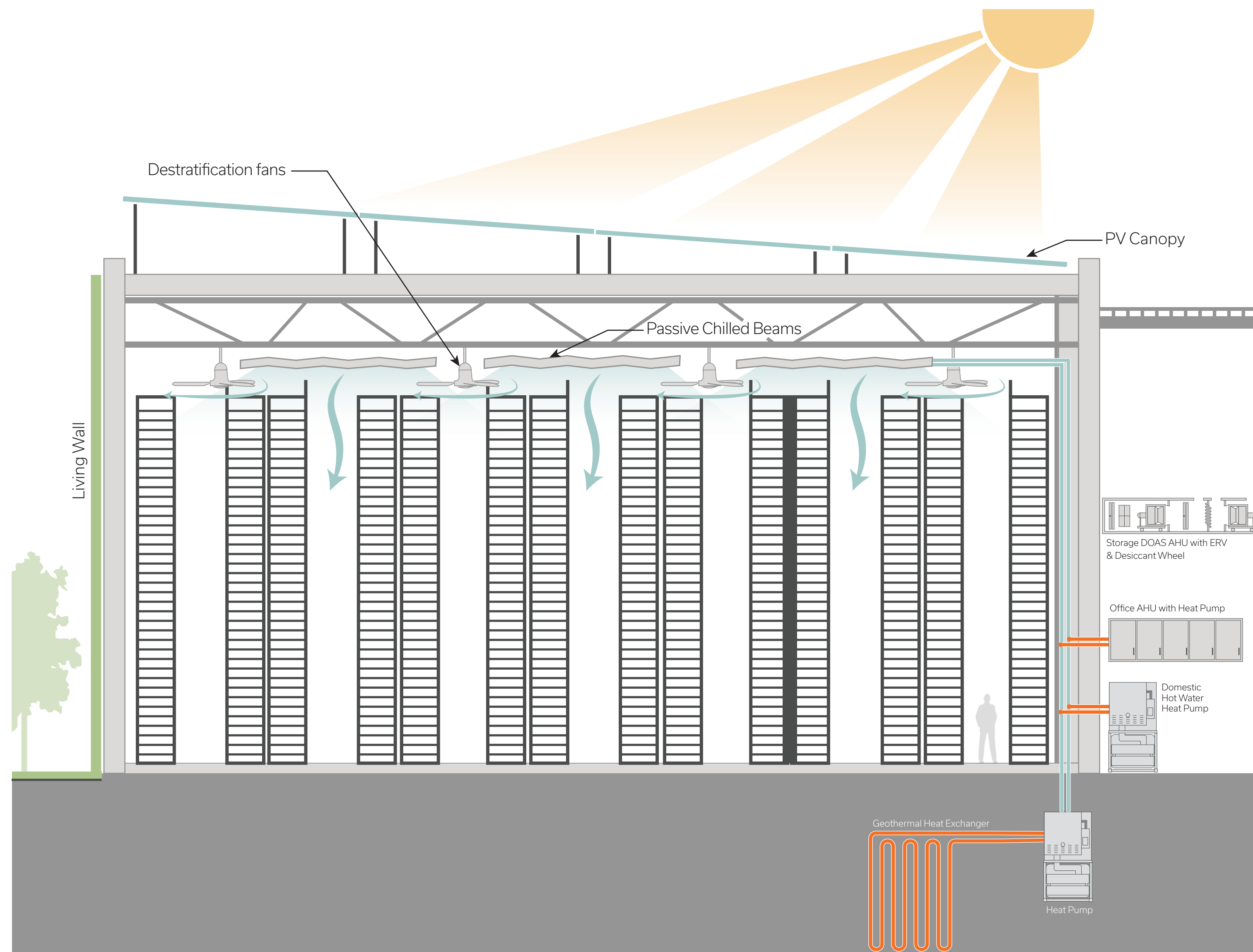
Captain  
James Cullin, PhD, PE

Member  
Greg Bucher

Member  
Kasey Richards

Member  
Charles White

Coach  
Alan Shepherd, PE, CEng

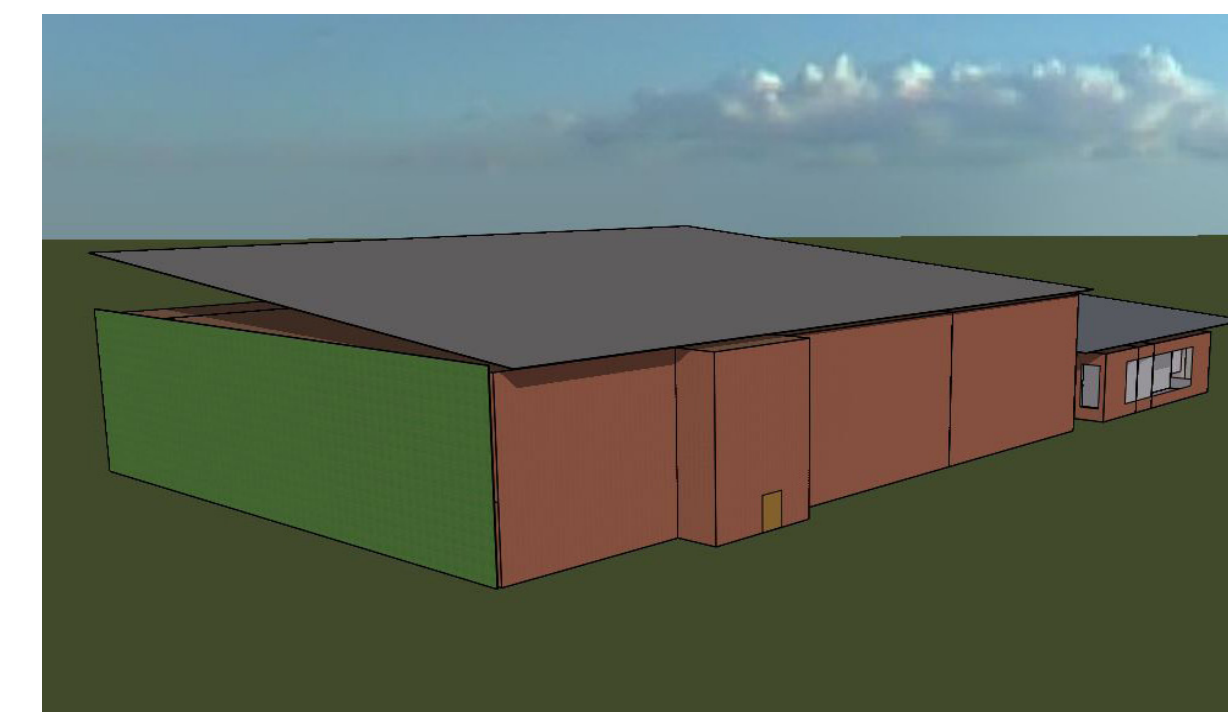
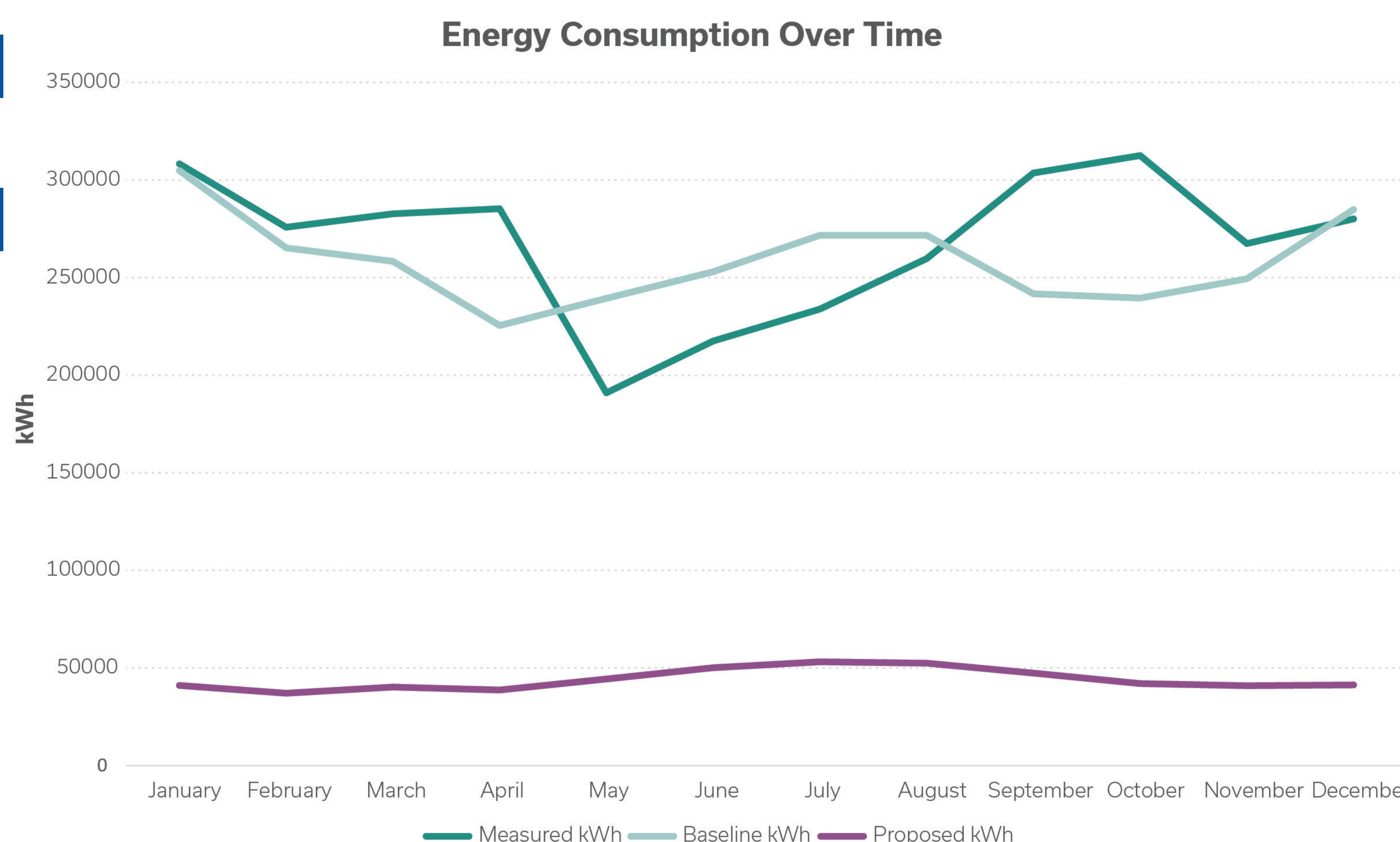


#### Model Description

The collections facility building has been modeled in the IES Virtual Environment 2017. The existing conditions were developed according to the provided documentation, while the proposed design was assembled to account for all energy savings strategies. The integrated package results in roughly 90% energy savings after the inclusion of photovoltaic generation.

#### Energy Savings Strategies

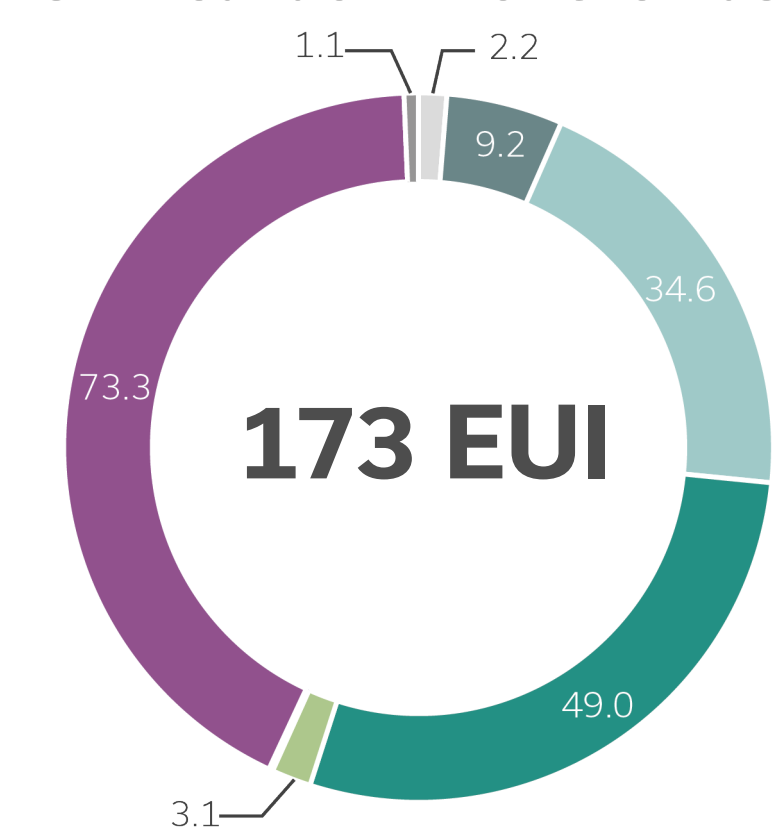
The major step in reducing energy consumption for this building was to isolate the ventilation load from other space loads. Reducing envelope gains through improved insulation and solar shading, as well as ensuring via vestibules and operational management that infiltration is mitigated. This allows for a DOAS unit to provide only ventilation air to the storage rooms; it includes an 80% effective total heat recovery unit, desiccant wheel recharged via compressor heat, and evaporative pad humidifier. Large fans destratify the tall spaces. Any remaining sensible conditioning is performed by passive chilled beams, which are served by a vertical geothermal loop. The office area is served by an AHU that also is connected to the geothermal field. LED lights with data center-style "follow me" occupancy controls greatly reduce lighting energy. Solar panels on the rooftop canopy provide roughly one-third of the energy used by the redesigned building.



## 6 Steps to Passive Design



#### EUI Breakdown for the Baseline



#### EUI Breakdown for the Proposed Design

