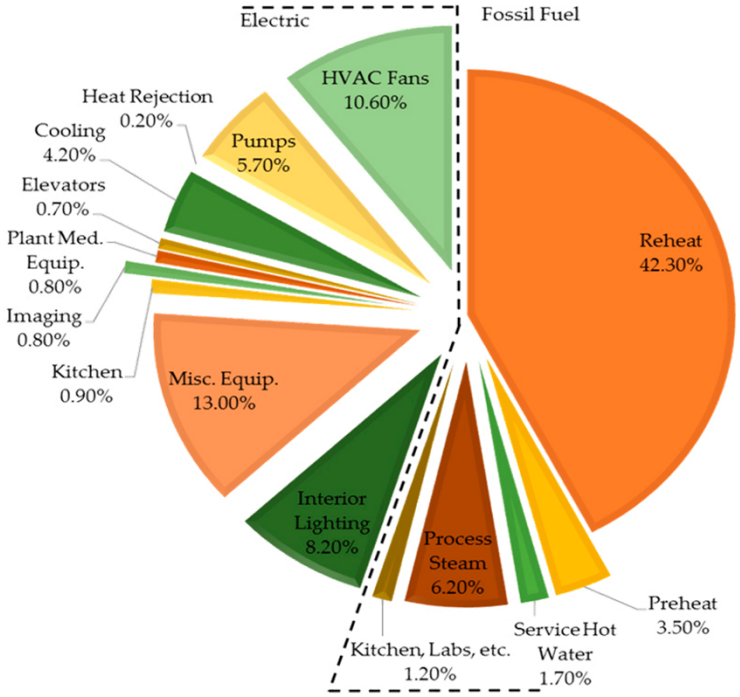
# Custom HVAC Energy Efficiency Measures

# Energy in Healthcare




Ref: Targeting100!

- 55% of Thermal Energy from Fossil Fuels
- Reheating Systems 45% of Thermal Load
- Control Setbacks = Large Opportunity for Thermal Energy Reduction
- Setbacks Implemented as Custom HVAC Energy Conservation Measure

# ECM Project Statistics

**Projects: 122**

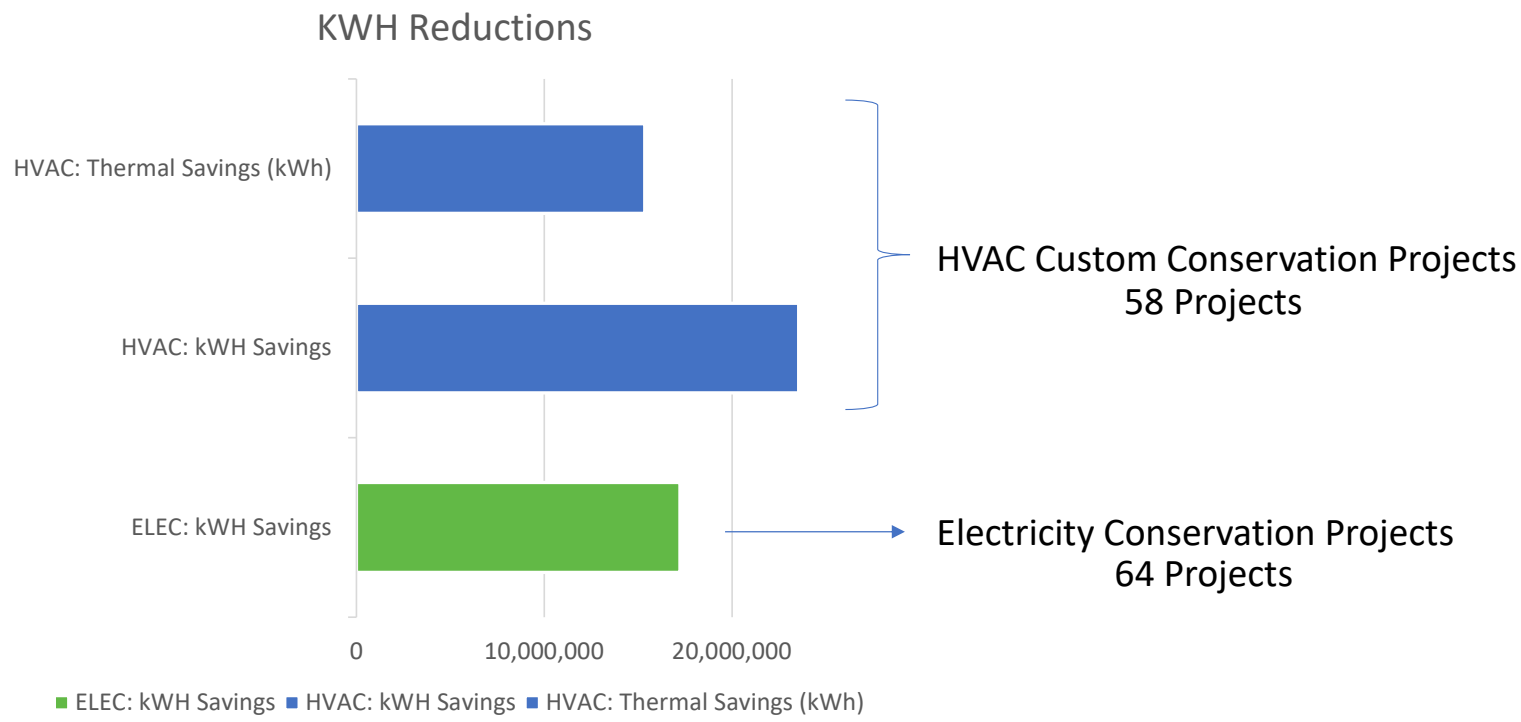
**Lighting: 64** **Custom HVAC: 58**

**Electricity Savings: 40,772,656 kWh**

**Natural Gas Savings: 52,420 MMBTU**

**Avoided $CO_2$ Emissions: 39,147,415 lbs**

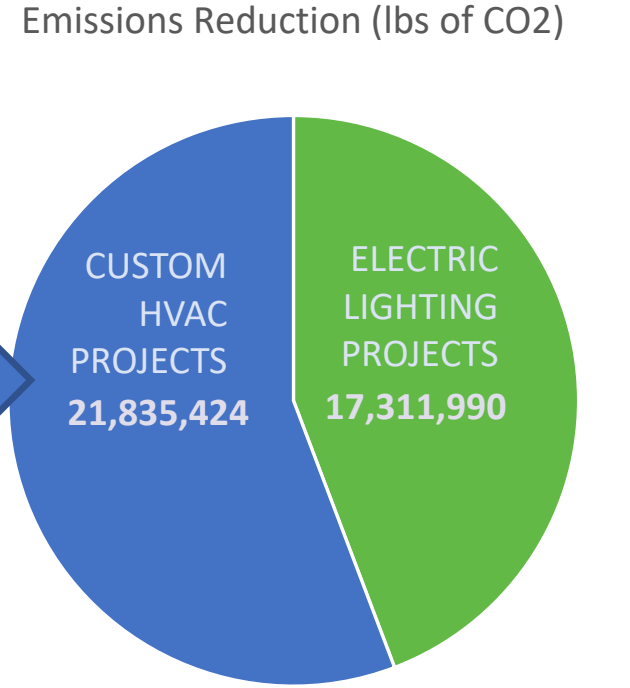
# HVAC ECMs Reduce Thermal Energy AND Electricity




**Energy Reduction Projects Last 4 Years**

# Custom HVAC ECM's Reduce More Emissions

Despite Fewer Projects, Custom HVAC Projects Responsible for **Majority of Emissions Reductions**



# Recent Lighting Project Example

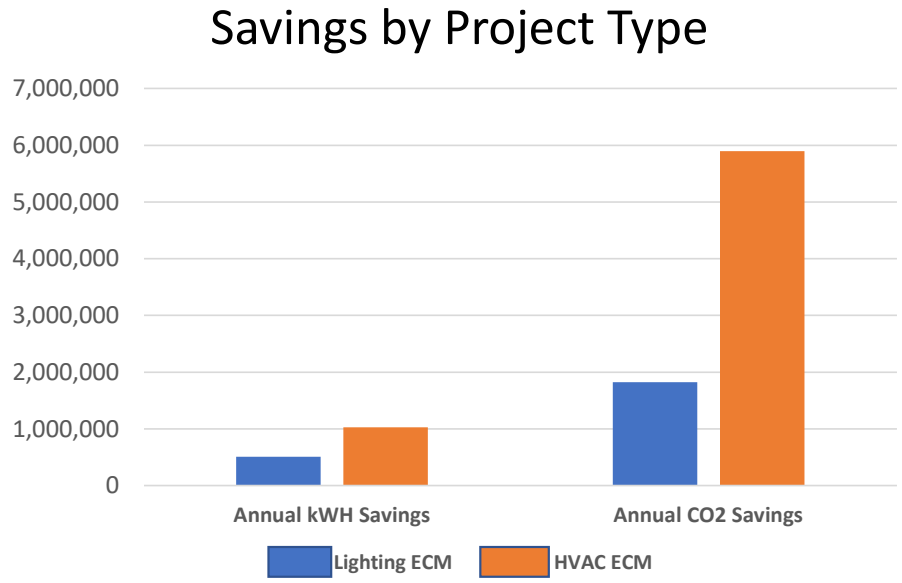
- **Total Fixture Upgrades:** 3,215
- **Annual kWh Savings:** 509,794
- **Annual NG Therms Saved:** 0
- **Annual $CO_2$ # Reduction:** 1,825,062
- **Implementation Time:** 162 Days

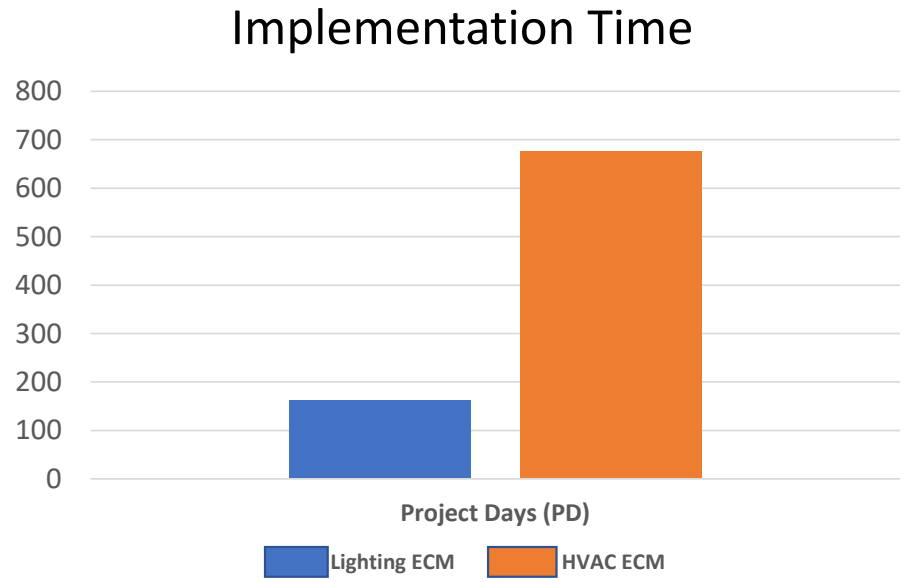
# Recent Custom HVAC Project Example

- **Total VAV Upgrades:** 181
- **Annual kWh Savings:** 1,030,090
- **Annual NG Therms Savings:** 189,228
- **Annual $CO_2$ # Reduction:** 5,894,549
- **Implementation Time:** 677 Days

# HVAC ECMs Offer Greater Carbon Benefits

| Project | Annual kWH Savings | Annual $CO_2$# Savings | Project Days (PD) |
|---|---|---|---|
| Lighting ECM | 509,794 | 1,825,062 | 162 |
| Custom HVAC ECM | 1,030,090 | 5,894,549 | 677 |



# Custom HVAC vs Lighting ECM

- HVAC ECMs:
  - Higher kWH reductions
  - ALL thermal reductions
  - Higher CO2 reductions
  - On average process is 4x longer

# Is Process Contributing to Program Performance?

**PA Custom HVAC Program Performance**
**2023 Planned vs. Actual**

| | All Custom HVAC | Actual Net Annual MWh |
|---|---|---|
| **Year** | **Plan Net Annual MWh** | **Plan Actual MWh** |
| 2023* | 13,860 | **3,122** |

* 2023 Actual New Annual MWh is data through Q2 2023 and is calculated from KPI 5. (34,967 Net Lifetime MWh)/(average measure life from plan of 11.2 years).

**Less than 25% of Annual Goal Completed with 3 Months to Go**

# Recent Project Challenges

# Example #1: 2023 New Boiler Project

- Project completed in March 2023
- 2nd of 2 Boilers Upgraded
- MRD for 2nd boiler required data for the following firing rates:
  - 25%, 50%, 75% & 100%
- Installing contractor provided 25%, 36% & 61%.
- Higher firing rates are not possible because installation designed with capacity for future expansion
- PA refused to issue incentive because the exact fire-rates were not provided despite technical explanation

**Issue: Lack of reasonable engineering judgment in determining project success**

# Example #2: 2022 Custom HVAC Energy Conservation Project

- Project completed in November 2022
- MRD documents submitted in December 2022 to Gas and Electric PA
- Electric PA confirmed completion and issued incentive
- Gas PA rejected MRD, claimed “zero” savings refused to honor LOA incentive
- Customer appealed & informed Gas PA they were using incorrect MRD; Gas PA confirmed that this was the case and committed to resolve in timely manner
- No incentive received to date; 9 months from initial submission of post-install & no timeframe for resolution

## Issues:

- Lack of PA Coordination
- Lack of Expediency in Resolving Issues

# Example #3: 2023 New Construction Project

- In May of 2023 Customer submits project design documents to PA
- In June PA indicates no saving possible in project
- July Customer & PA meet and PA agrees savings are possible, PA agrees to assign TA vendor
- September TA vendor notifies customer that correct application and MOU must be submitted before TA can begin

## Issues:

- Lack of PA Support in Administering Program
- Unnecessary Delays in Process

# Example #4: 2023 Custom HVAC Energy Conservation Project

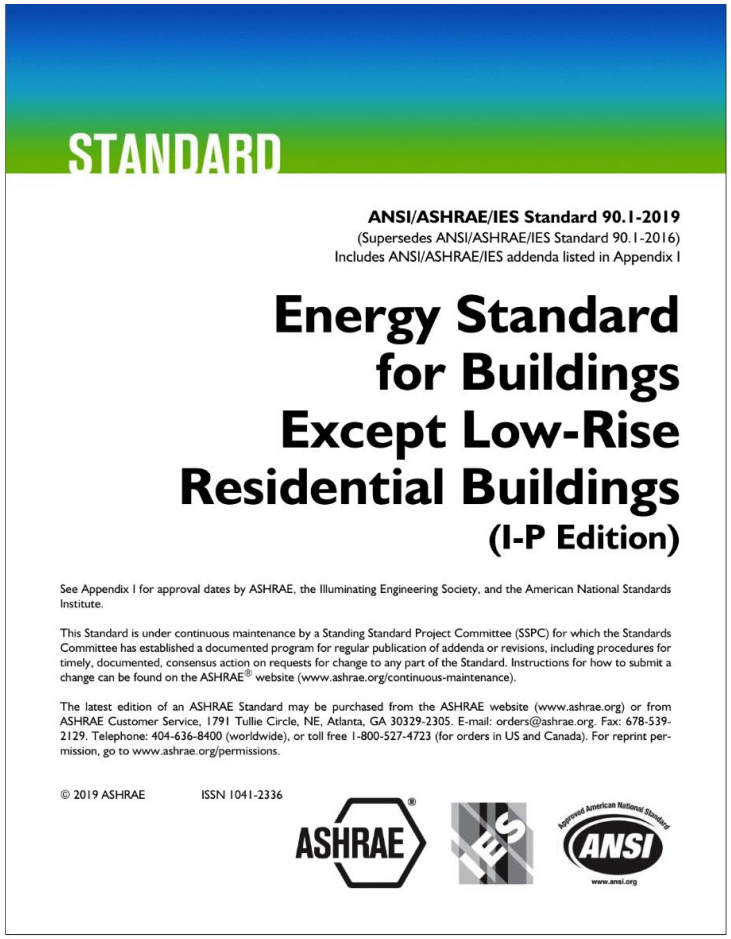
- Application submitted in May 2023 with energy study, calculations & MRD
- PA rejected use of fan energy calculations in determining baseline energy usage
- PA insisted that repairs and existing fan curves were required to establish baseline

**Issue:**

- Lack of reasonable engineering judgement
- Disregard of National Energy Code requirements

# ASHRAE 90.1 Energy Code

**PA rejected use of fan energy calculations in determining baseline energy usage**



STANDARD

**ANSI/ASHRAE/IES Standard 90.1-2019**
(Supersedes ANSI/ASHRAE/IES Standard 90.1-2016)
Includes ANSI/ASHRAE/IES addenda listed in Appendix I

**Energy Standard for Buildings Except Low-Rise Residential Buildings**
**(I-P Edition)**

See Appendix I for approval dates by ASHRAE, the Illuminating Engineering Society, and the American National Standards Institute.

This Standard is under continuous maintenance by a Standing Standard Project Committee (SSPC) for which the Standards Committee has established a documented program for regular publication of addenda or revisions, including procedures for timely, documented, consensus action on requests for change to any part of the Standard. Instructions for how to submit a change can be found on the ASHRAE® website (www.ashrae.org/continuous-maintenance).

The latest edition of an ASHRAE Standard may be purchased from the ASHRAE website (www.ashrae.org) or from ASHRAE Customer Service, 1791 Tullie Circle, NE, Atlanta, GA 30329-2305. E-mail: orders@ashrae.org. Fax: 678-539-2129. Telephone: 404-636-8400 (worldwide), or toll free 1-800-527-4723 (for orders in US and Canada). For reprint permission, go to www.ashrae.org/permissions.

 ISSN 1041-2336

ASHRAE IES Approved American National Standard ANSI www.ansi.org

**"G3.1.2.9 System Fan Power**
*System* fan electrical power for supply, return, exhaust and relief (excluding power to fan powered *VAV* boxes) shall be calculated using the following formulas;"

**G3.1.2.9 System Fan Power**

*System* fan electrical power for supply, return, exhaust, and relief (excluding power to fan-powered *VAV* boxes) shall be calculated using the following formulas:

For *Systems* 1 and 2,

$$P_{fan} = \text{CFMs} \times 0.3$$

For *Systems* 3 through 8, and 11, 12, and 13,

$$P_{fan} = \text{bhp} \times 746/\text{fan motor } \textit{efficiency}$$

For *Systems* 9 and 10 (supply fan),

$$P_{fan} = \text{CFMs} \times 0.3$$

For *Systems* 9 and 10 (non-*mechanical cooling* fan if required by Section G3.1.2.8.2),

$$P_{fan} = \text{CFM}_{nmc} \times 0.054$$

where

$P_{fan}$ = electric power to fan motor, W
bhp = brake horsepower of baseline fan motor from Table G3.1.2.9

# Common Challenges Across PAs

- Lack of transparency in application process (especially timeframes)
- Lack of PA support during process
- Unnecessary delays – extended timeframe without cause
- Lack of PA coordination
- Lack of reasonable engineering judgement
- Application of unreasonable standards & rejection of industry standard practice

# Improvement Suggestions

- Establish minimum standards for Custom HVAC Technical Analysis (TA) & MRDs
- Form group to develop Custom HVAC TA minimum standards with:
  - PA Engineers
  - TA Vendors
  - Design Engineers
  - Customers
- Allow customer funded TA with 100% reimbursement
- Encourage TA vendor impartiality
- Completed TA's that meet minimum standards automatically approved for Letter of Agreement (LoA) [Incentive offer]
- Final incentive based on actual MRD at close-out