Cool Roof Rating Council (CRRC)
Annual General Membership Meeting

UNDER 1 ROOF

High-Solar-Reflectance Roofs for Low-Income Homes in San Antonio

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BEFORE AFTER

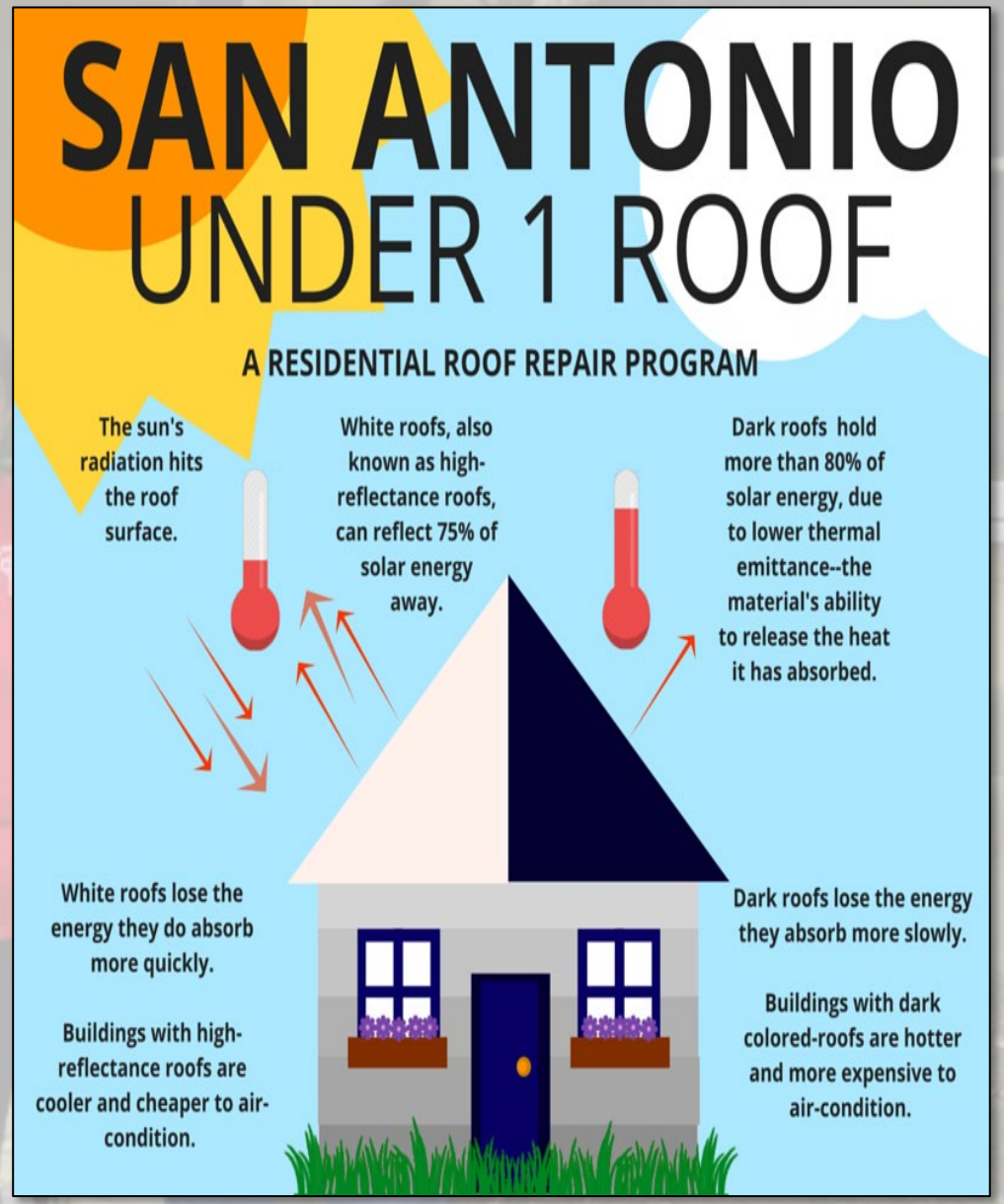
PROGRAM OBJECTIVES

- Maintain home integrity by addressing roofing needs
- Improve energy efficiency and reduce utility bills
- Demonstrate benefits of cool roofs to builders and residents

Source: City of San Antonio Neighborhood and Housing Services Department

PROGRAM BENEFITS

- Maintain home structure and stability.
- Improve Indoor Comfort.
- Reduce Overall Attic Temperature.
- Decrease Roof Maintenance.
- Energy Savings.



Source: City of San Antonio Neighborhood and Housing Services Department

ROOFING MATERIALS USED

Solarhide Reflective underlayment, SRI = 0.97

Owens Corning Single 3-tab Shasta White Shingles, SRI = 0.31


BEFORE


AFTER

RESEARCH PROGRAM OBJECTIVES

1. Assessing impact of new roof installation on difference between attic and outdoor temperatures

2. Assessing impact of new roof installation on household electricity use

3. Identifying and controlling any external factors (house condition, user behavior, etc.) that may affect results

METHODOLOGY

1

- T/RH HOBO Data Loggers (U12-012 & MX1101) were installed for a minimum of two weeks pre and post roof installation.
- Average daily temperature profiles for $\Delta T = T_{attic} - T_{outdoor}$ were developed for each home pre & post-roof installation.
- Average daily ΔT pre & post-roof installation profiles for all homes were developed and compared.

2

- Utility information obtained for all homes for at least one-year pre and post roof installation.
- Utility information inputted into EPA Portfolio Manager.
- PM used to calculate electricity use by calendar month & to normalize data for weather differences.
- Difference in electricity use pre and post roof installation calculated.

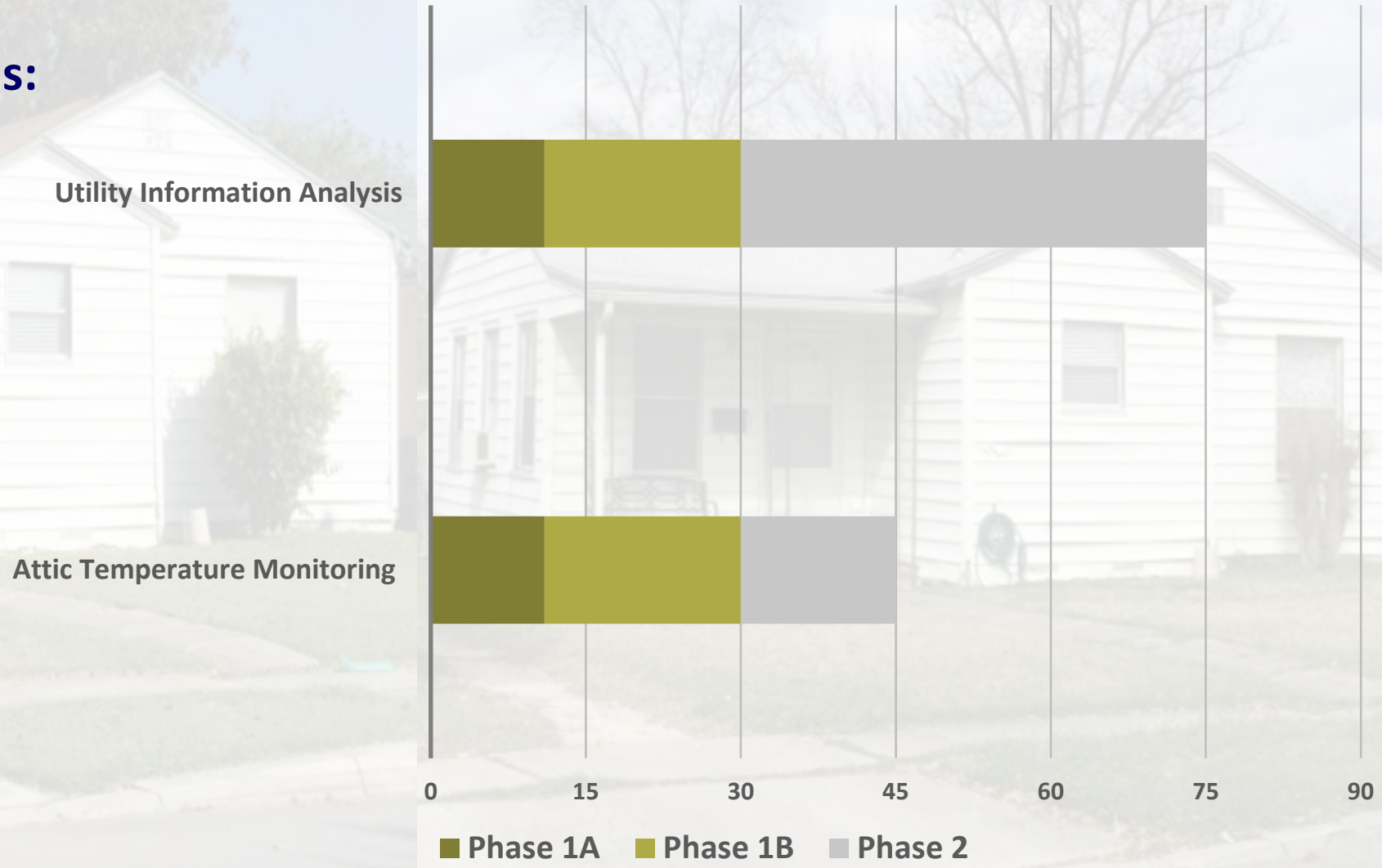
3

- Conditions' assessment conducted for all homes
- User energy use behavior survey conducted for all home users.
- Results used to identify anomalies and exclude from overall results

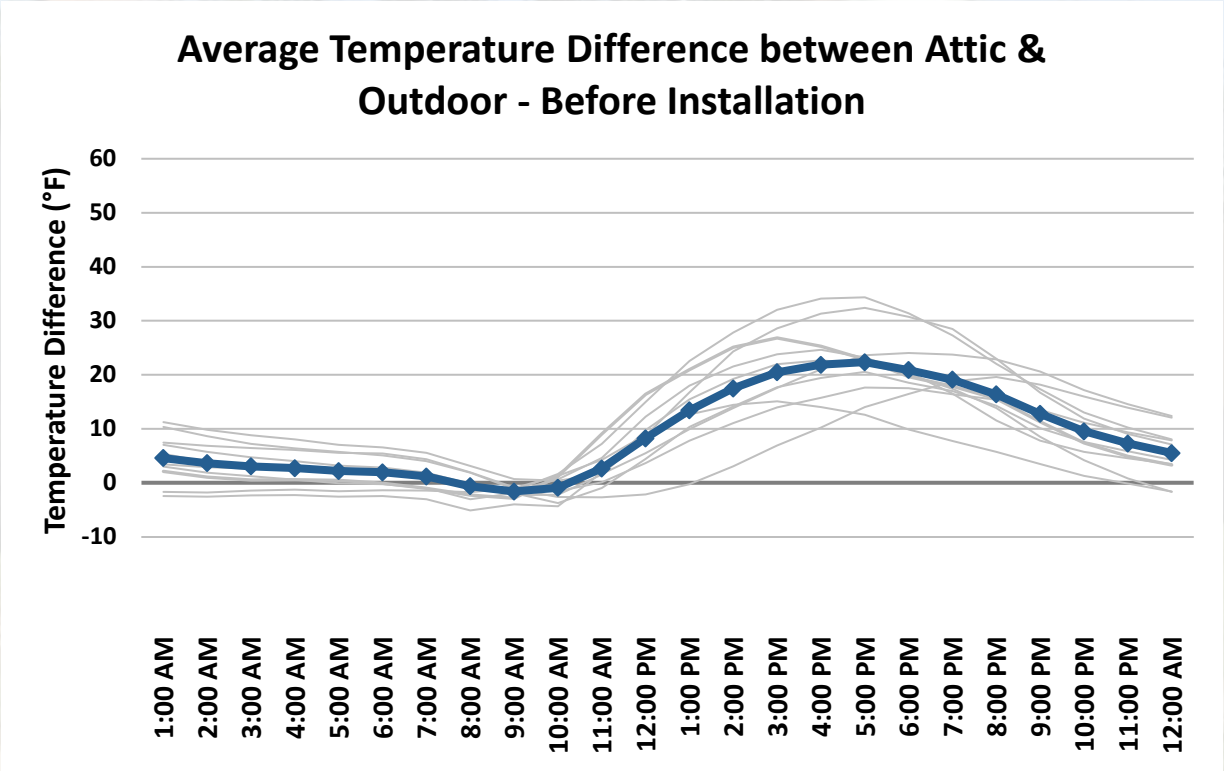
SAMPLE SIZE

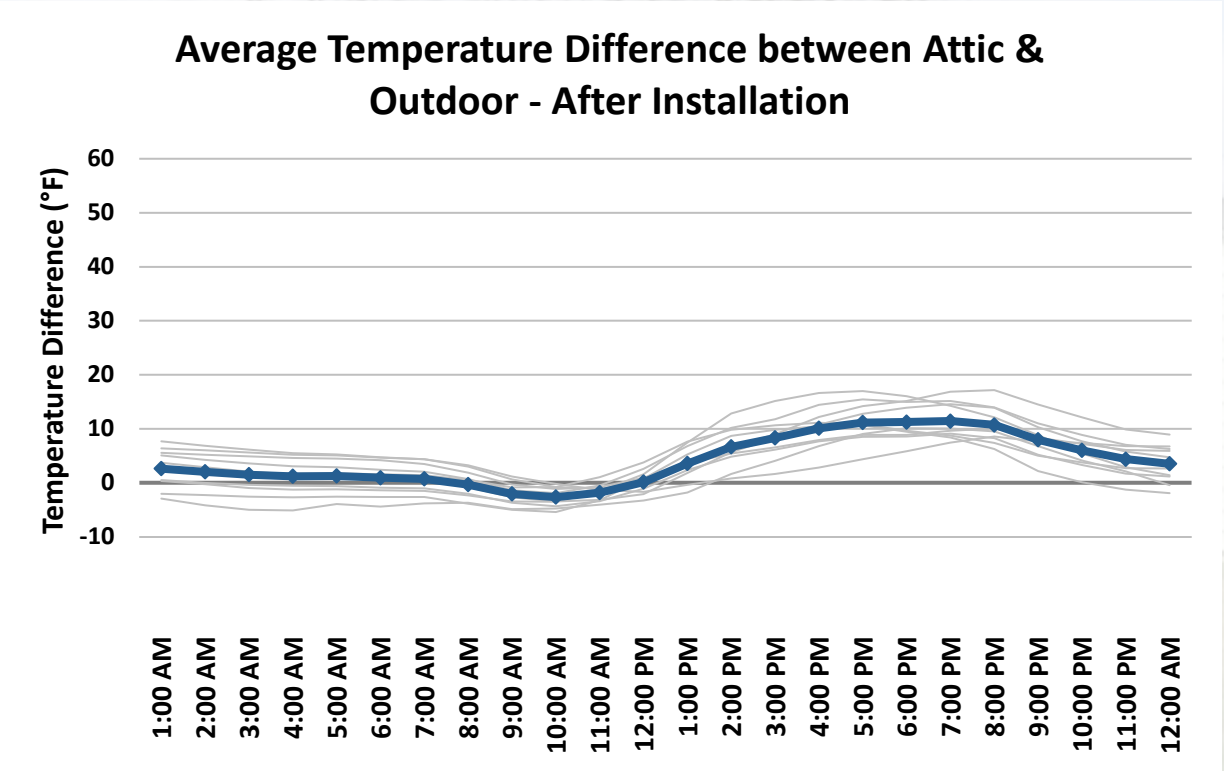
Roof Installation Periods:

- **Phase 1A:**
  Jul. – Sep. 2016
- **Phase 1B:**
  Dec. 2016 – Feb. 2017
- **Phase 2:**
  April – May 2018



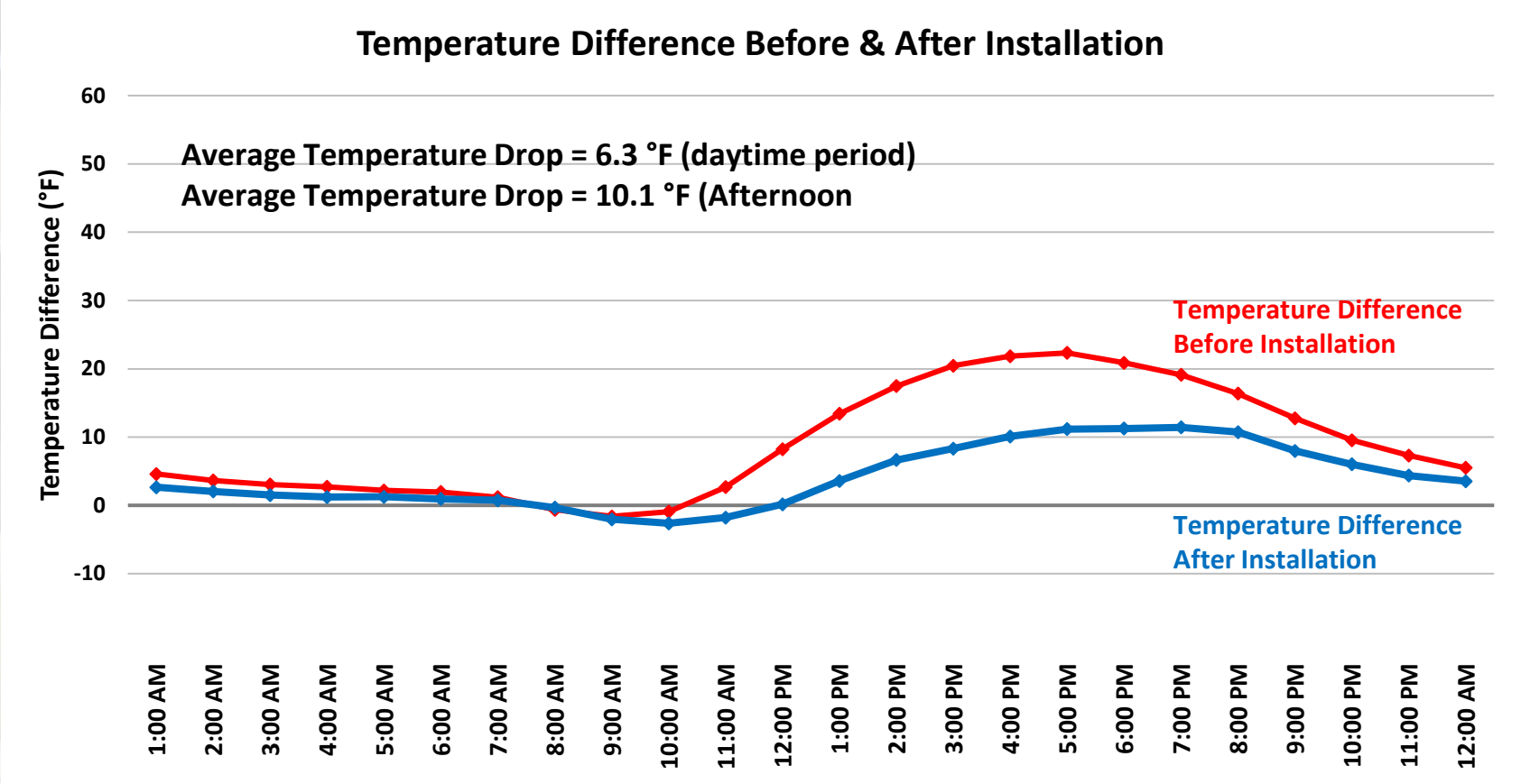
RESULTS: ATTIC TEMPERATURE





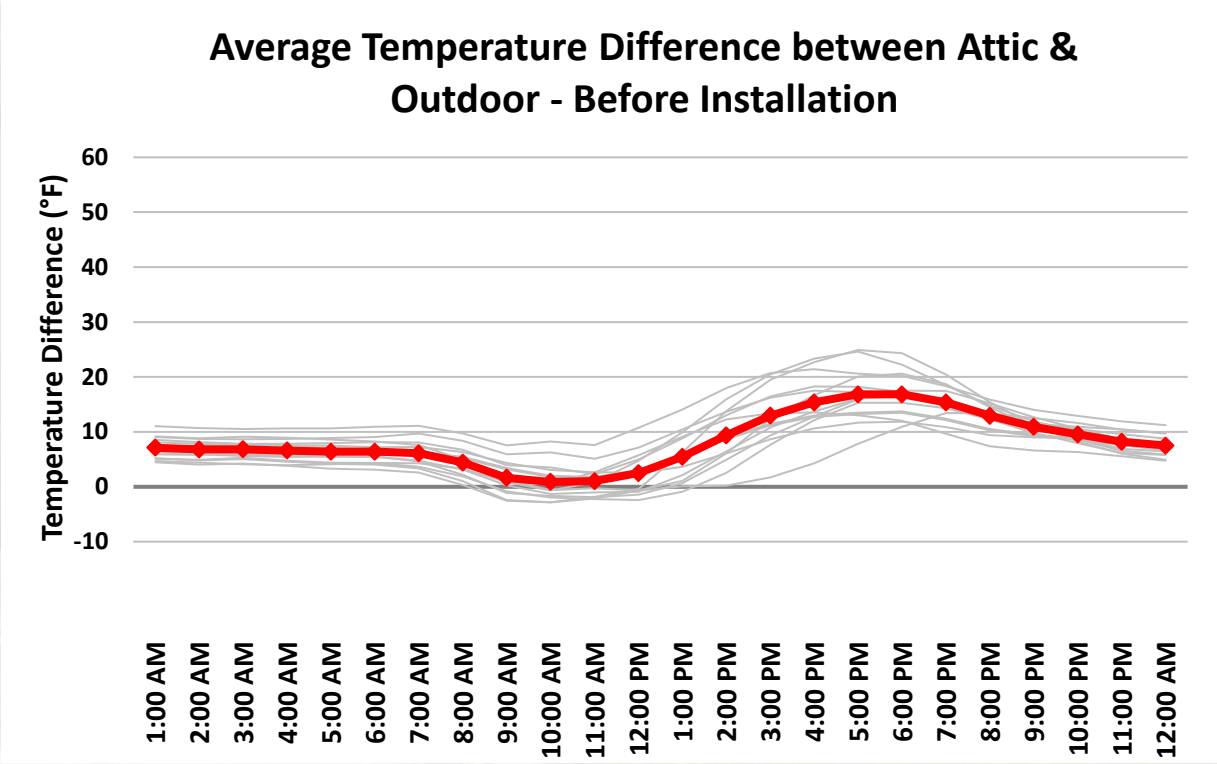
Phase 1A: Installation from July to September 2016

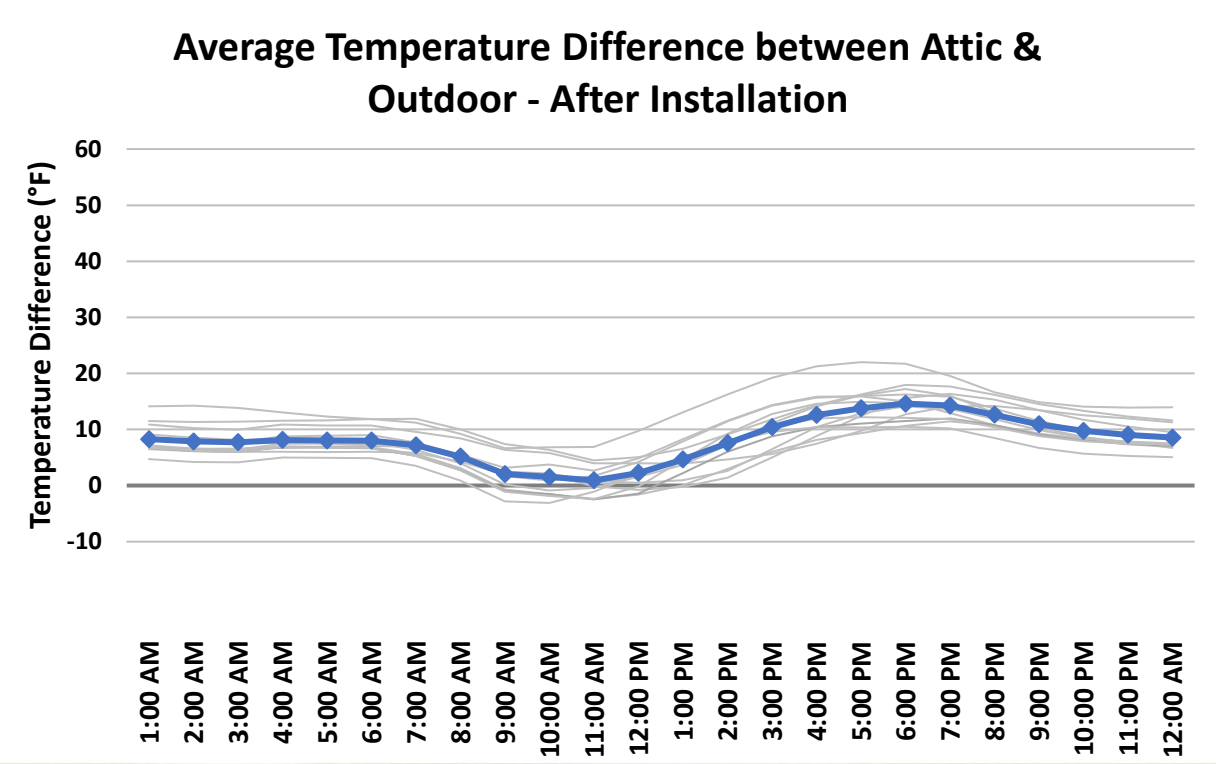
RESULTS: ATTIC TEMPERATURE



Phase 1A: Installation from July to September 2016

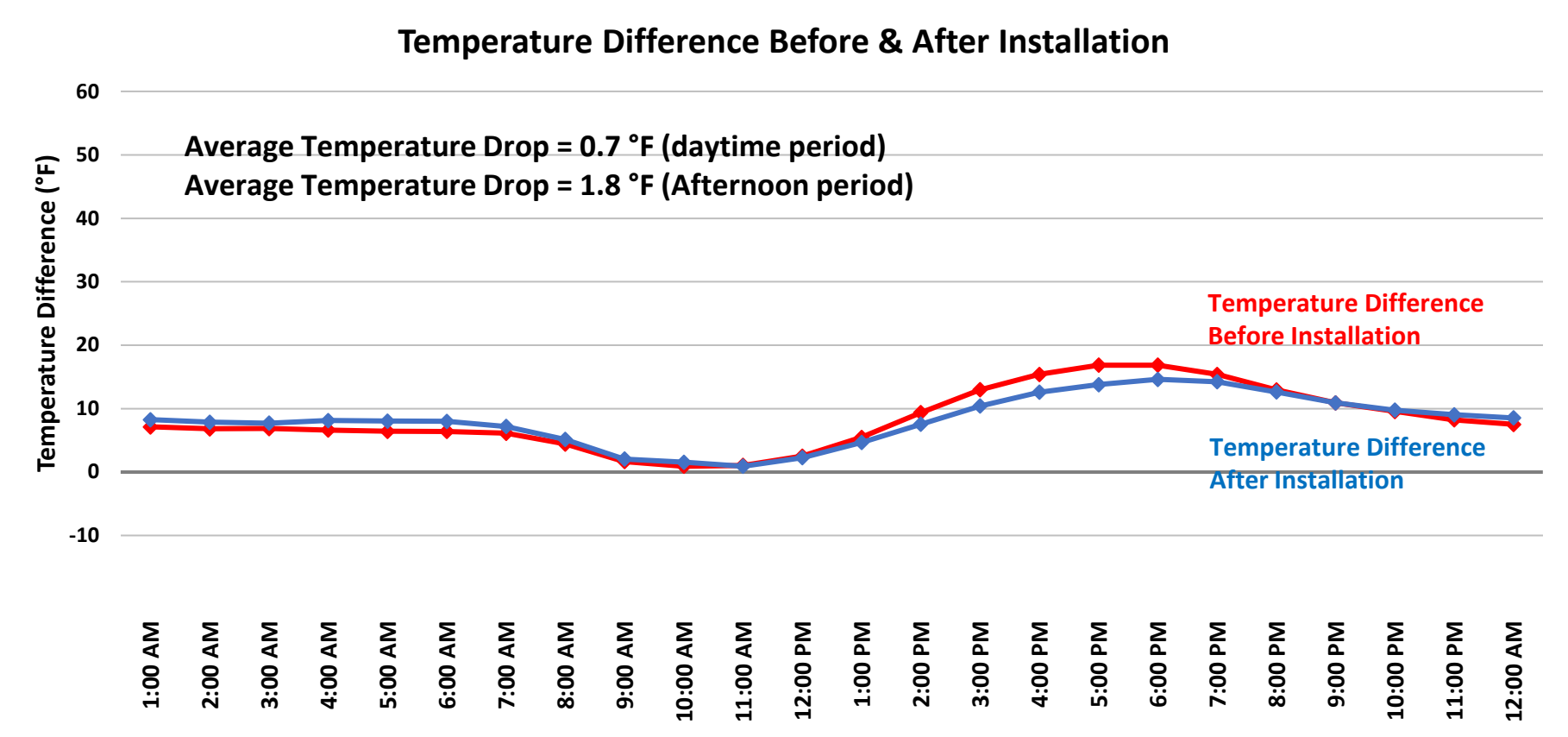
RESULTS: ATTIC TEMPERATURE





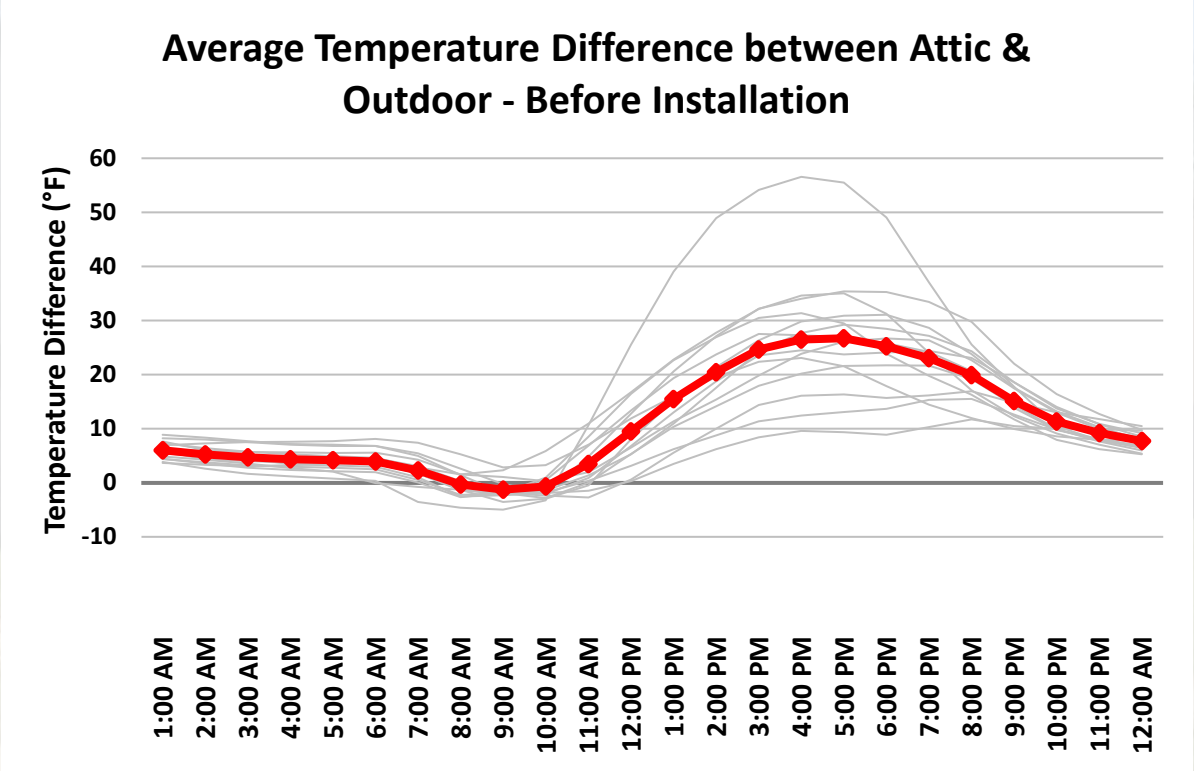
Phase 1B: Installation from December 2016 – February 2017

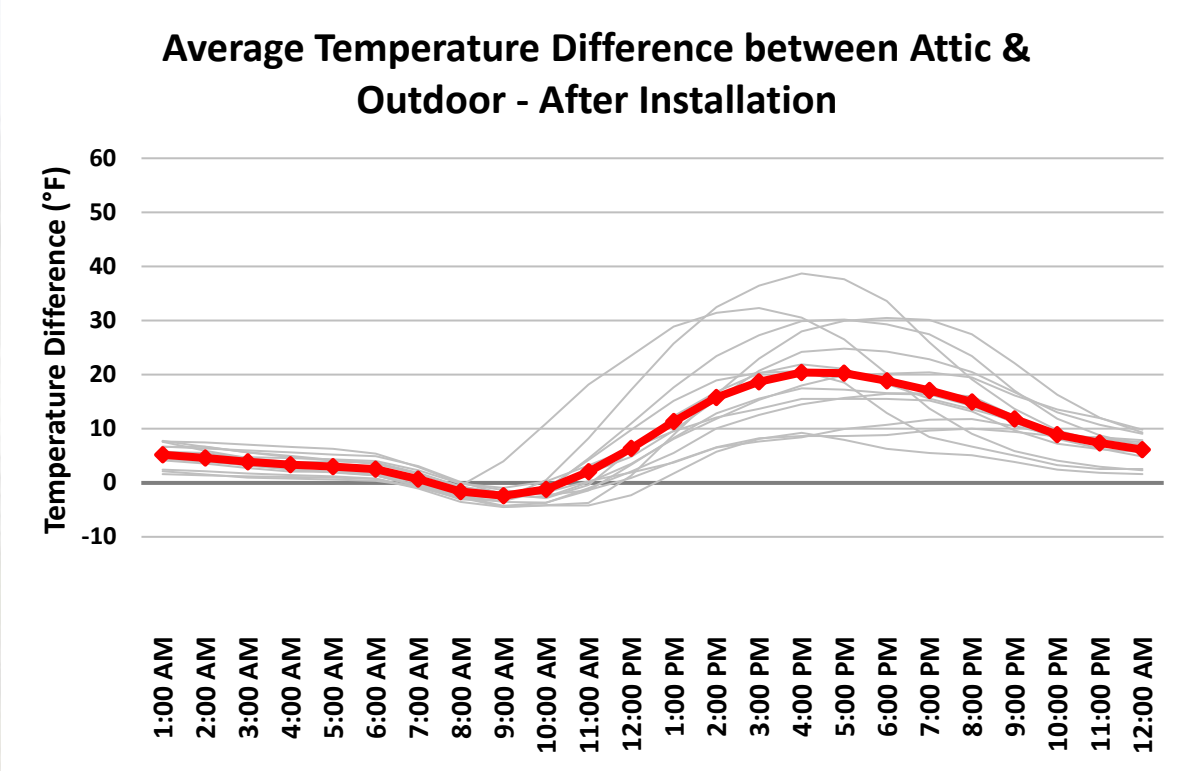
RESULTS: ATTIC TEMPERATURE



Phase 1B: Installation from December 2016 – February 2017

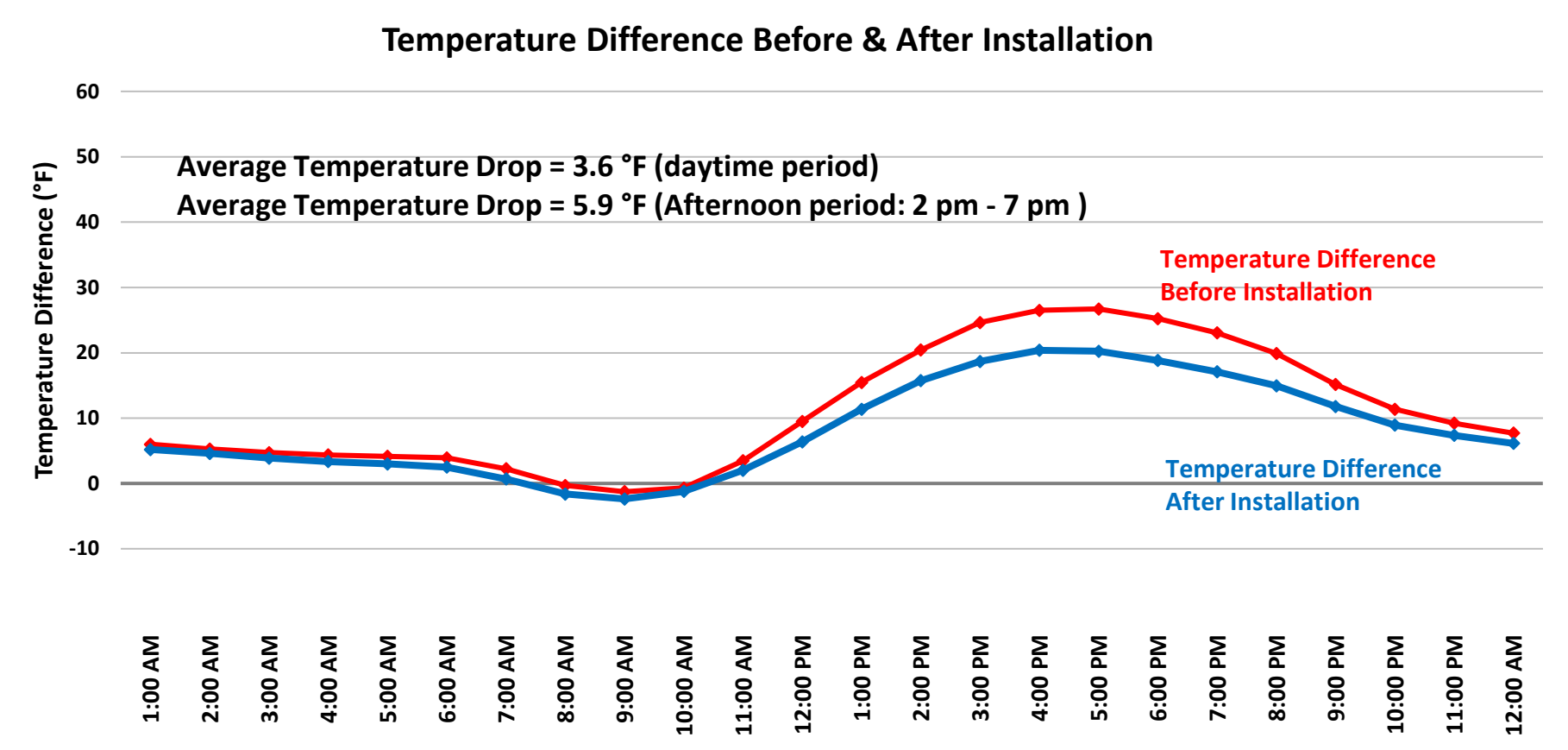
RESULTS: ATTIC TEMPERATURE





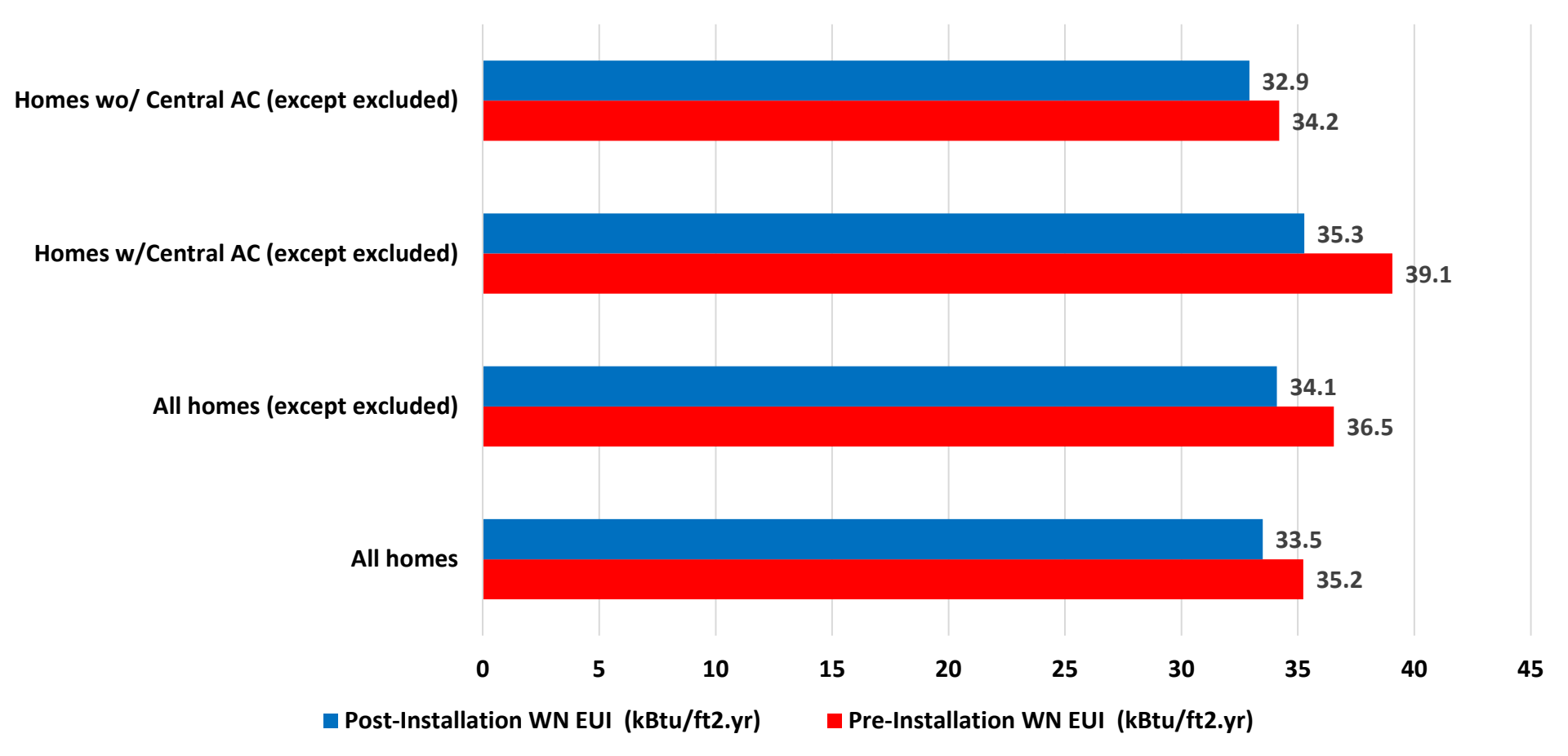
Phase 2: Installation from April – May 2018

RESULTS: ATTIC TEMPERATURE



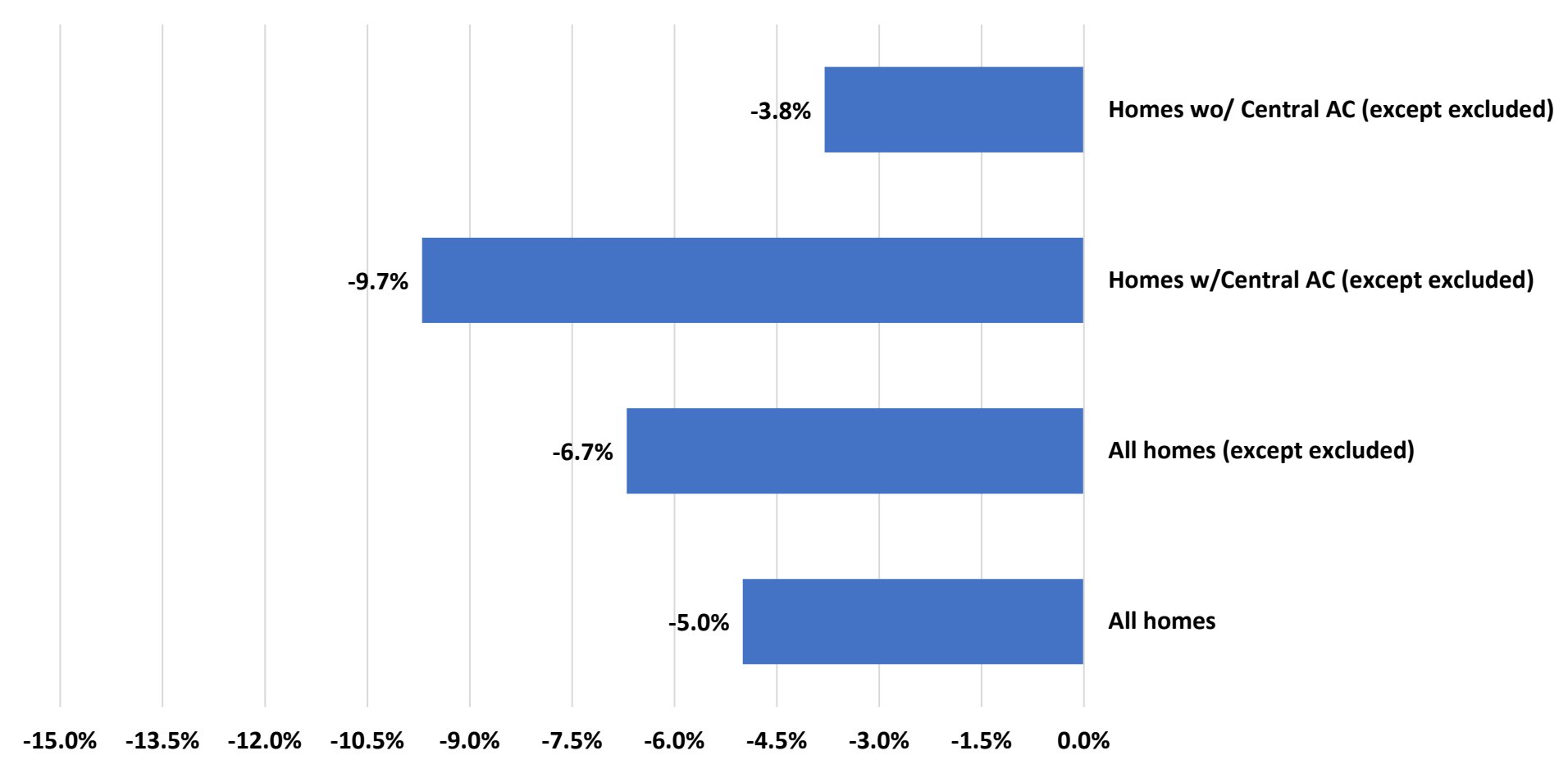
Phase 2: Installation from April – May 2018

RESULTS: ELECTRICITY USE



All Monitored Homes – Weather Normalized EUI Before & After Installation

RESULTS: ELECTRICITY USE



All Monitored Homes – Change in Weather Normalized EUI

CONCLUSIONS & RECOMMENDATIONS

- The installation of the new roofs generally had a positive impact on reducing the difference between attic temperatures and coincident outdoor temperatures.
- Even in homes without air conditioning or those which do not use a lot of air-conditioning for economic reasons, the reduction in attic temperatures will still provide a positive benefit through decreasing indoor temperatures & improving the thermal comfort and user satisfaction.
- The impact of the new roof on attic temperatures in winter months was minimal, indicating that they should not have a negative impact on heating energy use and/or winter user thermal comfort.
- On average, the new roofs had a positive impact on reducing electricity use. This impact was higher for homes with central air-conditioning systems compared to those with window unit systems or those which do not use a lot of cooling.
- The results indicate a much larger potential for the new technology if installed in homes form different socioeconomic groups. Such homes will typically be larger, therefore having larger roof areas, and will use more cooling energy, therefore offering a larger potential for achieving larger reductions in energy use through installing the new roofs.
- While the new technology has been shown to have an average positive impact on reducing electricity use, the impact for individual homes was shown to be highly variable and dependent on home conditions and user behavior.

Questions?

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