ASSOCIATION FOR ENERGY AFFORDABILITY INC.

Multifamily Building Decarbonization

Existing Building Retrofit Data and Challenges

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ASSOCIATION FOR ENERGY AFFORDABILITY INC

Not-for-profit technical services & training organization dedicated to bringing the benefits of clean energy and energy efficiency to under-served communities

Programs | Research & Demonstration | Technical Services | Policy | Training

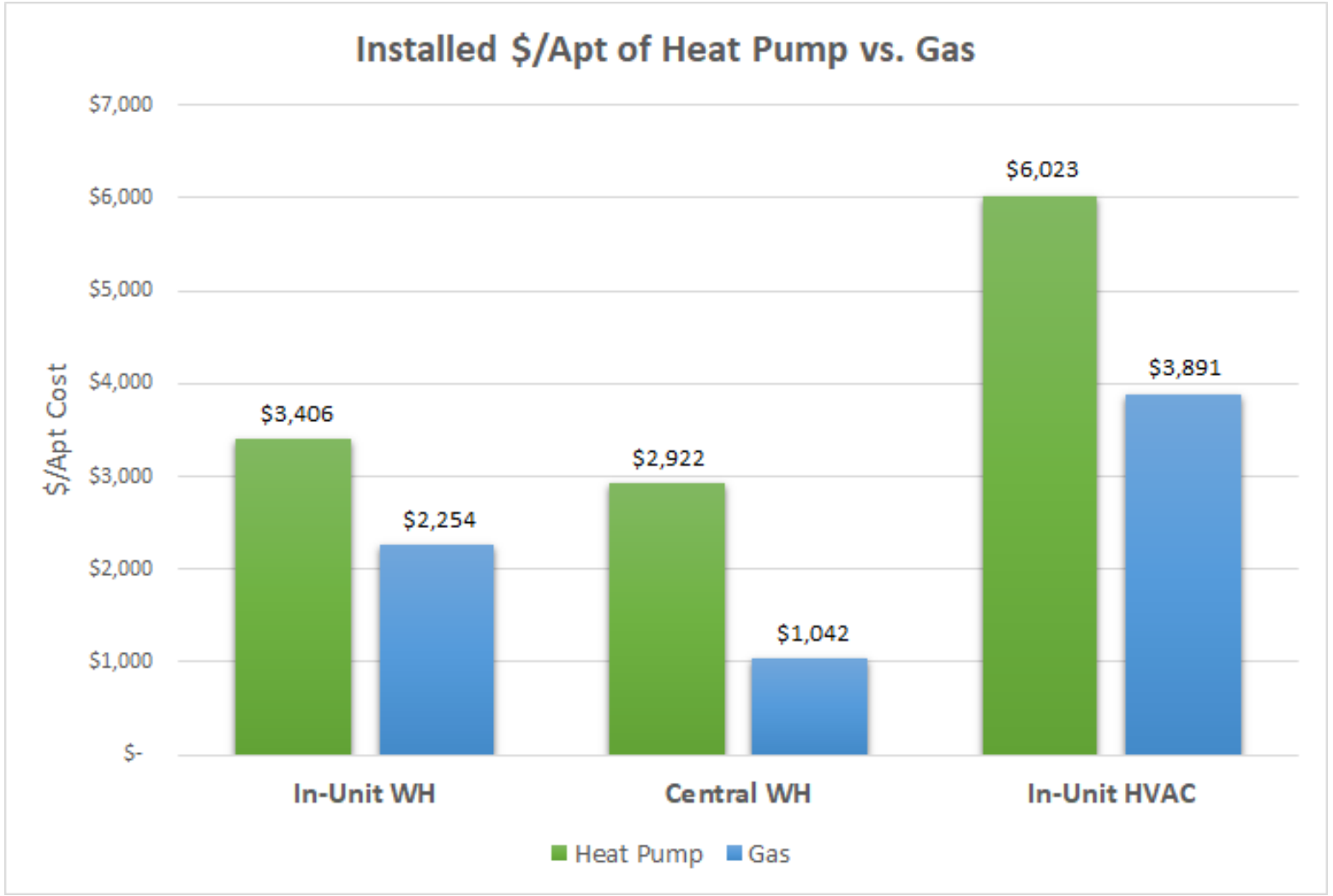
- Low Income Weatherization Program for Multifamily (LIWP-MF)
- BayREN: Bay Area Multifamily Building Enhancements Program (BAMBE)
- Solar on Multifamily Affordable Housing (SOMAH)
- SMUD: Multifamily GoElectric
- MCE: Multifamily Energy Efficiency Program, LIFT, WE&T
- TECH
- SCAQMD: Multifamily Affordable Housing Electrification Program (MAHEP)
- 3C-REN: MF Homes Energy Savings

Developing cutting edge clean energy programs designed to bring the benefits of clean, affordable energy to underserved and disadvantaged communities

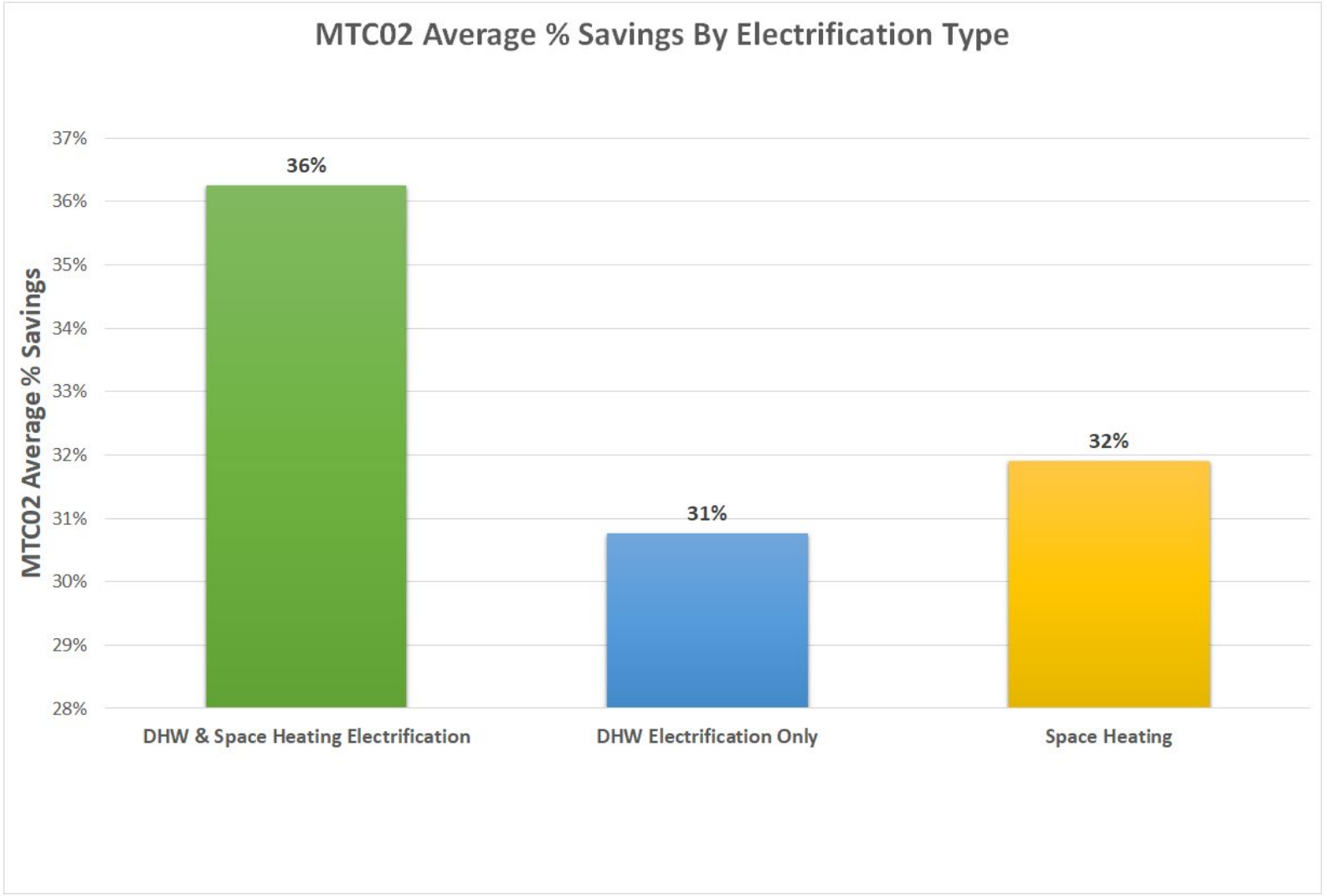
AEA Building Decarb Retrofit Statistics

Electrification Project Information from LIWP, BAMBE, MCE & SMUD		
Total Multifamily Electrification Projects	**79**	
HPWH Projects	**59**	
HVAC Projects	**44**	
In-Unit Water Heater	**Heat Pumps**	**Gas Comparisons (LIWP only)**
Installation Cost for All In-Unit Water Heaters	$2,033,522	$4,199,392
Total # HPWH's	597	1863
Total $/unit	**$3,406**	**$2,254**
Central Water Heating		
Installation Cost for All Central Water Heating	$10,948,767	$2,487,397
Total # of Units Served with Central Water Heater	3,747	2386
Total $/unit	**$2,922**	**$1,042**
# of Projects	43	
$/Project	$254,622	
In-Unit HVAC		
Installation Cost for HVAC Heat Pumps	$13,859,632	$280,171
Units Served	2,301	72
$/Unit	**$6,023**	**$3,891**

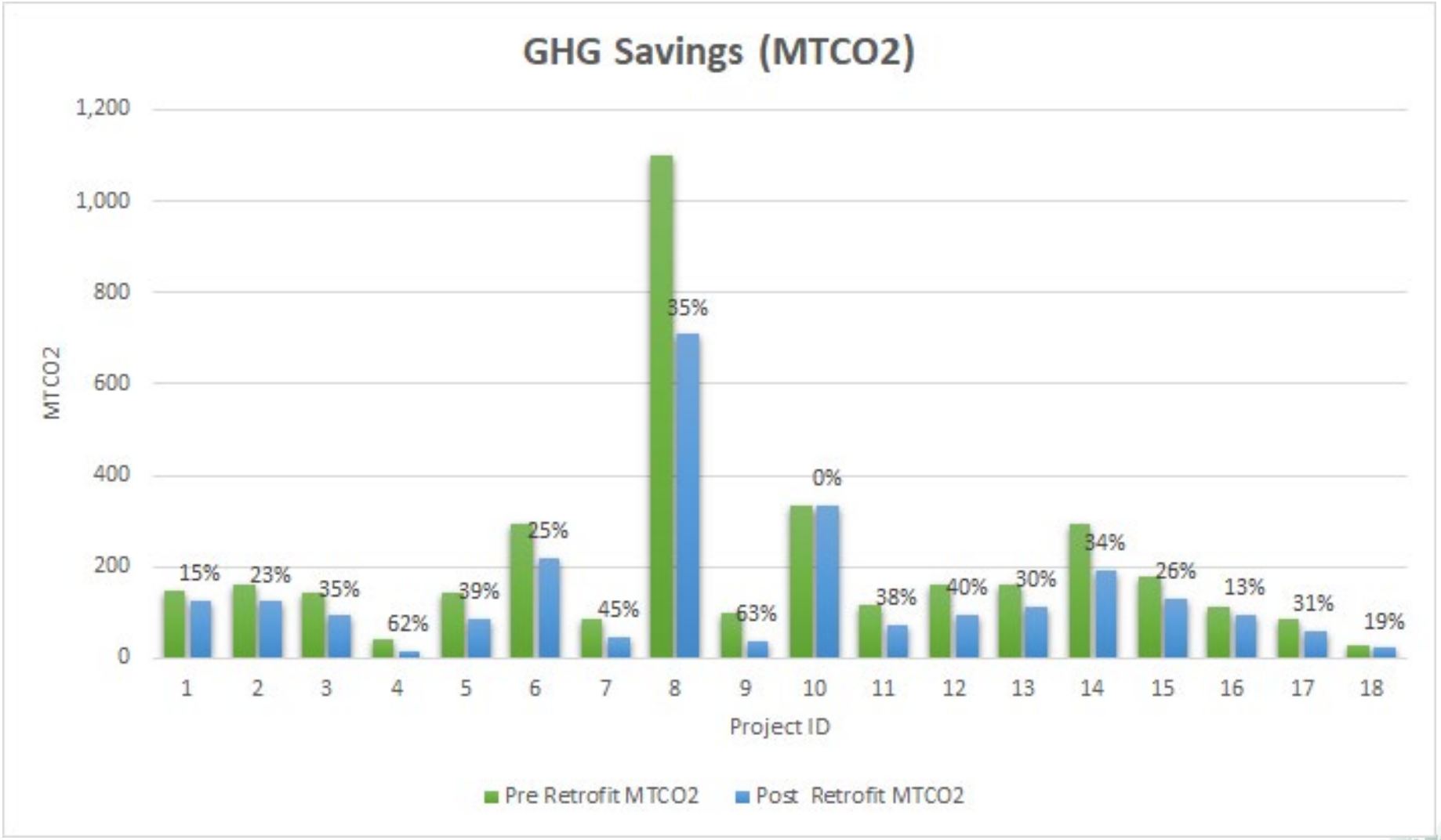
Installed Cost Comparison: Heat Pump Vs. Gas



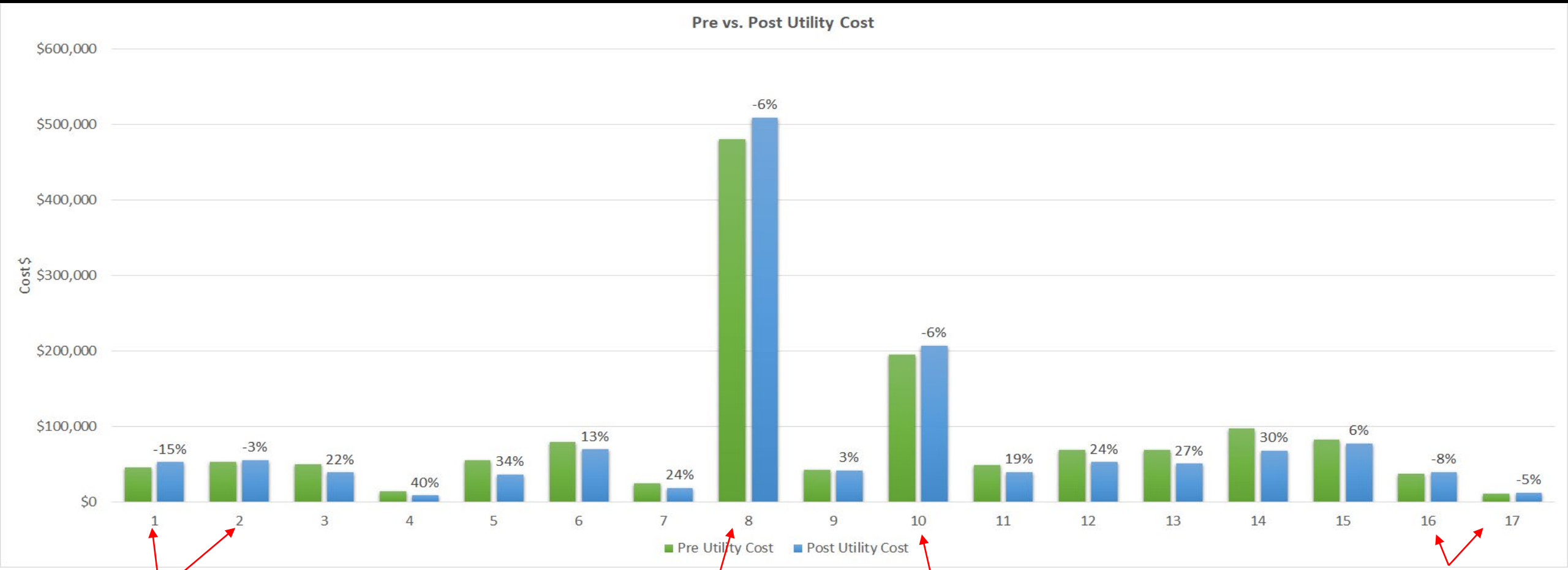
Average GHG Emissions Reductions (by end use)



GHG Emissions Reduction (by project)



Pre & Post Utility Costs (by project)



HPWH fully or partially by passed, running on gas

PV not completed yet.

HPWH fully or partially by passed, running on gas

PV and some EE not complete yet

General Project Characteristics

Very few projects can fully electrify *all* end uses, primarily due to costs and building and unit level electrical capacity issues

In some cases electricity consumption increased more than anticipated, but still reduced energy usage, all projects resulted in significant GHG reductions, but not always utility costs.

Confluence of factors that affect this

- Actual operational performance lower than models calculate
- Installation issues
- COVID related occupancy schedules
- and likely others

Building Retrofit Challenges

Barriers:

- Cost and financing challenges
- Time intensive
- Existing Conditions/Building Age
- Logistically challenging
- Requires expertise, custom approach
- Contractor familiarity
- Building electrical infrastructure challenges

Electrical Infrastructure

- **Panel Upgrades -** Expensive and invasive to run new circuits to upsize electric service
  - In-unit DHW and/or HVAC
    - Subpanels located in closets (electrical code requires they be moved)
    - Electrical panel somewhere in the apartment, but WH or HVAC not close by, increases costs
    - Panel space
  - Common Area
    - Still long runs
    - Trenching may be required
    - Phase changes (high capacity CHPWH often require 3-phase)
  - Current workarounds:
    - Reduce all other existing electrical loads as much as possible
    - Sharp pencil NEC calc
    - Layer efficiency w/ low amp draw equipment
    - Look for easy wiring runs
    - Cooking usually not electrified as it often forces increased service size per NEC
- Transformer Upgrades
  - Not as common, but when it arises its usually a deal breaker: $2M cost to address

Factors to Consider When Electrifying Affordable Housing

- Electrification must be part of a more comprehensive retrofit to mitigate risk of utility bill increases
- Must include solar. Common scenario we see is that solar gets installed last (6-12 months after EE retrofit), placing potential short term cost burden on residents.
- Installation issues are more likely and are higher risk
- Benchmarking and ongoing utility data tracking are more important than ever.
- Rate reform will be critical

Thank You!

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