Multi-Family New Net Zero - LA

Building Type & Use: Multi-family residential, new construction, low-rise

Location: Los Angeles, CA

Occupancy/Client: Developed by A Community of Friends (ACOF) – affordable housing for military veterans who are homeless & living with disabilities

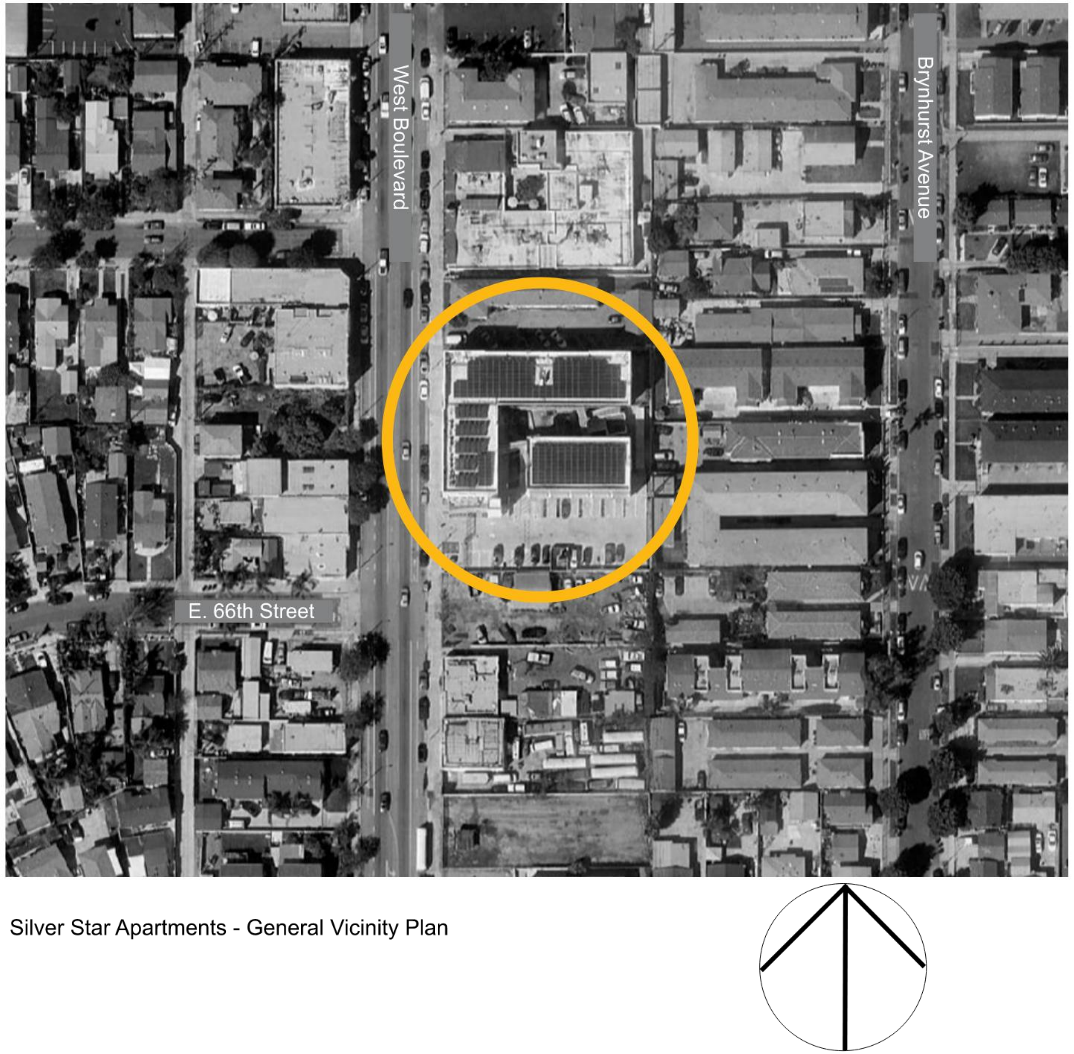
Highlights: Net positive performance/LEED certification, all electric design, daylighting, energy star for residential

This case study is part of a series illustrating how building energy modeling is applied on real projects — showing the tools, decisions, and outcomes that define high-performance design in practice. CalBEM, a collaborative initiative sponsored by Southern California Edison, brings together California's building energy modeling (BEM) community to advance solutions for high-performance buildings.

Site and Building Data

Building Statistics:

- **Gross Floor Area:** 34,000 gross square feet.
- **Occupancy/Units:** 48 one-bedroom units and one two-bedroom manager unit.
- **Structure:** Wood-frame construction.
- **Site:** The site was previously occupied by light industrial structures and has **unobstructed solar access**.



Silver Star Apartments - General Vicinity Plan

Goals

High energy performance goals to ensure long-term affordability and sustainability

- **ZNE Target:** To achieve **Net Positive** performance

- **Certification Goals:**
  - **LEED for Homes Platinum certification**
  - **Energy Star® for Residential New Construction**.

- **Decarbonization Goal:**
  - **no use of natural gas** on the site
  - mandating an **all-electric design**.

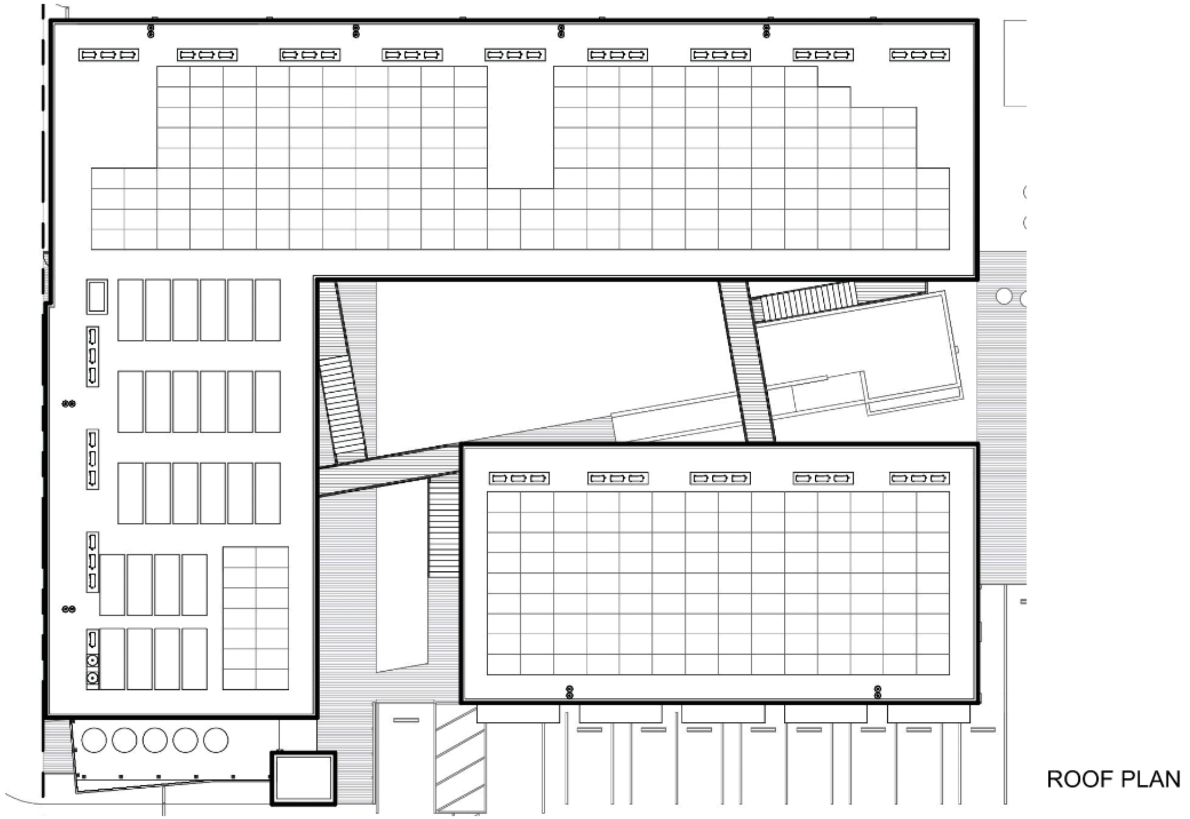
PHOTO: NATALIA KNEZEVIC

Challenges

Site Constraints

Due to the urban context the area limitation of the roof would naturally limit the solar energy that could be collected, setting the maximum energy use that could be used by the buildings.

However, no trees or nearby built objects affect solar access to the site.



Design Problems/ Approaches

Problems being evaluated with targeted design approaches through use of Building Energy Modeling (BEM)

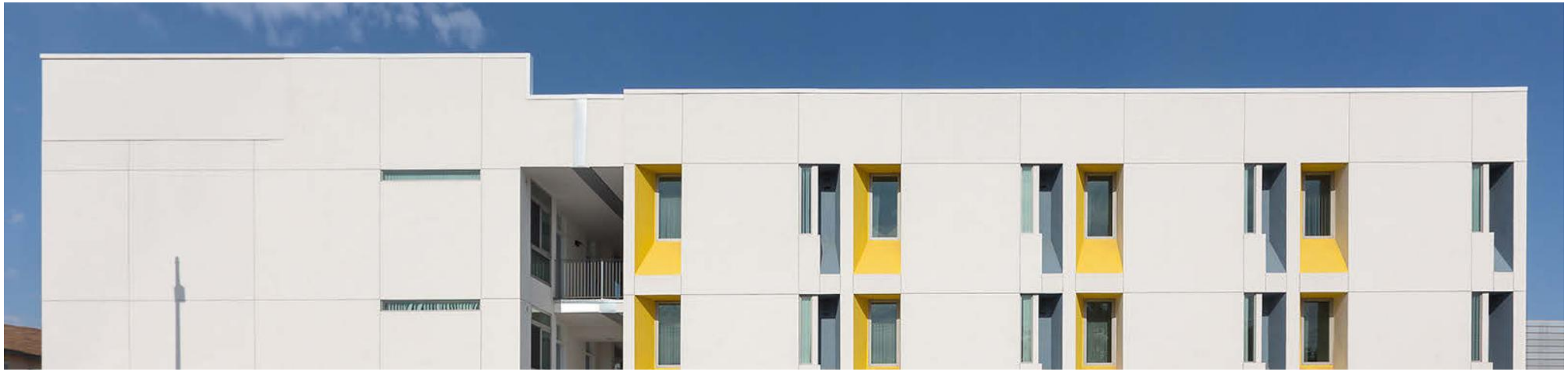
1. Balancing Loads and Limited Space: fit enough on-site renewable energy generation onto the limited urban roof space to offset the total energy demand.

2. Optimizing Water Heating: Mild climate kept heating and cooling loads low, domestic hot water (DHW) was estimated to consume about one-third of the total energy demand.

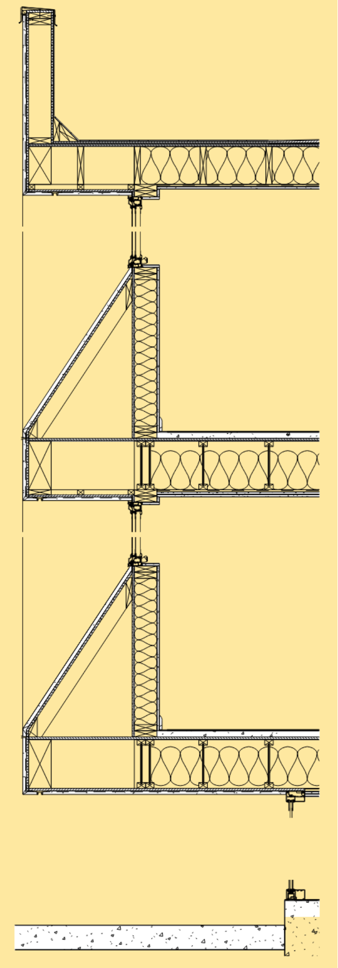
Design Problems/ Approaches

3. Increased Envelope Performance:
    - Wood frame construction with **higher than code insulation** levels by maximizing the wall area filled with insulation.
    - **Phase Change Material (PCM)** uses inside the south wall to avoid needing expensive continuous exterior insulation. PCM was estimated to **reduce seasonal heating and cooling loads by 30%**.

Design Problems/ Approaches



4. Daylighting Strategy to Reduce Internal Lighting Needs:
    - Modeling supported the architectural choice to use advanced framing to place window headers higher, increasing the penetration of daylight deep into the units and thereby reducing the **Plug Load and Lighting** portion of the energy budget.



(Above) Section through the south wall at the Community Room.

BEM Questions

The BEM process helped the integrated design team (Architects, Mechanical Engineers, and Solar Consultants) answer critical trade-off questions:

1. How do we maximize the renewable energy system footprint?
2. Which DHW system is the most roof-area efficient?
3. Will the envelope meet ZNE targets without costly upgrades?

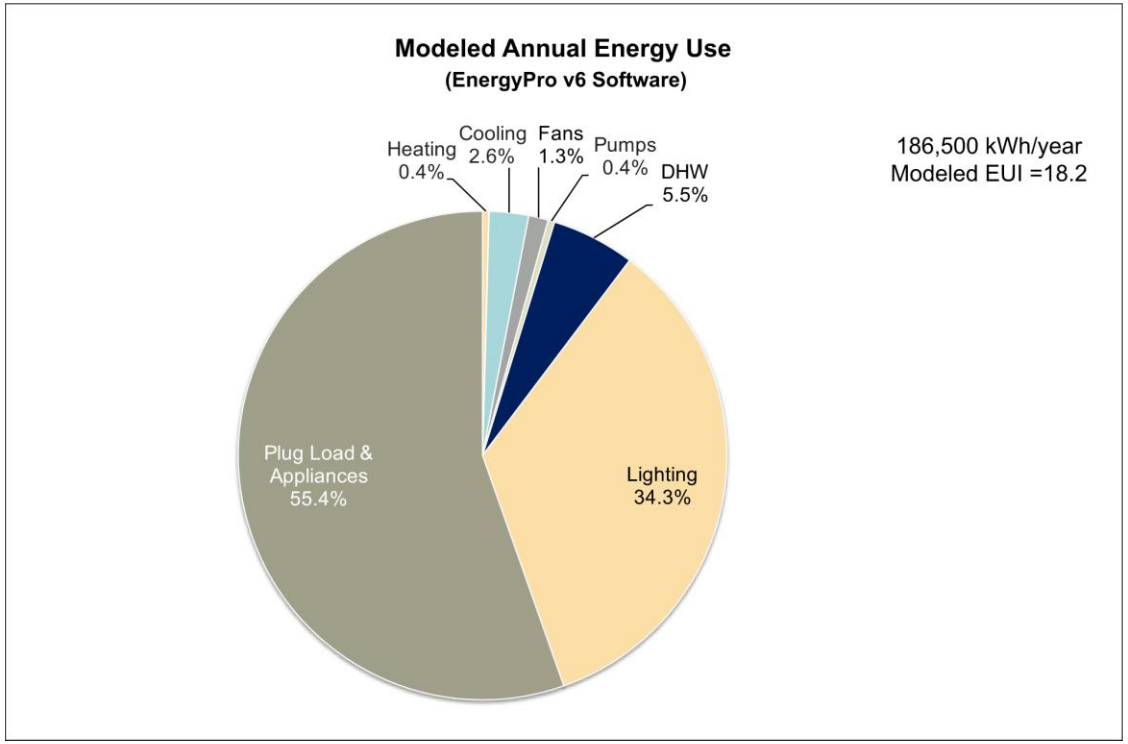
Results: Prediction Vs. Reality

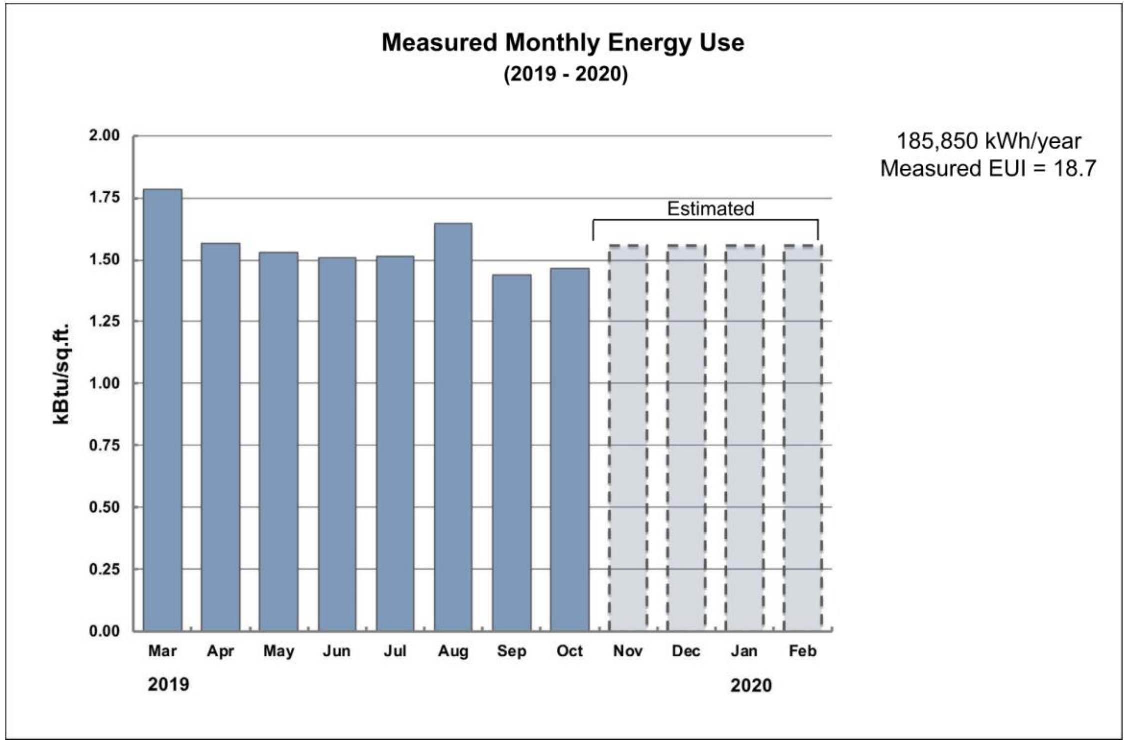
Comparison table of the modeled BEM prediction and the actual measured performance

Metric	Modeled Performance (EnergyPro v6, 2017)	Measured Performance (Annualized, 2019–2020)
Site Energy Use Intensity (EUI)	18.8 kBtu/sq.ft. per year	18.7 kBtu/sq.ft. per year
Annual Energy Use (Total)	186,500 kWh	185,850 kWh (Estimated)
Annual PV Production	(Designed to exceed 186,000 kWh)	138,200 kWh per year
ZNE Status	Modeled ZNE/Net Positive	Fell significantly short of ZNE (Net Negative)

Results: Prediction Vs. Reality

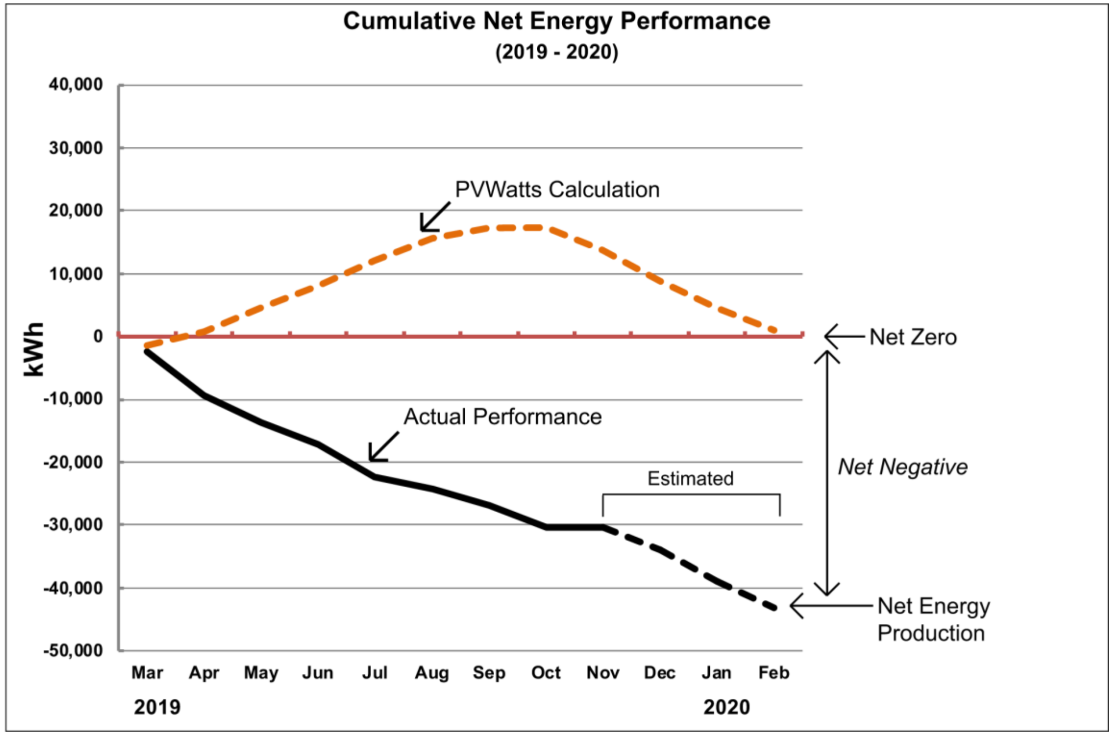
Modeled end use breakdown and measured monthly data:





Operational Performance: PV System

The project failed to meet its ZNE goal **not because of a design flaw, but because of operational issues**.



Investigation revealed that a **failed inverter** and a **buildup of airborne particulate film** on the solar panels significantly reduced PV production (by about 35% less than designed).

Impacts of Modeling

The energy modeling successfully predicted the energy *demand* of the building, proving the low-energy design strategies worked as intended: the modeled EUI (18.8) nearly matched the measured EUI (18.7).

Design Validation and System Sizing: BEM provided confidence in the passive design choices (like the PCM and advanced framing) and confirmed the necessary capacity for the complex hybrid DHW system and mini-split HVAC.

Key Take Aways

Building Energy Modeling was like a perfectly accurate weather forecast: it correctly predicted the temperature and climate (the building's energy *demand*).

However, the solar panels, which were meant to be the umbrella protecting the budget, had dirt buildup and equipment failure (operational issues).

This shows that successful ZNE relies on the **Model, the Meter, and the Maintenance.**

PHOTO: NATALIA KNEZEVIC