CONSPICUOUS CONSUMPTION:

Human behavior is the next frontier of energy efficiency in large scale net-zero housing. Design that empowers occupants to measure and manage their energy consumption can have a significant impact on overall building energy use.

Well-studied and programmed, the three buildings favor an east-west orientation around covered open-air courts. These outdoor spaces give residents a connection to the weather, encourage interaction, and eliminate common area conditioning and ventilation. The envelope is tightly sealed and well insulated, and thermal bridging is minimized. External vertical shutters are opened during cool weather to take advantage of passive solar heat gains, and are closed during warmer weather, providing resident engagement and control while eliminating the need for a cooling system.

Electricity is generated through photovoltaics, and hot water and space heating through a ground-source heat pump. The PV array powers the building to maximize the electricity budget, while external panels are selectively transparent to bring dappled daylight into the central courts.

A budget for net-zero energy is tracked and displayed in real-time. At an individual level, a smart phone app is tracking, at a building level, dynamic color LED lighting highlights the top-performing floors; and at a campus level the three buildings' relative performance is displayed, encouraging competition and conversation. As a result, students and their families actively manage their energy with continual feedback. They carry these learned patterns to their post-academic life, setting the stage for net-zero behavior in communities beyond the UCSF Mission Bay campus.

ENERGY CONSERVATION STRATEGIES

- Tightly sealed, well-insulated envelope minimizes heat loss.
- Operable windows for passive cooling.
- External shutters provide users control over solar heat gain and glare.
- Hydronic radiator provides heating at perimeter supplied by a high efficiency central plant.
- HRVs provide bathroom exhaust when required.

END USE ENERGY = 12.1 EUI

SITE RENEWABLE ENERGY

- PV PANELS ARE REPLACED WITH MODIFIED WOOD THERMALLY VERTICAL SHUTTER
- COLD DAY
- OVER ROOF

SITE USER PROFILES

- RESIDENTS
- 29%—Toilets
- 23%—Lighting
- 14%—Equipment
- 13%—Domestic Hot Water
- 11%—Fans
- 4%—Cooling
- 4%—Heating

SITE PLAN

END USE BREAKDOWN

- Residential Use
- Default
- Occupant Behavior
- Improved
- Modern

BUILDING PERFORMANCE

- ENVELOPE
- LOW-FLOW FIXTURES
- HIGH EFFICIENCY COOLING SYSTEMS

TOTAL RESIDENTIAL CONSUMPTION

- 12.4 EUI
- 31%
- 6%
- 11%
- 49%
- 2%