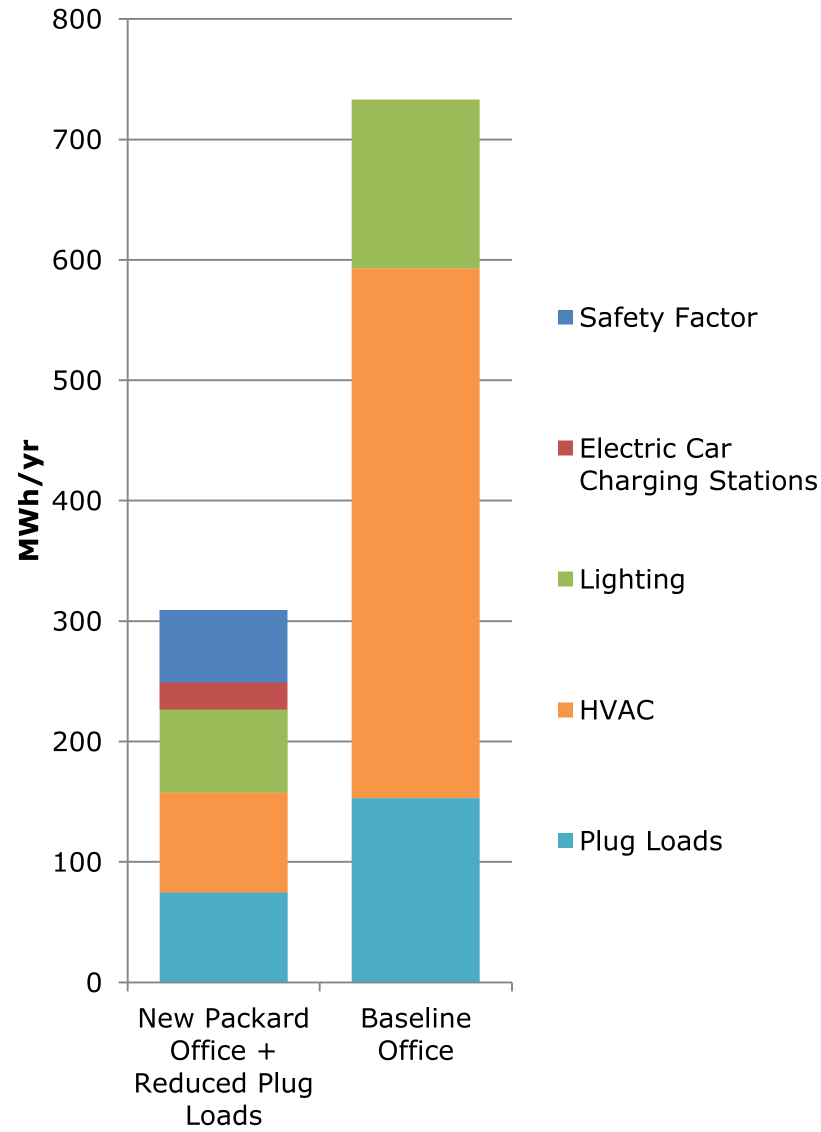
SUMMARY STATISTICS

Total EUI (kBTU/sf/yr)
18 kBTU/sf/yr

Net EUI (kBTU/sf/yr)
0 kBTU/sf/yr

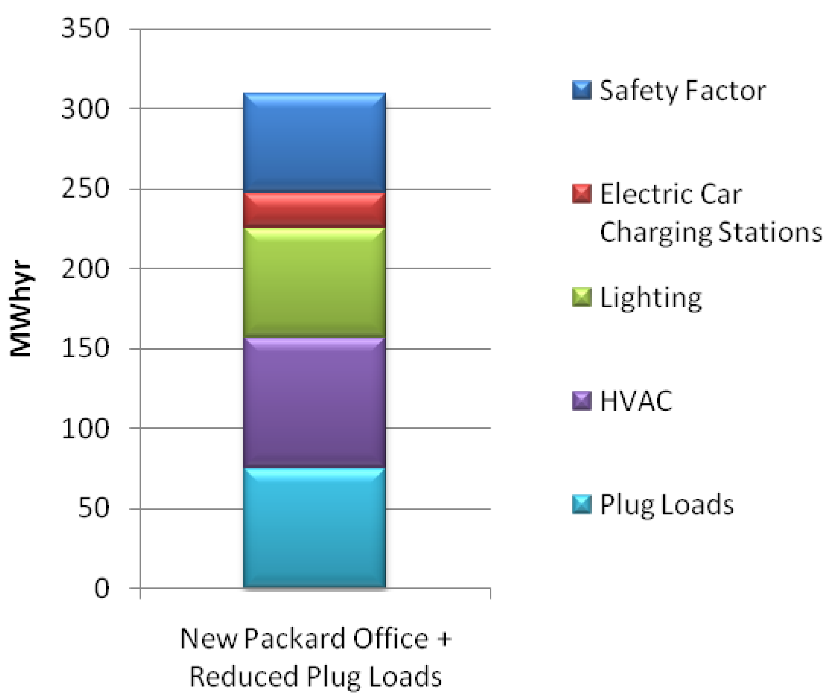
Percent Reduction from National Average EUI for Building Type – Energy Star
78% reduction from national average EUI (81kBtu/sf/yr)

Lighting Power Density
0.6 W/sf

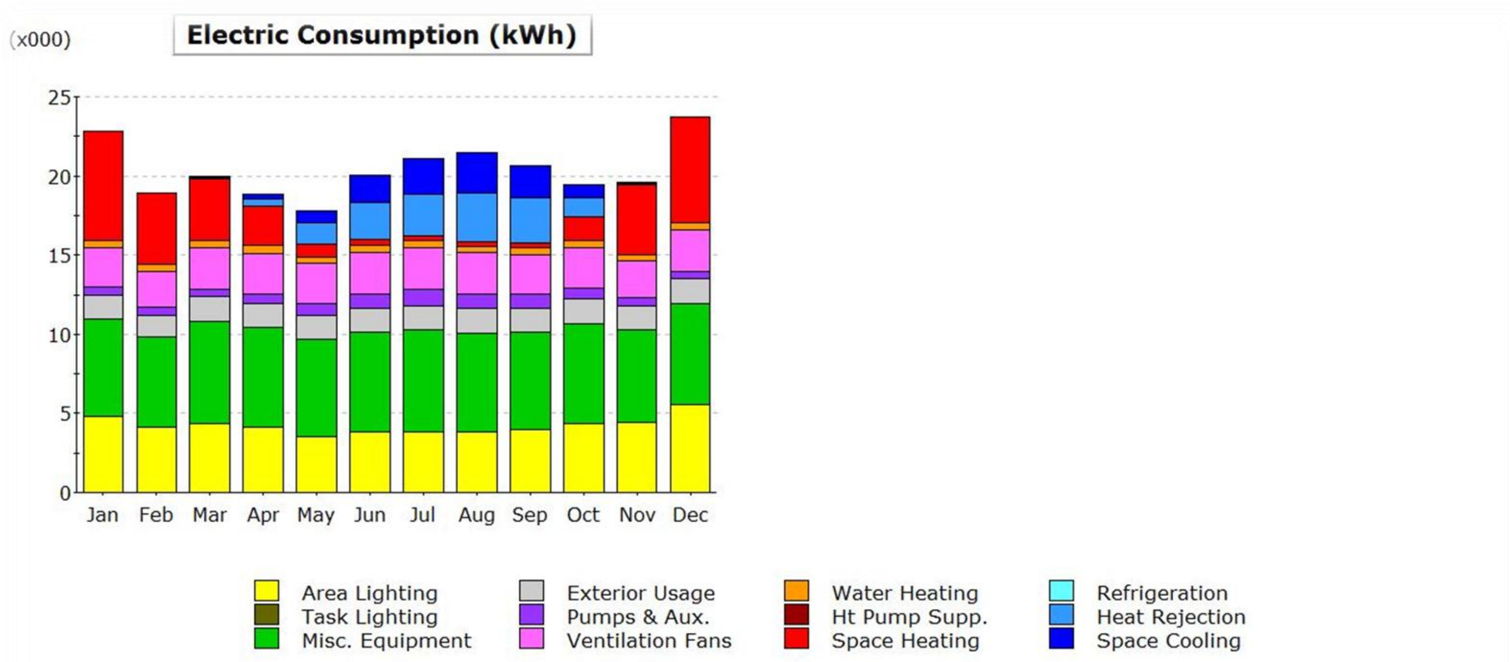


Total Processed Results

Item	Value	Units
Equest Reported Total Building Energy Use	244.43	MWh/yr
Annual Fan Energy Reduction from Spreadsheet Model	18.91	MWh/yr
Total Building Energy Use:	225.52	MWh/yr
Estimated Electric Car Charging Energy Use:	22	MWh/yr
Total Site Energy Use	247.52	MWh/yr
Annual Photovoltaic Production	309	MWh/yr
Photovoltaic Safety Factor	19.9%	



eQuest Results



Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	0.01	0.02	0.06	0.37	0.76	1.71	2.20	2.52	2.03	0.88	0.08	0.02	10.66
Heat Reject.	0.00	0.02	0.09	0.38	1.34	2.32	2.69	3.07	2.86	1.20	0.06	0.03	14.07
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	6.94	4.50	3.88	2.54	0.81	0.41	0.29	0.29	0.28	1.46	4.40	6.63	32.42
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	0.44	0.41	0.47	0.46	0.43	0.46	0.46	0.45	0.44	0.45	0.41	0.47	5.35
Vent. Fans	2.48	2.30	2.61	2.59	2.48	2.59	2.61	2.57	2.50	2.57	2.33	2.61	30.22
Pumps & Aux.	0.50	0.46	0.48	0.60	0.75	0.90	1.01	0.94	0.85	0.71	0.50	0.49	8.19
Ext. Usage	1.54	1.39	1.54	1.49	1.54	1.49	1.54	1.54	1.49	1.54	1.49	1.54	18.16
Misc. Equip.	6.12	5.67	6.43	6.35	6.12	6.35	6.43	6.29	6.18	6.29	5.85	6.43	74.51
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	4.82	4.15	4.38	4.09	3.56	3.82	3.84	3.80	3.99	4.39	4.46	5.53	50.84
Total	22.86	18.93	19.94	18.88	17.79	20.05	21.08	21.46	20.64	19.48	19.58	23.75	244.43

Photovoltaic Summary
The graph at left shows the overall energy budget of the facility. According to the current energy model the photovoltaic system, currently sized at a capacity of 285 kW, will be able to meet the net zero electricity goals of the project with a 19.9% safety factor.

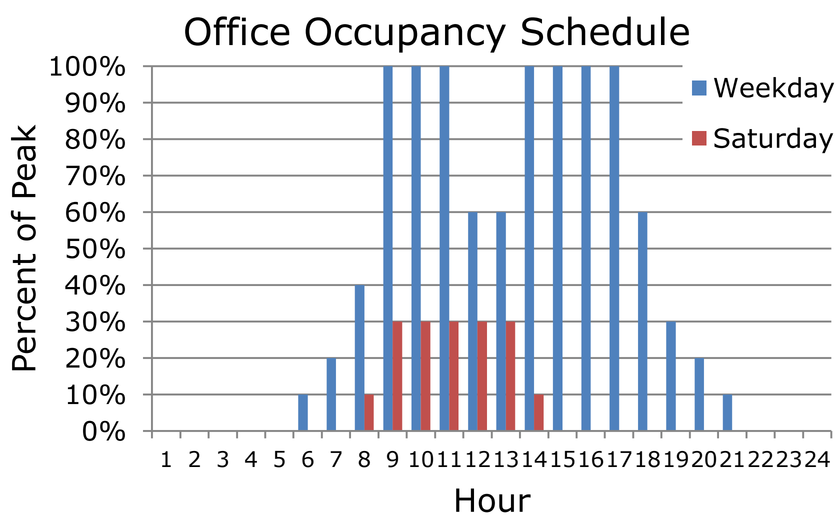
- Energy Consumption: 247 MWh/yr
- Energy Production: 309 MWh/yr
- Safety Factor: 19.9%

Energy Efficiency Strategies
The following is a list of design strategies, active and passive, architectural and mechanical, that are incorporated into this building to achieve the project goal of net zero energy use:

High performance glazing
- Additional insulation in walls, roof, and slab
- Passive solar heating
- Maximized daylighting
- Automatic exterior window shading
- Chilled beams for cooling and heating
- Medium temperature chilled water
- Chilled water storage
- Water side free cooling
- High efficiency chillers, cooling towers, boilers, and pumps
- Significantly reduced plug loads

Typical Occupancy Schedule
A net zero energy building cannot be simply designed, built, and expected to achieve the net zero energy goal by itself. The building must be used in the ways that it was designed if the net zero energy goal is to be achieved.

This building incorporates many passive elements and very low HVAC energy and plug loads. With such great energy use reductions, the schedule of occupancy attains a greater impact on the overall energy use of the building. The graphic at right shows the typical office occupancy schedule assumed in the energy model. If the building is occupied more densely or for significantly more hours than the energy model anticipates, then the building energy use will be higher than the model's prediction and the net zero energy goal may be compromised.



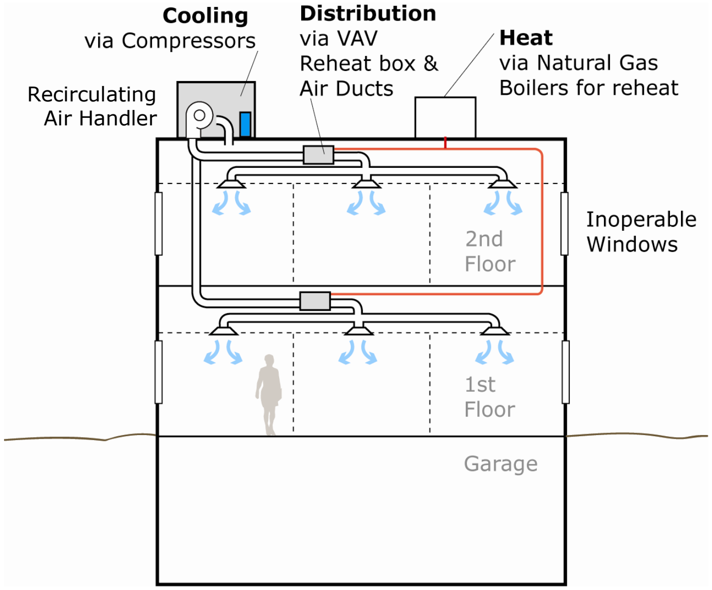


Figure 3: Typical Building Systems

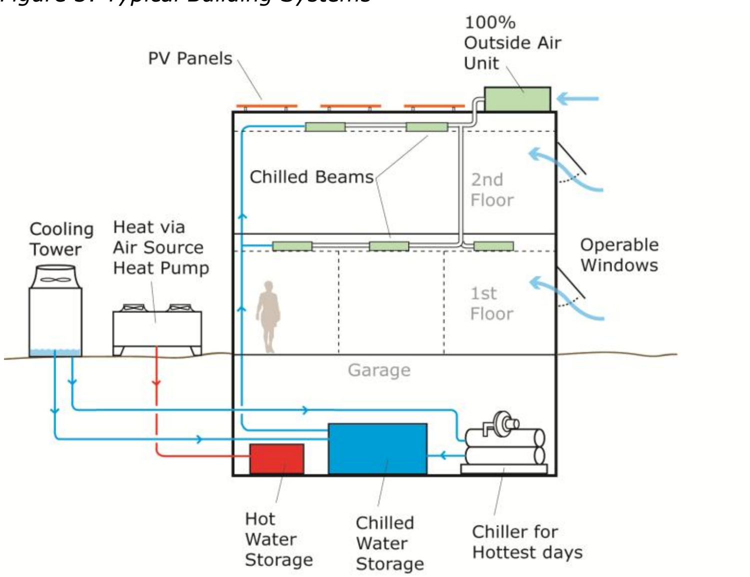


Figure 4: Zero-Energy Building with Highly Efficient Building Systems

2. Mechanical System Description

In order to achieve the goal of occupant comfort and health in a zero-energy building, several innovative mechanical systems will be incorporated into the building design. All of the lighting, HVAC and plug loads will be thoroughly minimized while providing a high level of comfort and indoor air quality. On-site renewable energy or photovoltaic panels will be used to meet 100% of the building energy use.

The HVAC system will deliver thermal comfort and ventilation independently. Decoupling these systems (which are commingled in typical buildings) will permit optimized heating and cooling at the same time as optimized ventilation. This system will provide higher levels of comfort and health than traditional HVAC systems.

Cooling for a typical office building is provided by compressors in recirculating air handlers. These systems return air from the building, mix it with ventilation air, cool it, and then redistribute the mixed air. The proposed building, by contrast, does not recirculate air. Ventilation is provided by a 100% outdoor air unit that filters and cools the air, while hydronic cooling is provided independently within each zone.

Heating in a typical office building is provided at variable air volume (VAV) reheat boxes – where the already-cooled air is reheated for spaces that require heating. With the ventilation provided separately, the heating can be provided directly when required, with no energy penalty for cooling and then reheating.

5. Design Criteria

Location

Los Altos, California

Outside Design Conditions (ASHRAE 0.4% conditions)

Summer
Dry Bulb: 88.2°F DB/ 66.1°F WB (coincident)
Wet Bulb: 68.5°F WB/ 82.6°F DB (coincident)
Dew Point: 63.3°F DP/ 67.4%RH / 74.8°F DB (coincident)
16.4°F Mean Daily Range during hottest month

Winter
36.4°F DB (ASHRAE 99.6% Conditions)

Wind
15 / 8 mph (Winter / Summer Average Wind Speed)

Title 24 requires that we design using the 0.4% ASHRAE design conditions. These design conditions may be exceeded for a number of hours per year (due to outside temperatures exceeding the ASHRAE 0.4% design conditions). While designing to the ASHRAE 0.4% conditions by definition indicates that design setpoints will be exceeded during peak periods, typical design often requires a minimal amount of oversizing so that control is always maintained. This results in small amounts of risk and results in significant first cost and operating cost savings.

Interior Design Conditions

Space Type	Temperature	Humidity
Offices and Conference Rooms	Summer – 76°F ±2	<0.012 HR
	Winter - 70°F ±2	
Lobby	Summer – 76°F ±6	<0.012 HR
	Winter - 70°F ±4	
Large Meeting Room	Summer – 73°F ±2	<0.012 HR
	Winter - 70°F ±2	
Mech. and Elect. Rooms	50-85°F	<0.012 HR

A winter nighttime, unoccupied temperature setback to 60°F may be used when appropriate.

Hours of Operation

The following areas operate 24 hours and will be individually and independently conditioned:

- Server room
- Elevator machine room
- Electrical room

Remaining areas have the following occupancy schedules:

Offices and Conference Rooms	0600h-2000h M-F
	0800h-1300h Sat
Lobby	0700h-2300h M-F
Large Meeting Room	0800h-2300h M-F

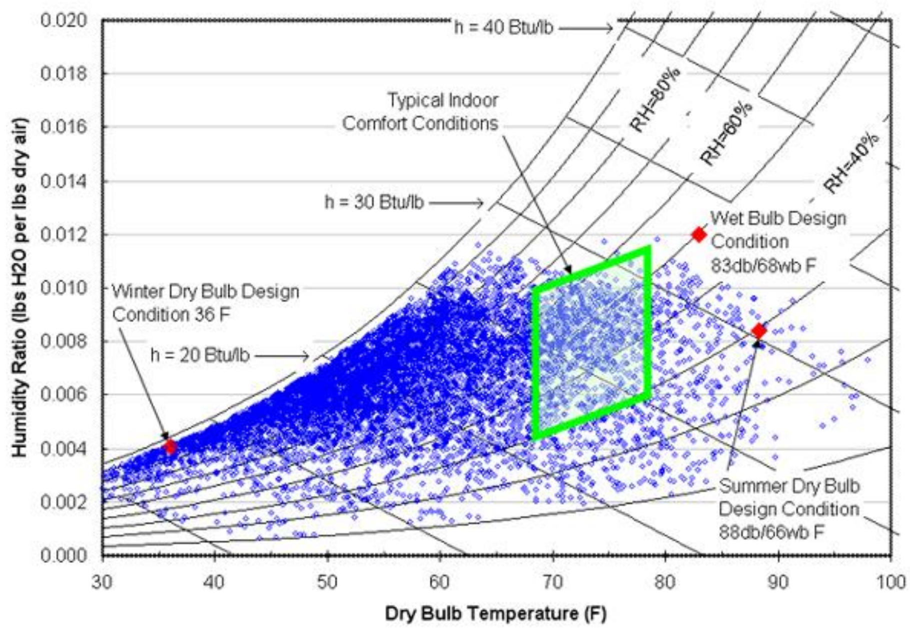


Figure 17: Hourly Weather Conditions for Los Altos, CA

Adjusted Supply Fan Energy

The supply fan energy from the eQuest model was adjusted using a spreadsheet calculation, to account for limitations of the software and arrive at more accurate fan energy results.

	Equest Report	Adjusted Values	Savings beyond eQuest proposed model	% Savings beyond eQuest proposed model
	kWh/yr	kWh/yr	kWh/yr	
System 1	11,262	5,114	6,147	55%
System 2	11,262	5,831	5,431	48%
System 3	974	366	607	62%
System 4	6,723	0	6,723	100%
Sum	30,220	11,311	18,909	63%