Clean Coalition

SB Humane

Solar Microgrid Feasibility Study

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Tasks conducted in the feasibility study

1. Collect site and phasing information to stage effective modeling:
    - Site information includes technically viable solar & BESS siting locations, SCE meter and diesel generator ratings & locations, anticipated EV and load-impacting plans, and existing solar proposals and related energy analyses.
2. Create load profiles:
    a. Baseline Load Profile based on electrical engineers load profile modeling.
    b. Master Load Profile based on adjustments to the Baseline to reflect adjustments in the future due to Electric Vehicle (EV) charging. No additional significant changes were identified.
    c. Critical Load Profile based on an estimated percentage of load that is critical and that requires 100% energy resilience during major grid outages. Since the diesel generator will support the critical loads, the Solar Microgrid is confirmed to able to indefinitely support 7% of the load.
3. Size solar & storage resources:
    - Will be optimized to cost-effectively meet operational requirements while minimizing use of the diesel generator during grid outages
4. Evaluate viable load management solutions and recommend the best solution for the SB Humane Solar Microgrid.
5. Analyze the economics of the most viable Solar Microgrid and solar-only options.
6. Present findings & recommendations to the SB Humane team.

Future activities will include facilitating the RFP process, facilitating the contracting process, providing construction management support, and performing initial Monitoring & Verification (M&V) to ensure that the Solar Microgrid is meeting the contracted performance requirements.

Key components of the SB Humane Solar Microgrid

Solar:

- 339 kWdc configured in various rooftop and solar canopy configurations.
  - The rooftop configurations are mounted on South, West, and East angled roofs
  - The solar parking canopy configurations are either on new canopies that would need to be constructed, with low-degree tilts.
- 548,145 kWh of annual solar production (1,620 kWh/kWdc).
- 771 solar panels in total of JA Solar 395 Wdc and 540 W bifacial panels in landscape or portrait orientation, whichever optimally fits the roof or parking canopy space; or equivalent.

Battery Energy Storage System (BESS):

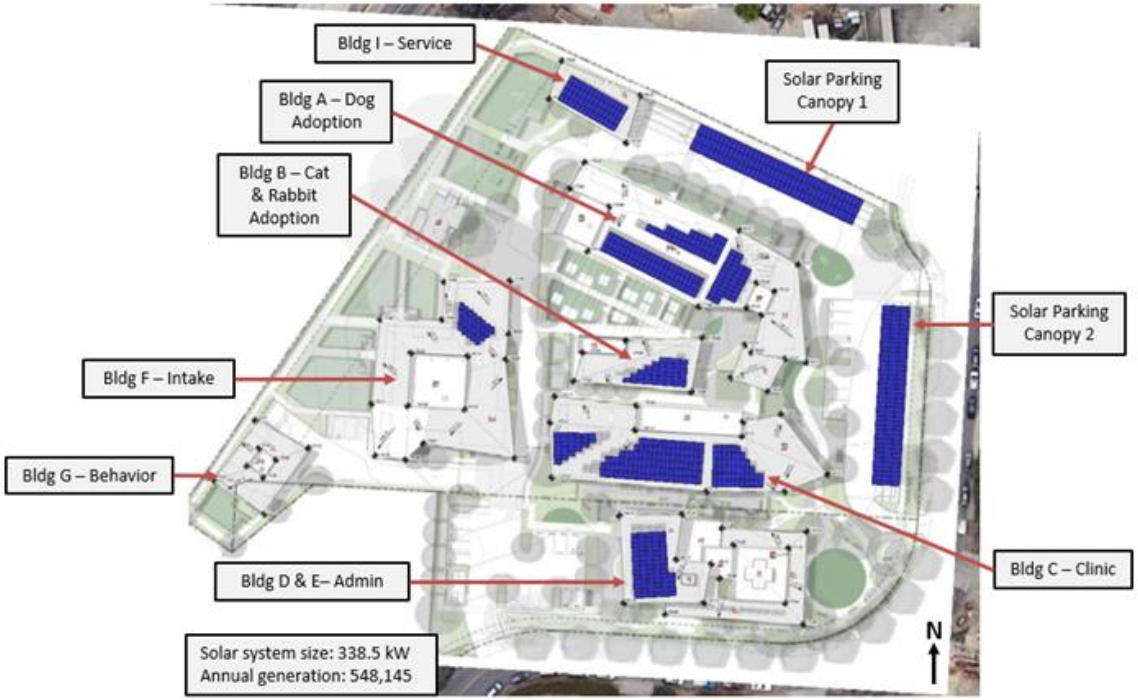
- 300 kW & 558 kWh Socomec HES L, or equivalent.

Microgrid Controller:

- Ageto Energy, or equivalent.

Load Management:

- SPAN, Eaton, Ageto, and/or equivalent.



Key cost assumptions for Solar Microgrid

SB Humane - Solar Microgrid System Sizing and Cost							
Solar System Size & Cost			Battery Energy Storage System (BESS) Size and Cost				
Solar System Size (kW)	Solar System Cost	Solar System Cost per W	BESS Power Capacity (kW)	BESS Energy Capacity (kWh)	BESS, Load Management & Microgrid Controller Cost	BESS, Load Management, & Microgrid Controller Cost per kWh	Total Capital Expenditure
339	$1,394,517	$4.11	300	558	$1,072,857	$1,923	$2,467,374

Rate schedule and service rating

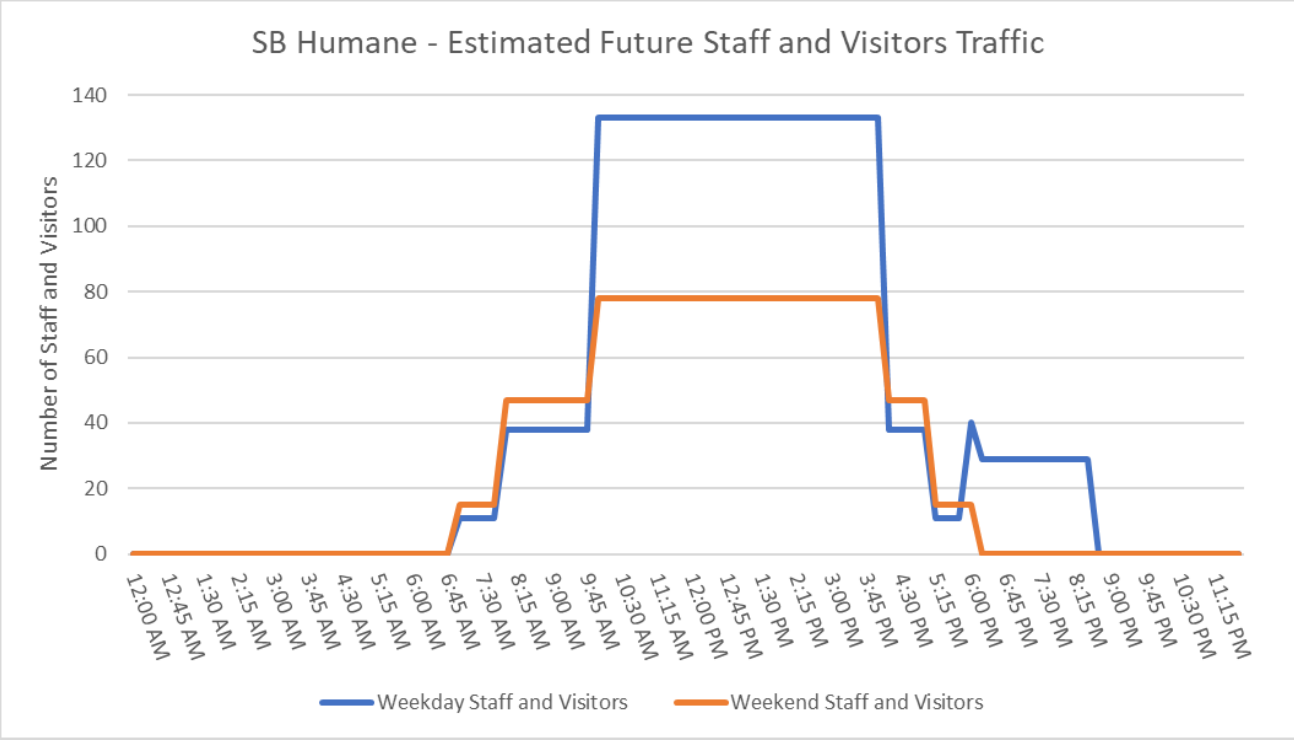
SB Humane - Rate Schedule and Service Rating					
Load Profile Type	**Total Annual Load (kWh)**	**Peak Demand (kW)**	**Southern California Edison (SCE) Rate Schedule**	**Central Coast Community Energy (3CE) Rate**	**Service Rating (kV)**
Baseline Load Profile	1,341,466	453	TOU-GS-3-D	3Cchoice	2

Load profiles

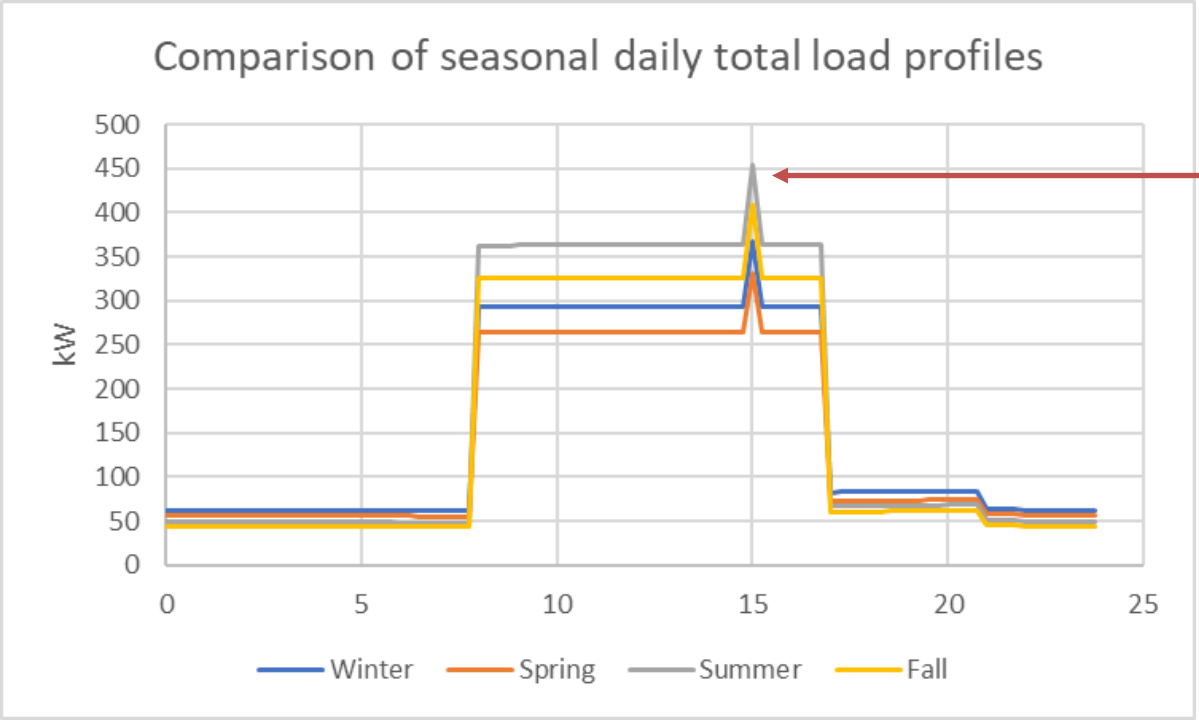
Key load related terms

Load Type	Definition
Baseline Load Profile	The annual load profile of electrical loads per site that forms the basis for creating the Master Load Profile.
Adjustments Load Profile	The annual load profile of adjustments for anticipated Electric Vehicle (EV) Charging Infrastructure (EVCI), electrification, energy efficiency, and new facilities.
Master Load Profile	The forecasted annual load profile used for this study's analysis, created from the Baseline Load Profile plus adjustments for anticipated EVCI, electrification, energy efficiency, and new facilities.
Critical loads	Electrical loads that are necessary to be provided with 100% energy resilience during grid outages
Critical Load Profile	Annual load profile of the critical loads.

Estimated future staff and visitors traffic



Baseline load profile by season



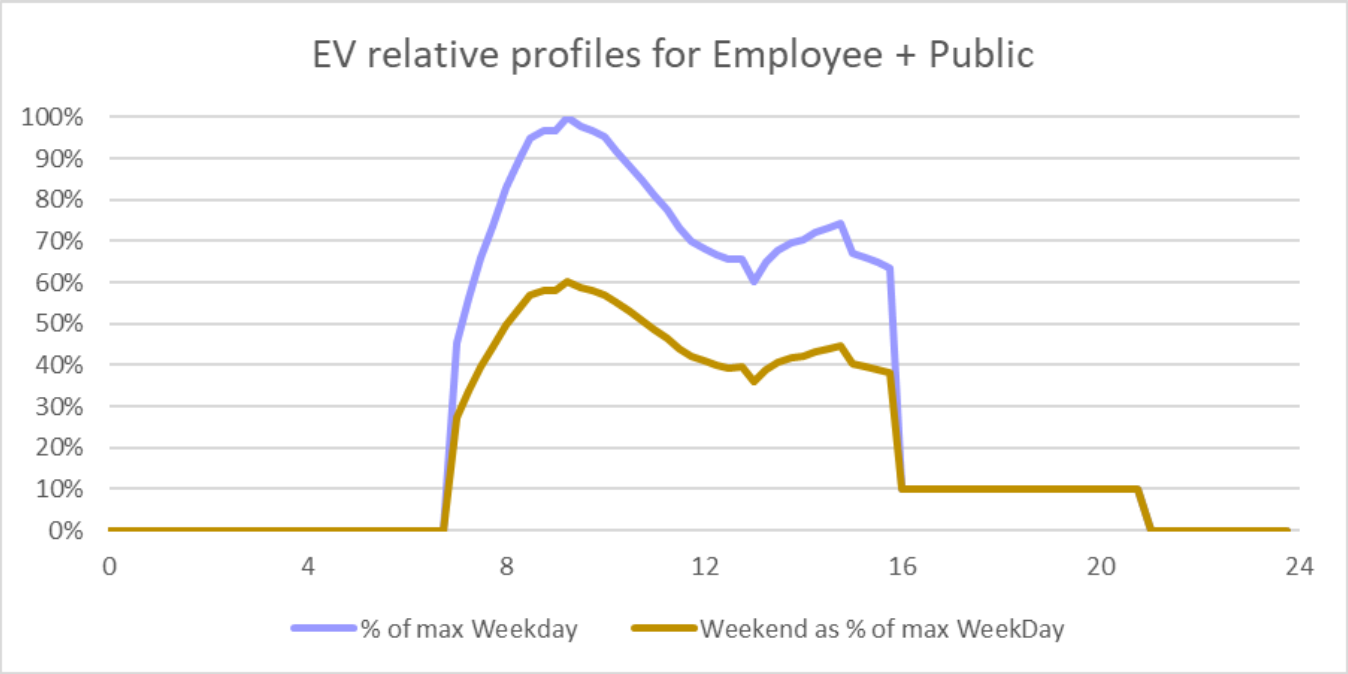
A 25% bump at 3pm was included every third Thursday to account for demand charges in our economic modeling.

Demand Charges are based on the max power at a 15-minute interval.

This load profile includes:

- Buildings A, B, C, D, E, F, G, & I
- Beck House
- Exterior Lighting
- Security Lighting

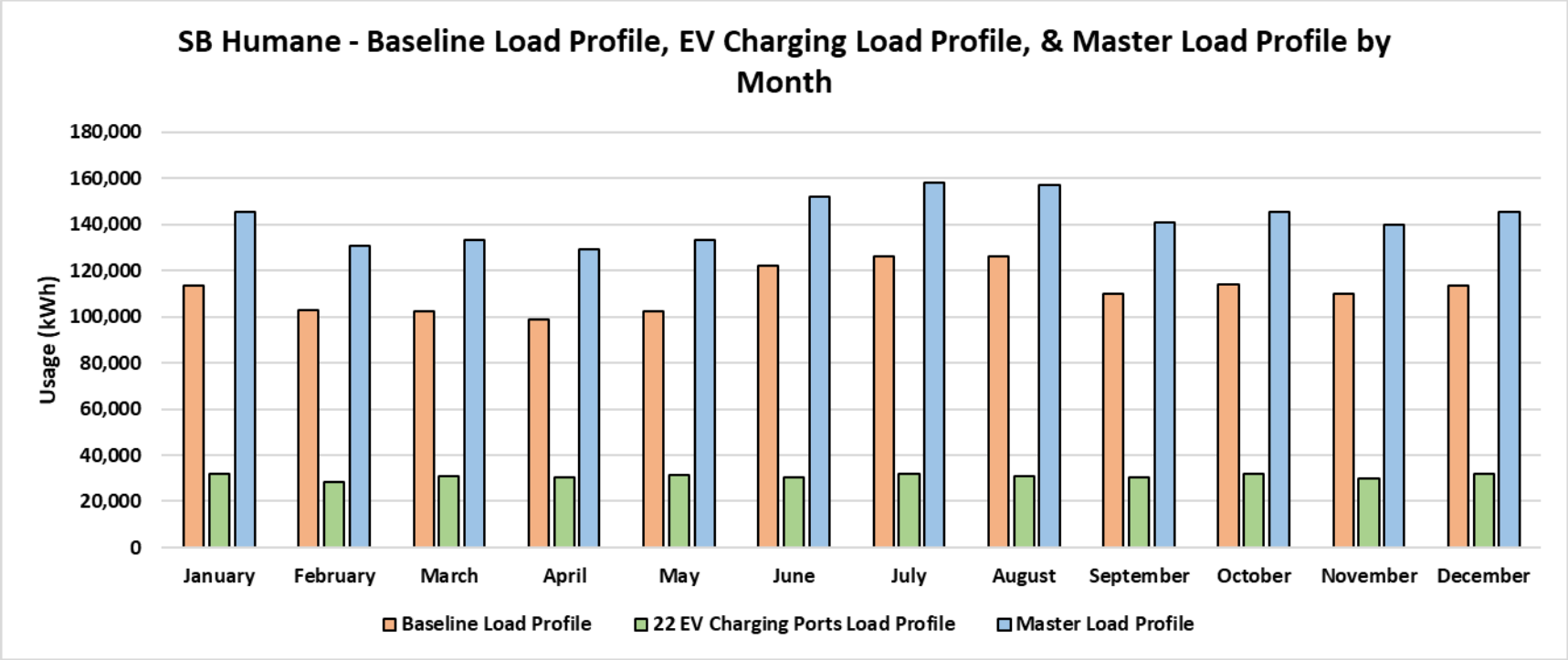
EV charging load profile



We made three essential updates to our original Employee & Public charging profile to match the traffic study:

1. Made the weekend curve 60% of the weekday curve
2. Moved the peak for both curves one hour later
3. Made sure no charging was occurring between the hours of 6:45am and after 9:00pm

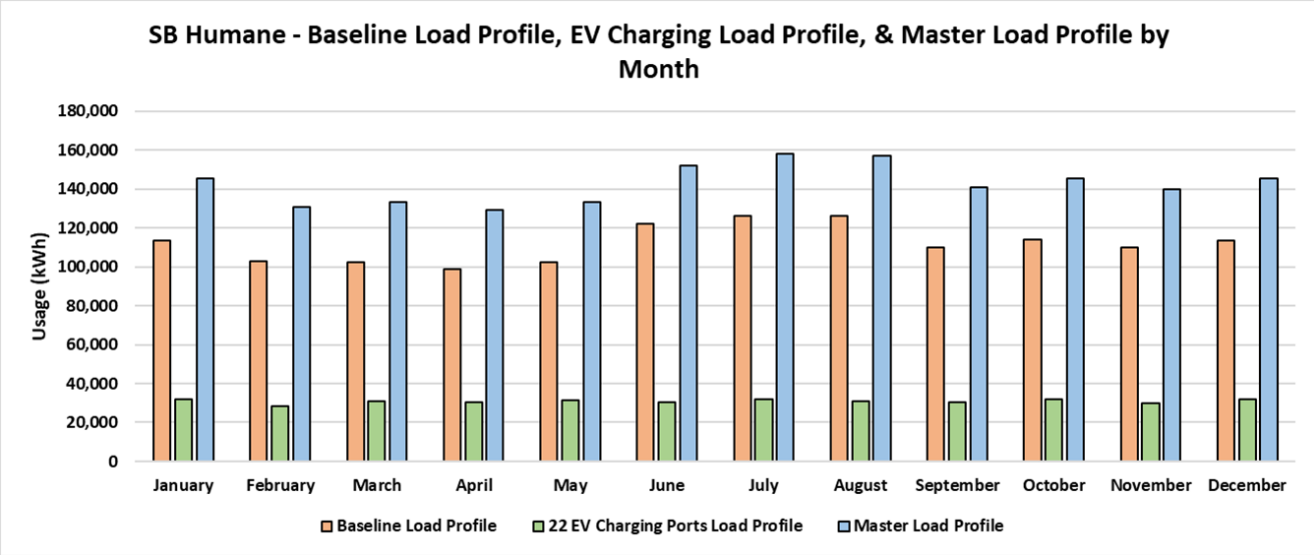
Load analysis



SB Humane - Projected Electricity Usage Details								
Meter Name	Rate Schedule	Address	Baseline Load Profile Annual Load (kWh)	22 EV Charging Ports Load Profile Annual Load (kWh)	Master Load Profile Annual Load (kWh)	Baseline Load Profile Peak Demand (kW)	22 EV Charging Ports Peak Demand (kW)	Master Load Profile Peak Demand (kW)
Main Meter	TOU-GS-3	5399 Overpass Rd	1,341,466	368,879	1,710,345	453	154	607

The EV Charging Profile makes up 22% of the Master Load Profile and it's Peak Demand will likely be controlled by Load Management, reducing the Master Load Profile Peak Demand.

Load analysis

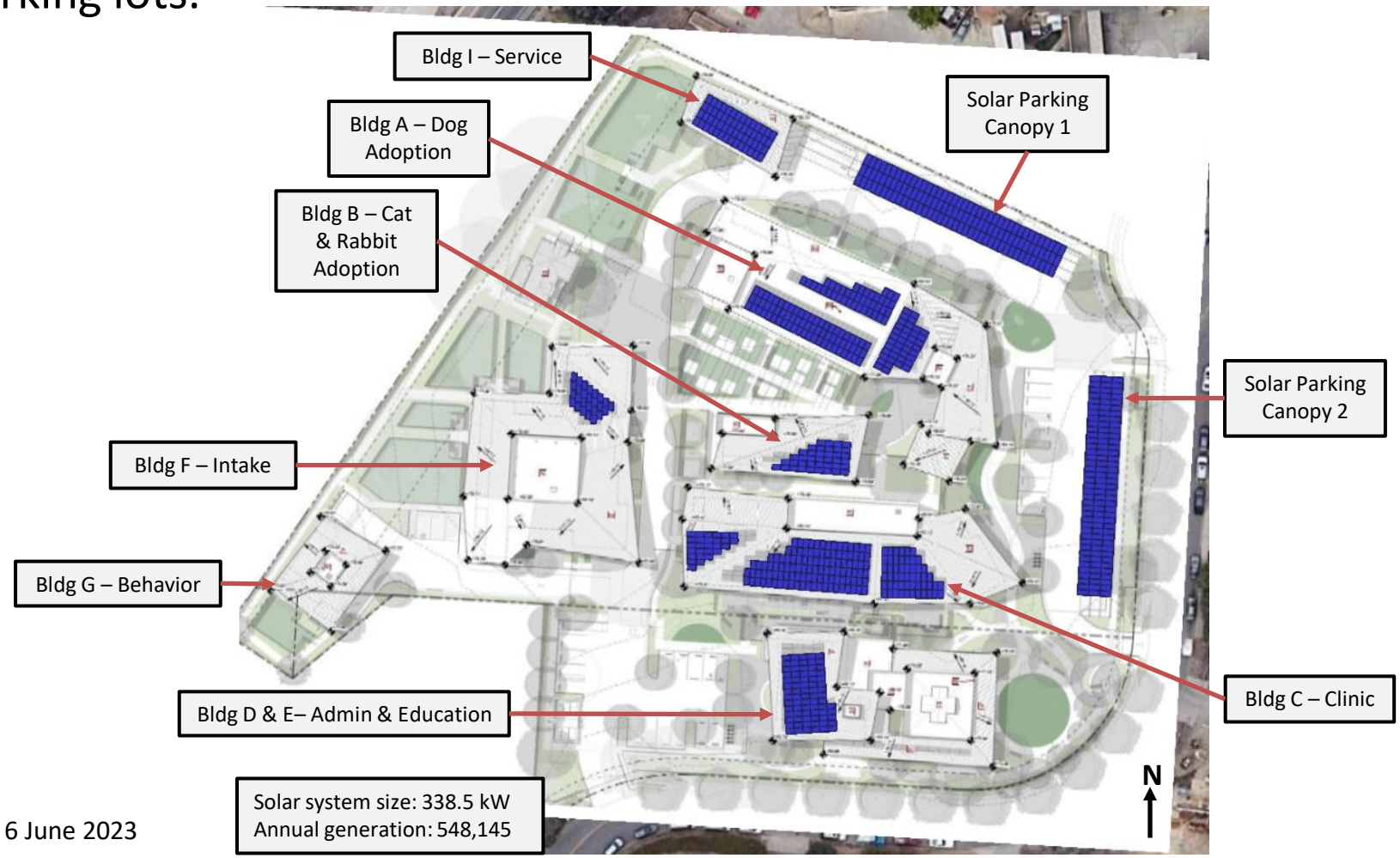


SB Humane - Total Monthly & Daily Max, Average, and Min Electricity Usage by Profile Type and Month												
Month	Baseline Load Profile				22 EV Charging Ports Load Profile				Master Load Profile			
	Total Electricity Usage (kWh)	Max Daily Electricity Usage (kWh)	Average Daily Electricity Usage (kWh)	Min Daily Electricity Usage (kWh)	Total Electricity Usage (kWh)	Max Daily Electricity Usage (kWh)	Average Daily Electricity Usage (kWh)	Min Daily Electricity Usage (kWh)	Total Monthly Electricity Usage (kWh)	Max Daily Electricity Usage (kWh)	Average Daily Electricity Usage (kWh)	Min Daily Electricity Usage (kWh)
January	113,589	3,682	3,664	3,664	31,681	1,131	1,022	709	145,269	4,794	4,686	4,373
February	102,598	3,682	3,664	3,664	28,288	1,131	1,010	709	130,887	4,794	4,675	4,373
March	102,166	3,312	3,296	3,295	30,838	1,131	995	709	133,003	4,426	4,290	4,004
April	98,871	3,312	3,296	3,295	30,550	1,131	1,018	709	129,420	4,426	4,314	4,004
May	102,166	3,312	3,296	3,295	31,259	1,131	1,008	709	133,425	4,426	4,304	4,004
June	122,118	4,093	4,071	4,070	30,128	1,131	1,004	709	152,246	5,201	5,075	4,779
July	126,188	4,093	4,071	4,070	31,681	1,131	1,022	709	157,868	5,201	5,093	4,779
August	126,188	4,093	4,071	4,070	30,838	1,131	995	709	157,025	5,201	5,065	4,779
September	110,109	3,690	3,670	3,670	30,550	1,131	1,018	709	140,658	4,800	4,689	4,379
October	113,778	3,690	3,670	3,670	31,681	1,131	1,022	709	145,459	4,800	4,692	4,379
November	110,109	3,690	3,670	3,670	29,707	1,131	990	709	139,815	4,800	4,661	4,379
December	113,589	3,682	3,664	3,664	31,681	1,131	1,022	709	145,269	4,794	4,686	4,373
Totals & Averages	1,341,466	3,694	3,675	3,675	368,879	1,131	1,011	709	1,710,345	4,805	4,686	4,384

Solar siting

Solar siting locations

Solar siting locations: The Clean Coalition will need from Judy and/or her proxy the final agreed upon locations for siting solar, including on rooftops and parking lots.

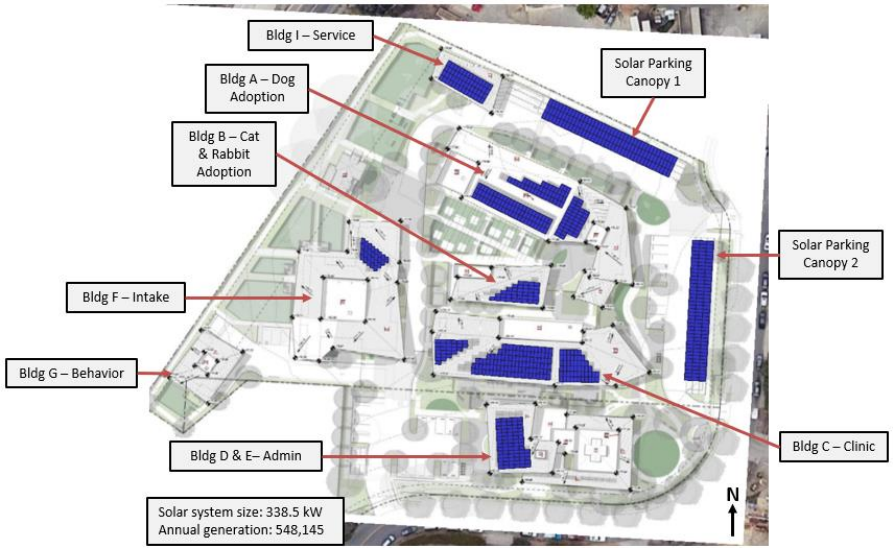


Design as of 6 June 2023

Solar siting potential – 338.5 kW

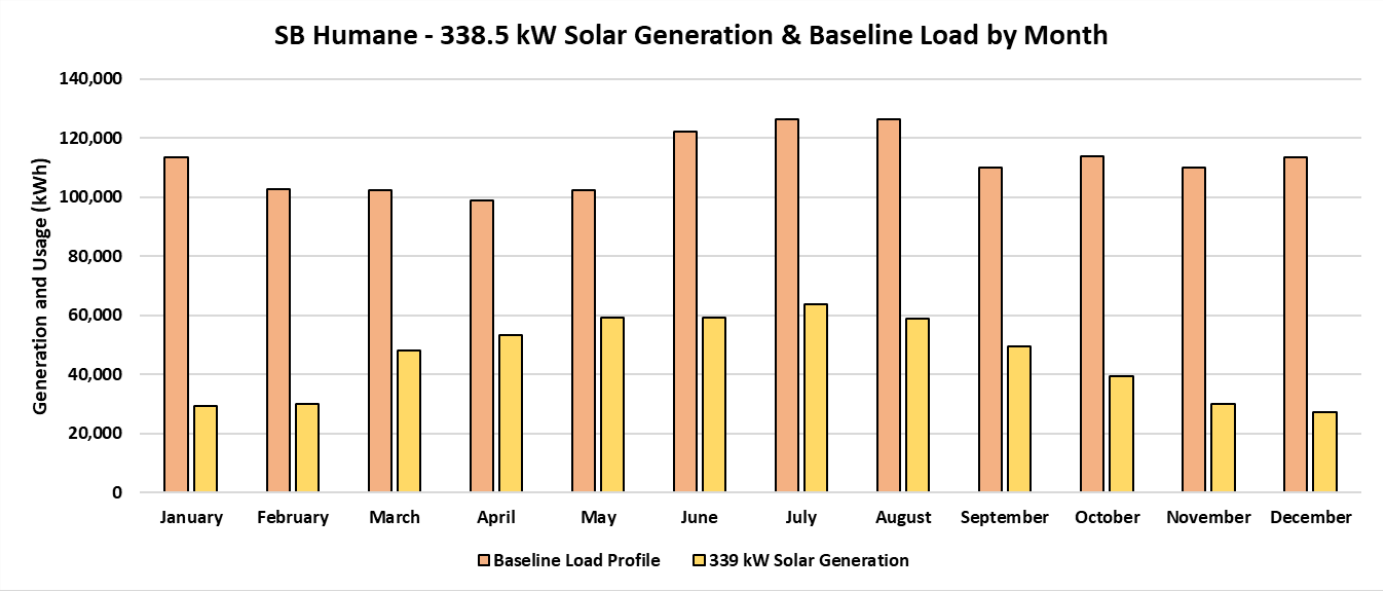
Clean Coalition

Total annual generation: 548,145 kWh
- 41% NZE of the Baseline Load Profile
- 32% NZE of the Master Load Profile



SB Humane - Solar Segement Size, Generation, and Layout Details					
Solar Segement	System Size and Annual Generation			System Layout Details	
	Solar System Size (kWdc)	Annual Generation (kWh)	Annual kWh/kWp	JA Solar Module Wattage	Number of Modules
Building A	59.3	98,008	1,653	395	150
Building B	15.4	25,982	1,687	395	39
Building C	75.4	123,868	1,642	395	191
Building D & E	29.6	48,576	1,640	395	75
Building F	10.3	14,935	1,454	395	26
Building I	22.1	36,164	1,635	395	56
Solar Parking Canopy 1	63.2	101,674	1,609	540	117
Solar Parking Canopy 2	63.2	98,939	1,566	540	117
Totals & Averages	338.5	548,145	1,619	-	771

Solar generation and Baseline Load Profile



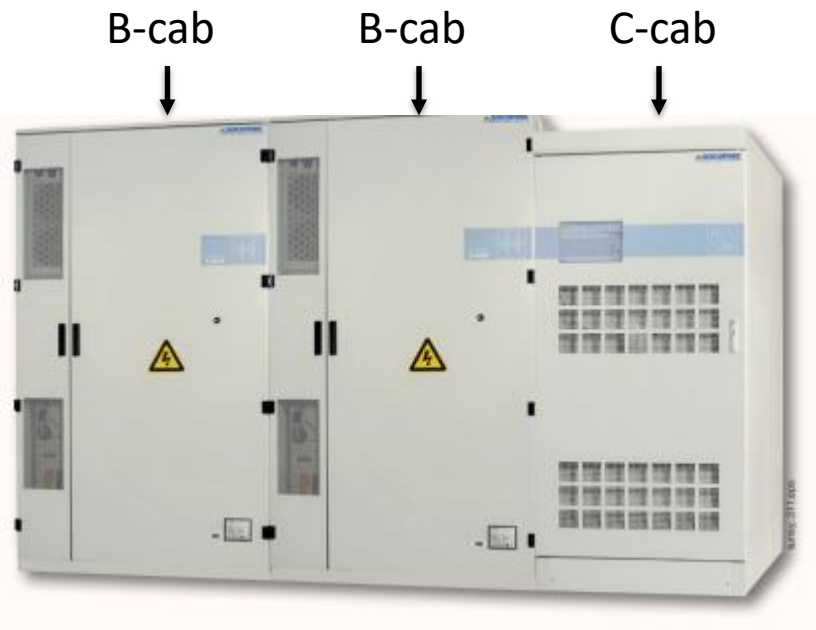
SB Humane - Total Monthly & Daily Max, Average, and Min Electricity Generation & Usage by Month								
Month	339 kW Solar Generation				Baseline Load Profile			
	Total Monthly Electricity Generation (kWh)	Max Daily Electricity Generation (kWh)	Average Daily Electricity Generation (kWh)	Min Daily Electricity Generation (kWh)	Total Monthly Electricity Usage (kWh)	Max Daily Electricity Usage (kWh)	Average Daily Electricity Usage (kWh)	Min Daily Electricity Usage (kWh)
January	29,290	1,243	945	248	113,589	3,682	3,664	3,664
February	30,094	1,602	1,075	290	102,598	3,682	3,664	3,664
March	48,205	1,968	1,555	620	102,166	3,312	3,296	3,295
April	53,409	2,206	1,780	551	98,871	3,312	3,296	3,295
May	59,057	2,308	1,905	530	102,166	3,312	3,296	3,295
June	59,338	2,334	1,978	795	122,118	4,093	4,071	4,070
July	63,584	2,265	2,051	1,070	126,188	4,093	4,071	4,070
August	58,870	2,147	1,899	1,105	126,188	4,093	4,071	4,070
September	49,489	1,984	1,650	563	110,109	3,690	3,670	3,670
October	39,498	1,684	1,274	294	113,778	3,690	3,670	3,670
November	30,110	1,328	1,004	325	110,109	3,690	3,670	3,670
December	27,202	1,066	877	353	113,589	3,682	3,664	3,664
Totals & Averages	548,145	1,845	1,499	562	1,341,466	3,694	3,675	3,675

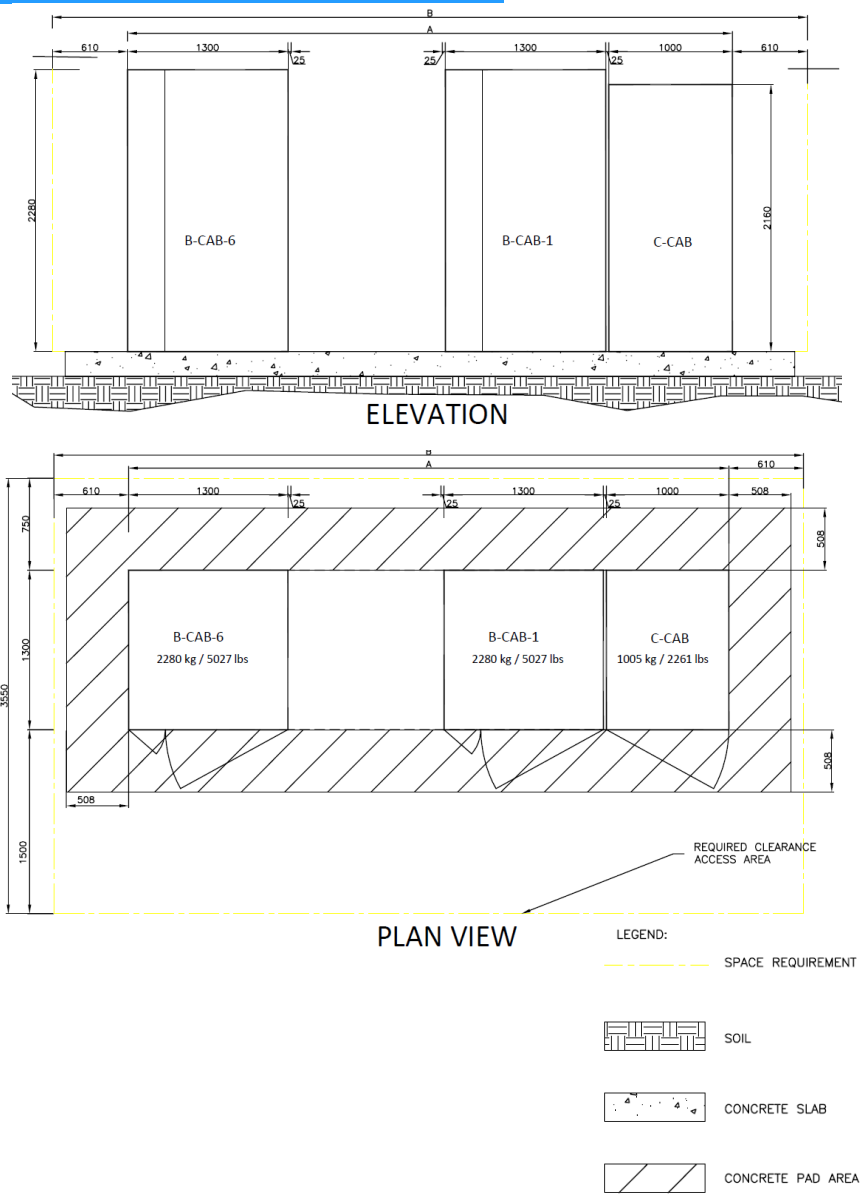
Battery energy storage system

Currently recommended Battery Energy Storage System

300 kW / 558 kWh Socomec SUNSYS HES L

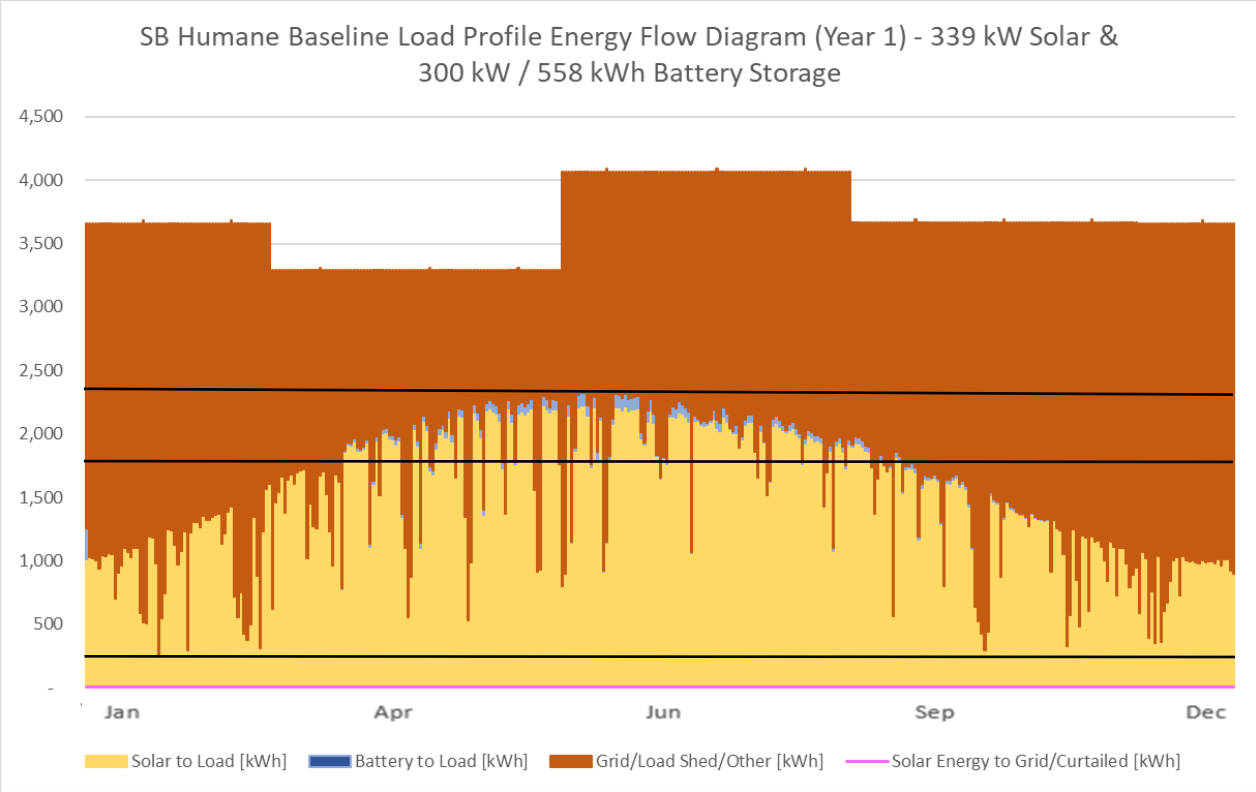
- One C-cab (converter cabinet) and three B-cabs (battery cabinets)
- Equipment required area of 73.57 sq ft
- Required clearance area of 268.78 sqft (including concrete pad)
- City of Goleta AHJ may have it's own clearance and setback requirements





Energy flow diagram

Baseline Load Profile Energy flow diagram (Year 1) – 339 kW solar & 300 kW / 558 kWh battery energy storage



Daily Coverage – Year 1

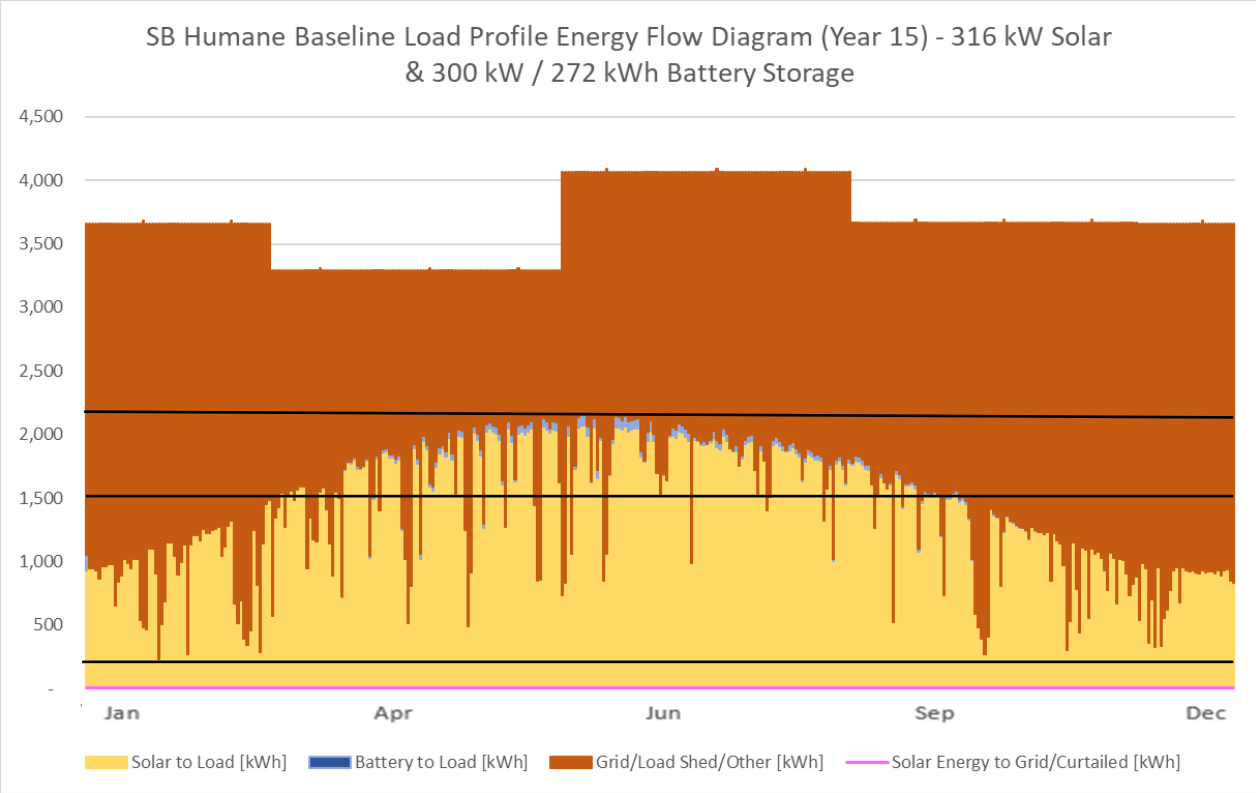
72% (2,385 kWh)

42% (1,698 kWh)

7% (248 kWh)

SB Humane Baseline Load Profile - Battery Energy Storage Sizing, System Cost, and Resilience (Year 1)									
Baseline Load Profile Peak Demand (kW)	Solar System Size Year 1 (kW)	Recommended Battery System Size (Year 1)		Resilience					
		Standard Option Battery Power Capacity (kW)	Standard Option Battery Energy Capacity (kWh)	Maximum Coverage with Solar + Storage		Average Coverage with Solar + Storage		Minimum Coverage with Solar + Storage	
				Year 1	Year 15	Year 1	Year 15	Year 1	Year 15
453	339	300	558	72%	67%	42%	38%	7%	6%

Baseline Load Profile Energy flow diagram (Year 15) – 316 kW solar & 300 kW / 272 kWh battery energy storage



Daily Coverage – Year 15

67% (2,198 kWh)

38% (1,534 kWh)

6% (230 kWh)

SB Humane Baseline Load Profile - Battery Energy Storage Sizing, System Cost, and Resilience (Year 15)									
Baseline Load Profile Peak Demand (kW)	Solar System Size Year 15 (kW)	Recommended Battery System Size (Year 15)		Resilience					
		Standard Option Battery Power Capacity (kW)	Standard Option Battery Energy Capacity (kWh)	Maximum Coverage with Solar + Storage		Average Coverage with Solar + Storage		Minimum Coverage with Solar + Storage	
				Year 1	Year 15	Year 1	Year 15	Year 1	Year 15
453	316	300	272	72%	67%	42%	38%	7%	6%

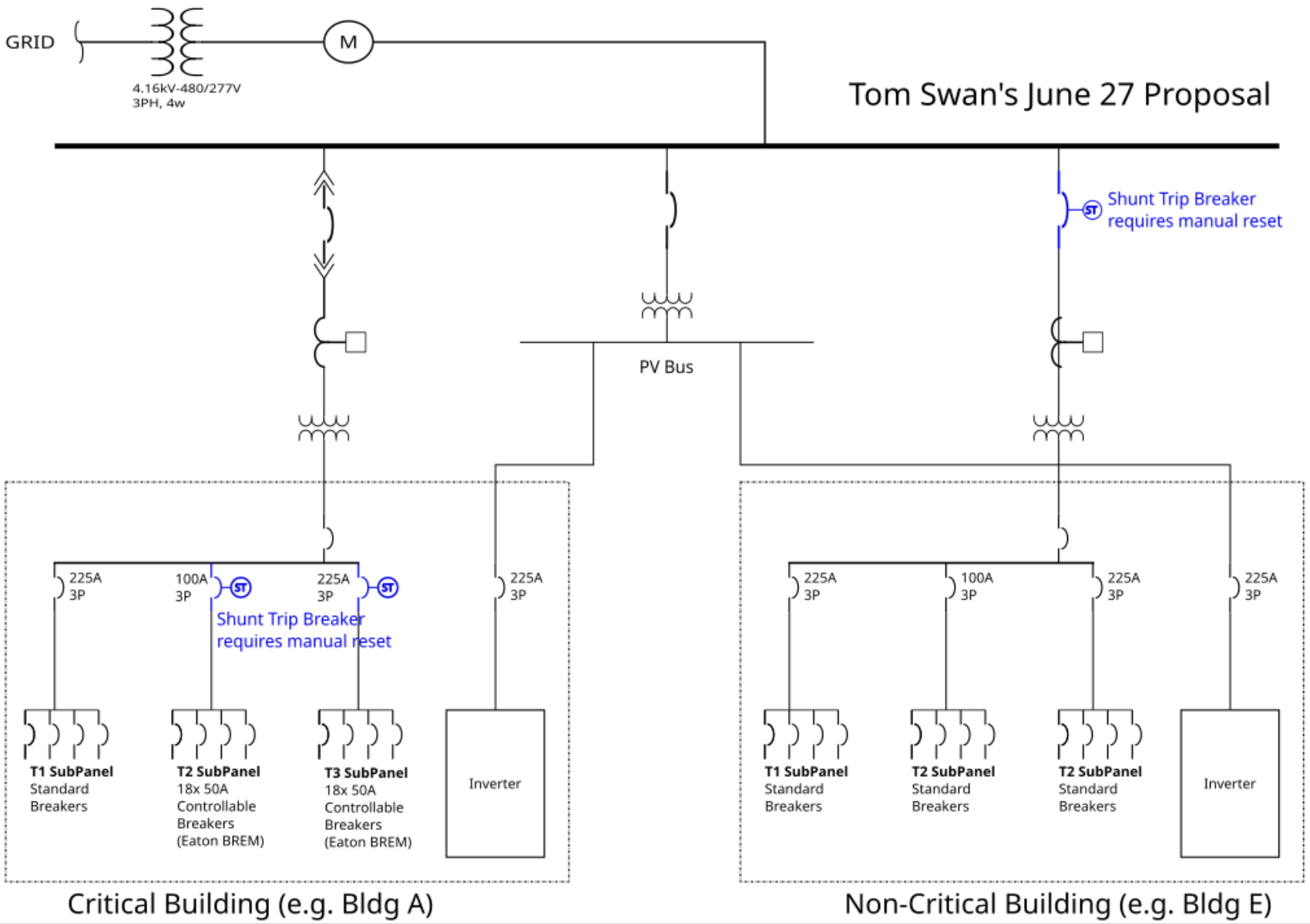
Load tiering

Load tiering

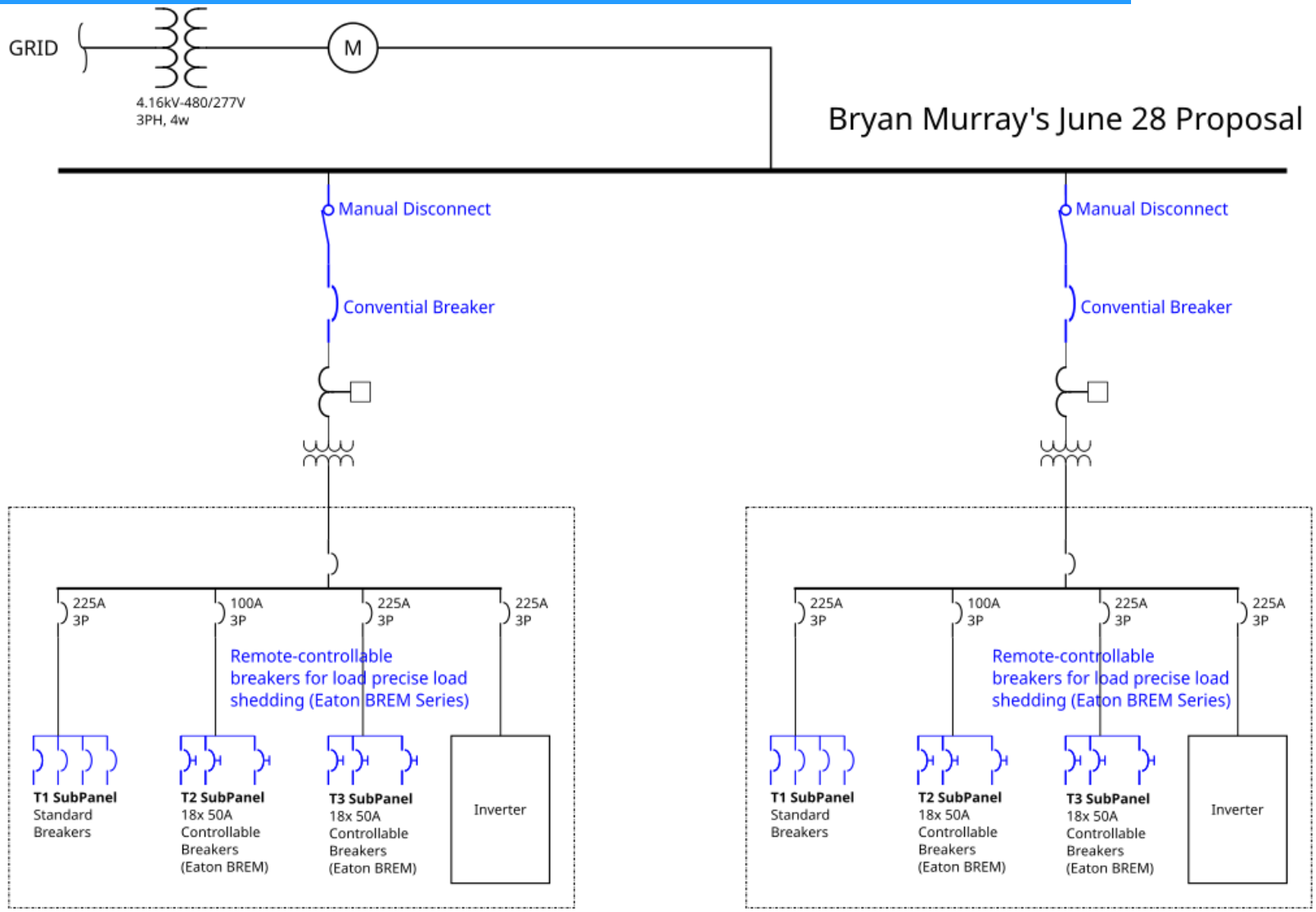
Tier:	Total Annual Load	Tier1	Tier 2	Tier 3
Total Load (kWh):	1,415,615	740,687	457,439	217,490
Tiering by kWh %:	100.0%	52.3%	32.3%	15.4%

Building	Load Type	Sub Category Loads	Average Annual Load by Load Type (kWh)	Percentage of the Total Load	Tier 1	Tier 2	Tier 3
BLDG A - Dog Adoption/Reception	HVAC		199,350	14.08%	x		
	Lighting		10,125	0.72%	x		
	Receptacles	Power (general receptacles)	10,166	0.72%		x	
		Information Technology	1,694	0.12%	x		
		Fire Protection and Security	1,694	0.12%	x		
		Refrigerator/Freezer	448	0.03%	x		
		Dishwasher	699	0.05%		x	
		Plumbing related equipement (Garbage disposal, drinking fountain, Trap Primer)	1,344	0.09%		x	
	Water Heaters		62,374	4.41%			x
	Laundry		3,090	0.22%	x		
BLDG B - Cat & Rabbit Adoption	HVAC		60,579	4.28%	x		
	Lighting		3,077	0.22%	x		
	Receptacles	Power (general receptacles)	2,158	0.15%		x	
		Information Technology	360	0.03%	x		
		Fire Protection and Security	360	0.03%	x		
		Refrigerator/Freezer	359	0.03%	x		
		Dishwasher	561	0.04%		x	
		Plumbing related equipement (Garbage disposal, drinking fountain, Trap Primer)	1,078	0.08%		x	
	Water Heaters		41,316	2.92%			x
	Laundry		3,090	0.22%			x
BLDG C - Clinic	HVAC		147,494	10.42%	x		
	Lighting		12,373	0.87%	x		
	Receptacles	Power (general receptacles)	61,250	4.33%	x		
		Information Technology	306	0.02%	x		
		Fire Protection and Security	306	0.02%	x		
		Refrigerator/Freezer	2,131	0.15%	x		
		Refrigerator Under Counter	1,421	0.10%	x		
		Plumbing related equipement (Garbage disposal, drinking fountain, Trap Primer)	2,131	0.15%		x	
	Water Heaters		41,606	2.94%			x
	Laundry		101,268	7.15%		x	
		Dental Delivery System	309	0.02%	x		
		Ultrasonic Machine	309	0.02%	x		
		Power Reel	2,474	0.17%	x		
		Walk on Scale	155	0.01%	x		

Load Management solutions (Syska's proposal)



Load Management solutions (Clean Coalition's proposal)

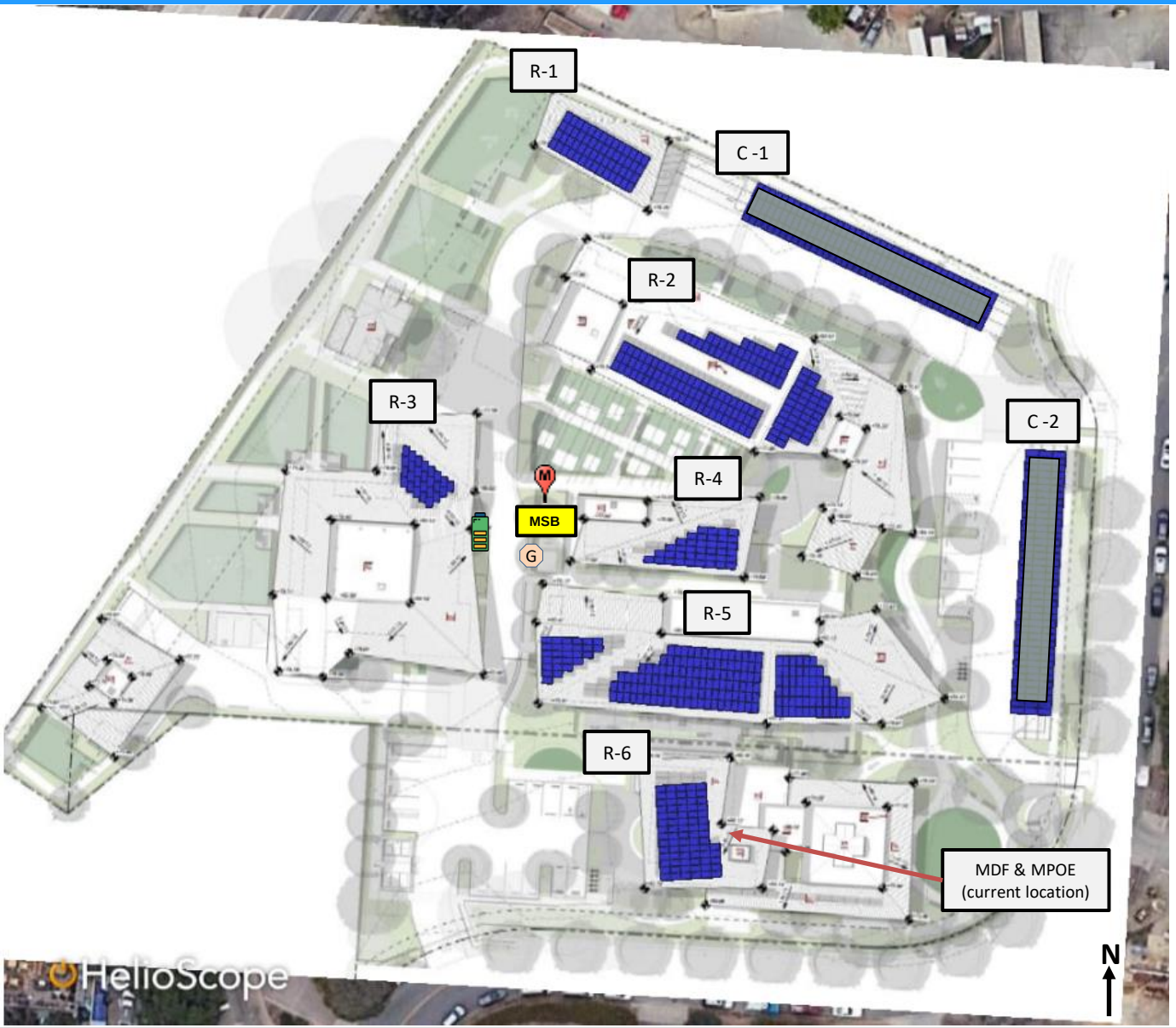


Critical Building (e.g. Bldg A)

Non-Critical Building (e.g. Bldg E)
...same concept!

Site layout

Site layout – 340 kW solar



SB Humane

5399 Overpass Rd, Goleta, CA

Service Meter

MSB — Main Service Switchboard 1600A, 480/277V, 3PH 4W

G — 250 kW Kohler diesel generator

22 potential level-2 EV ports (dual ports)

300 kW/558 kWh BESS location

Total Solar Siting Potential: 339 kW

- 41% NZE of Master Load Profile
- 32% NZE of Baseline Load Profile

C-1	63.2 kW Solar Parking Canopy
C-2	63.2 kW Solar Parking Canopy
R-1	22.1 kW Service Bldg I rooftop solar
R-2	59.3 kW Dog Bldg A rooftop solar
R-3	10.3 kW Intake Bldg F rooftop solar
R-4	15.4 kW Cat & Rabbit Bldg B rooftop solar
R-5	75.4 kW Clinic Bldg C rooftop solar
R-6	29.6 kW Admin & Education Bldg D & E rooftop solar

Total Annual Loads:

- Baseline Load Profile: 1,341,466 kWh
- EV Load Profile: 368,879 kWh
- Master Load Profile: 1,710,345 kWh

Critical Loads: HVAC (Bldg A, B, & C), MDF & MPOE (relocate to Bldg C), Lighting (Bldg A, B, C), General Receptacles (Bldg C), Medical equip (Bldg C)