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SB Humane Solar Microgrid

For EPC & PPA consideration

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Key components of the SB Humane Solar Microgrid reference design (proposers can meet or exceed)

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Solar system reference design:

- 339 kWdc configured in various rooftop and solar canopy configurations.
  - The rooftop configurations are mounted on angled roofs facing various directions.
  - The solar parking canopies are facing Southwest and West.
- 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) reference design:

- 326 kW & 1,305 kWh Tesla Megapack; or equivalent.

Fossil fuel generator

- 350 kW Generac with DeepSea 8610 MKII genset controller; or equivalent.

Microgrid Controller:

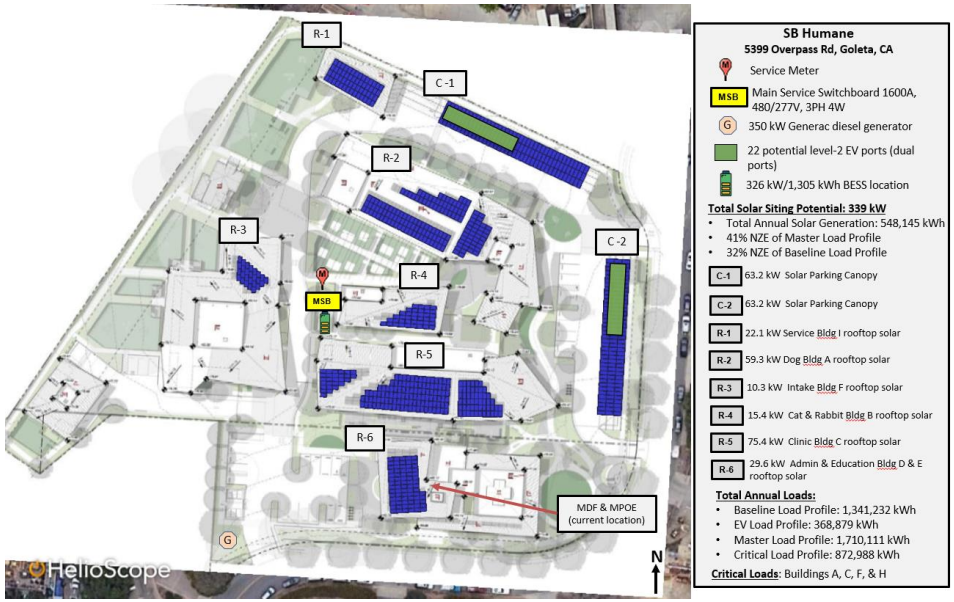
- Tesla, Ageto, or equivalent.

Load Management:

- Shunt-trip breakers controlled by Ageto, Eaton, or equivalent.

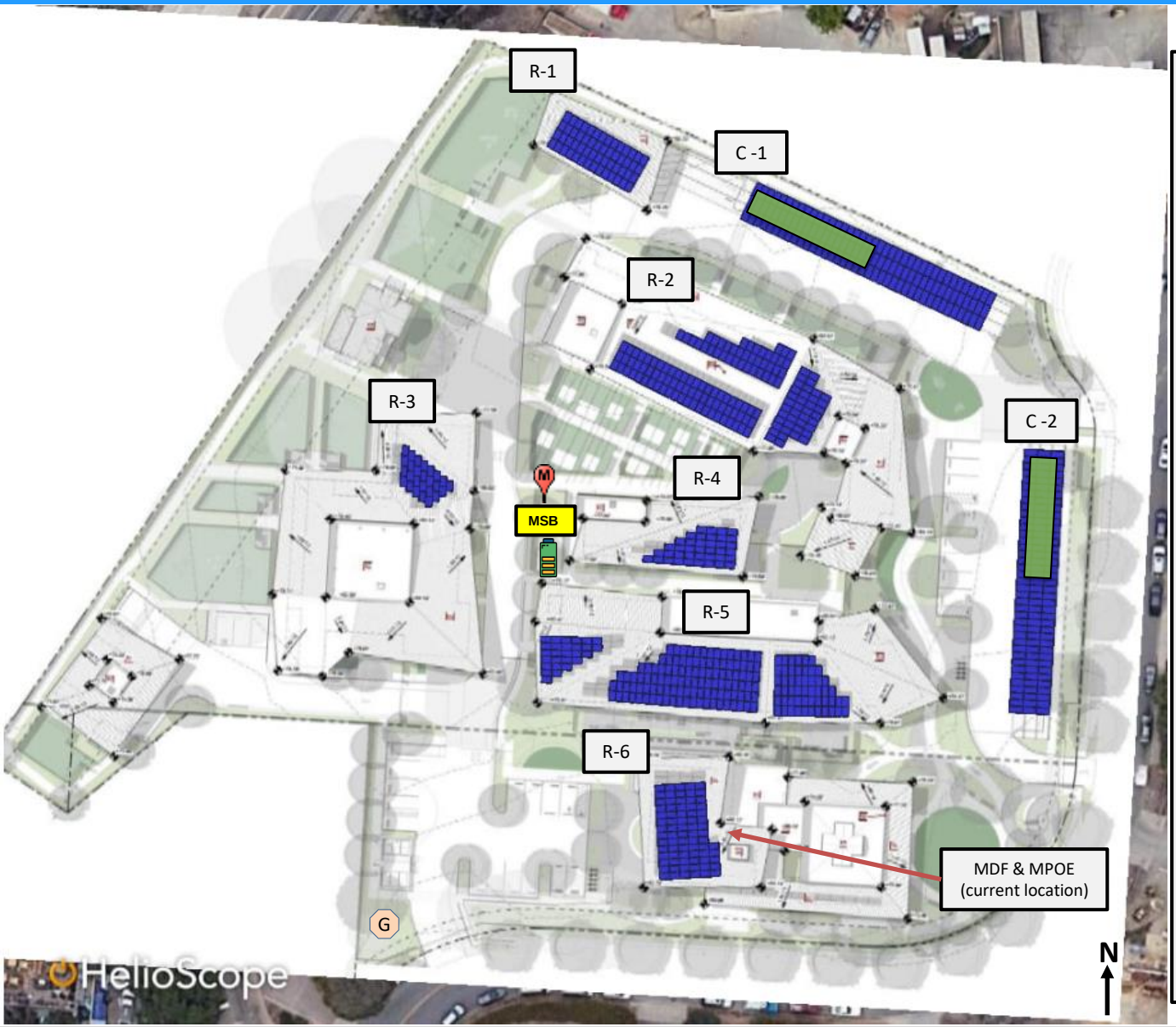
Electric Vehicle Charging Infrastructure:

- 22 Level-2 EV charging ports (minimum of 7 kW of simultaneous power capacity) to be sited under the solar parking canopies (12 under the northern canopy and 10 under the eastern canopy) and designed to meet the Solar Microgrid operational requirements.



The solar system design shown in the image above is based on an outdated roof plan. Proposers should create their own solar system design based on the updated roof plans per slide 12.

Reference solar layout (based on an outdated roof plan)



SB Humane

5399 Overpass Rd, Goleta, CA

- Service Meter
- MSB — Main Service Switchboard 1600A, 480/277V, 3PH 4W
- G — 350 kW Generac diesel generator
- 22 potential level-2 EV ports (dual ports)
- 326 kW/1,305 kWh BESS location

Total Solar Siting Potential: 339 kW

- Total Annual Solar Generation: 548,145 kWh
- 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: 1,341,232 kWh
- EV Load Profile: 368,879 kWh
- Master Load Profile: 1,710,111 kWh
- Critical Load Profile: 872,988 kWh

Critical Loads: Buildings A, C, F, & H

Load Profiles

Load profiles and rate schedules

The Aggregated Profiles Spreadsheet contains annual profiles in 15-minute intervals for:

1. Baseline Load Profile
2. Adjustments Load Profile (22 EV Charging Stations)
3. Master Load Profile
4. Critical Load Profile
5. Solar Generation Profile (from the reference design)

SB Humane Load and Billing Details										
Profile Type	Annual Load and Demand Values				Pre-Solar SCE & CCCE Billing Details			Post Solar Microgrid SCE & CCCE Billing Details		
	Total Annual Load (kWh)	Peak Demand (kW)	Average Demand (kW)	Minimum Demand (kW)	SCE & CCCE Rate Schedule	CCCE Rate Schedule	SCE Service Rating (V)	SCE & CCCE Rate Schedule	CCCE Rate Schedule	SCE Service Rating (V)
Baseline Load Profile	1,341,232	363	153	43	TOU-GS-3D	3Cchoice	480	TOU-GS-3E	3Cchoice	480
22 EV Charging Stations	368,879	154	42	0	-	-	-	-	-	-
Master Load Profile	1,710,111	517	195	43	TOU-GS-3D	3Cchoice	480	TOU-GS-3E	3Cchoice	480
Critical Load Profile (Buildings A, C, F & H)	872,988	256	100	25	-	-	-	-	-	-

TOU-GS-3D has a expected monthly peak demand of 200 kW through 500 kW. SB Humane's peak demand will be reduced with solar and not exceed this peak demand threshold.

Building phases

Site overview

SB Humane Campus

- 9 Buildings (see slide 26)
  - 4 critical
  - 5 non-critical
- 22 Level-2 EV charging ports
  - 10 ports on one circuit.
  - 12 ports on another circuit.

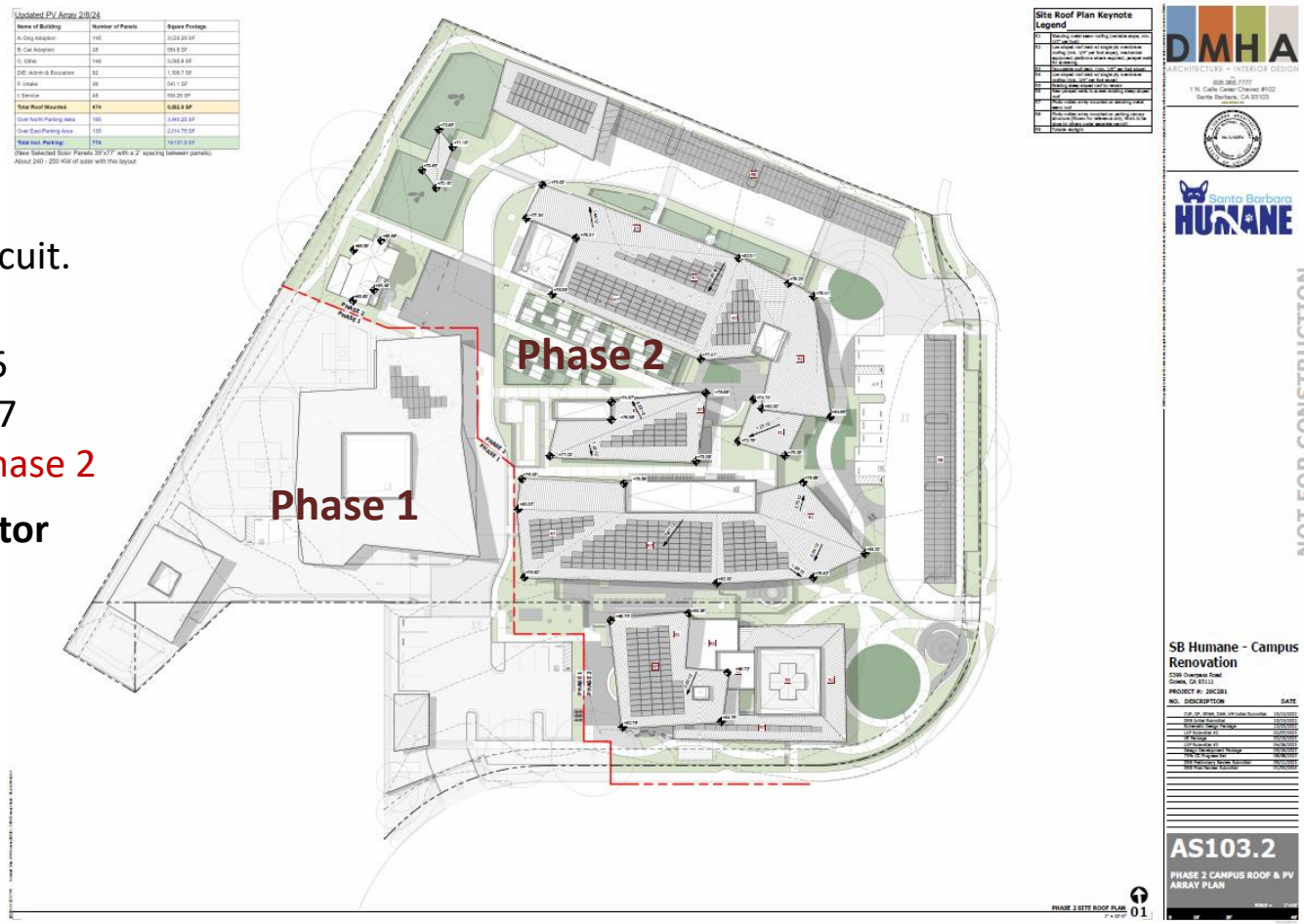
Two-Phase Construction

- Phase 1: Oct 2024 - Dec 2025
- Phase 2: Dec 2025 - Nov 2027
  - Solar Microgrid all in Phase 2

Solar Microgrid & diesel generator from reference design

- Solar: 339kWh
- BESS: 326kW & 1,305kWh
- Fossil fuel generator: 350kW

Site progress set



Site phase 1

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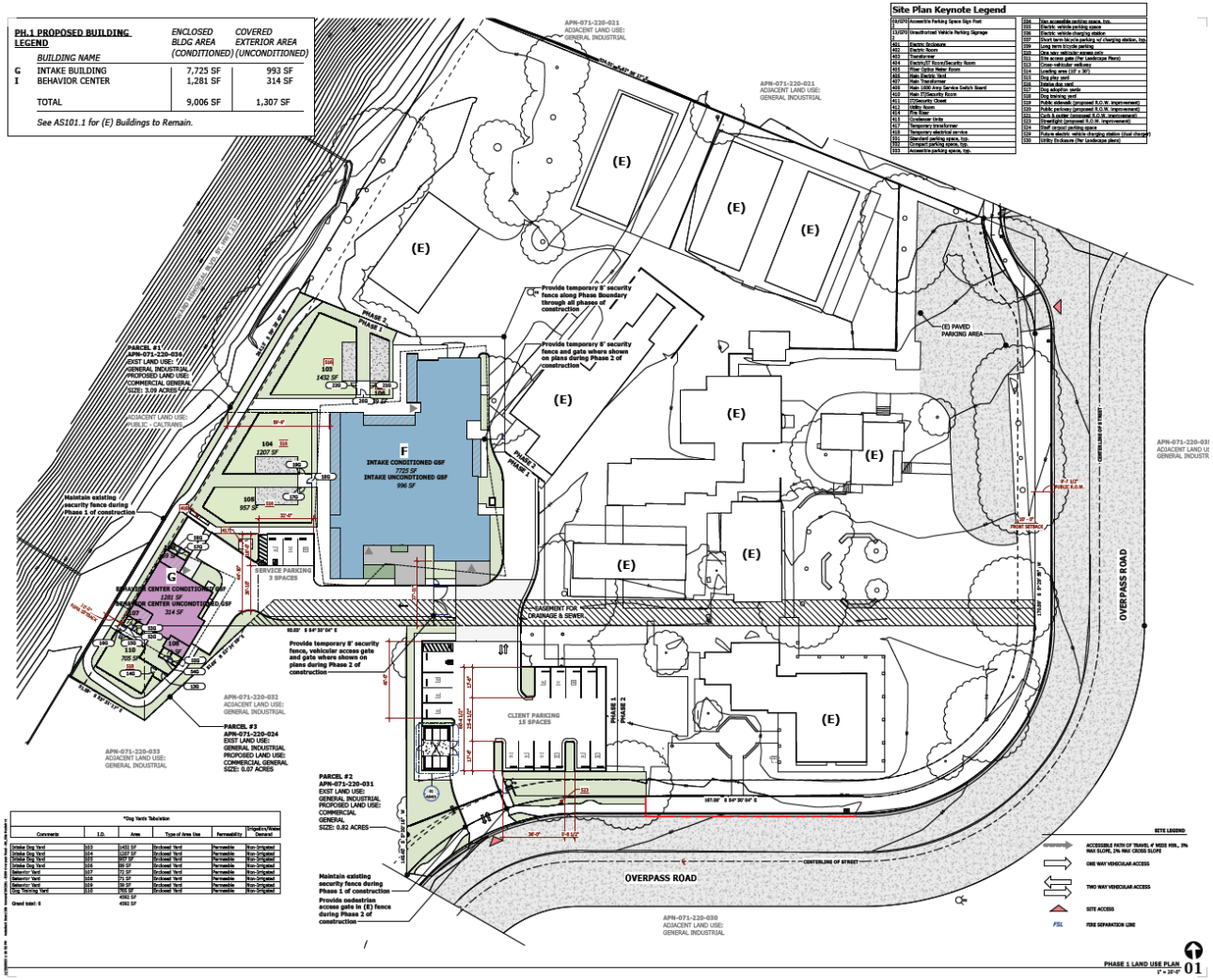
Site progress set



Site phase 2

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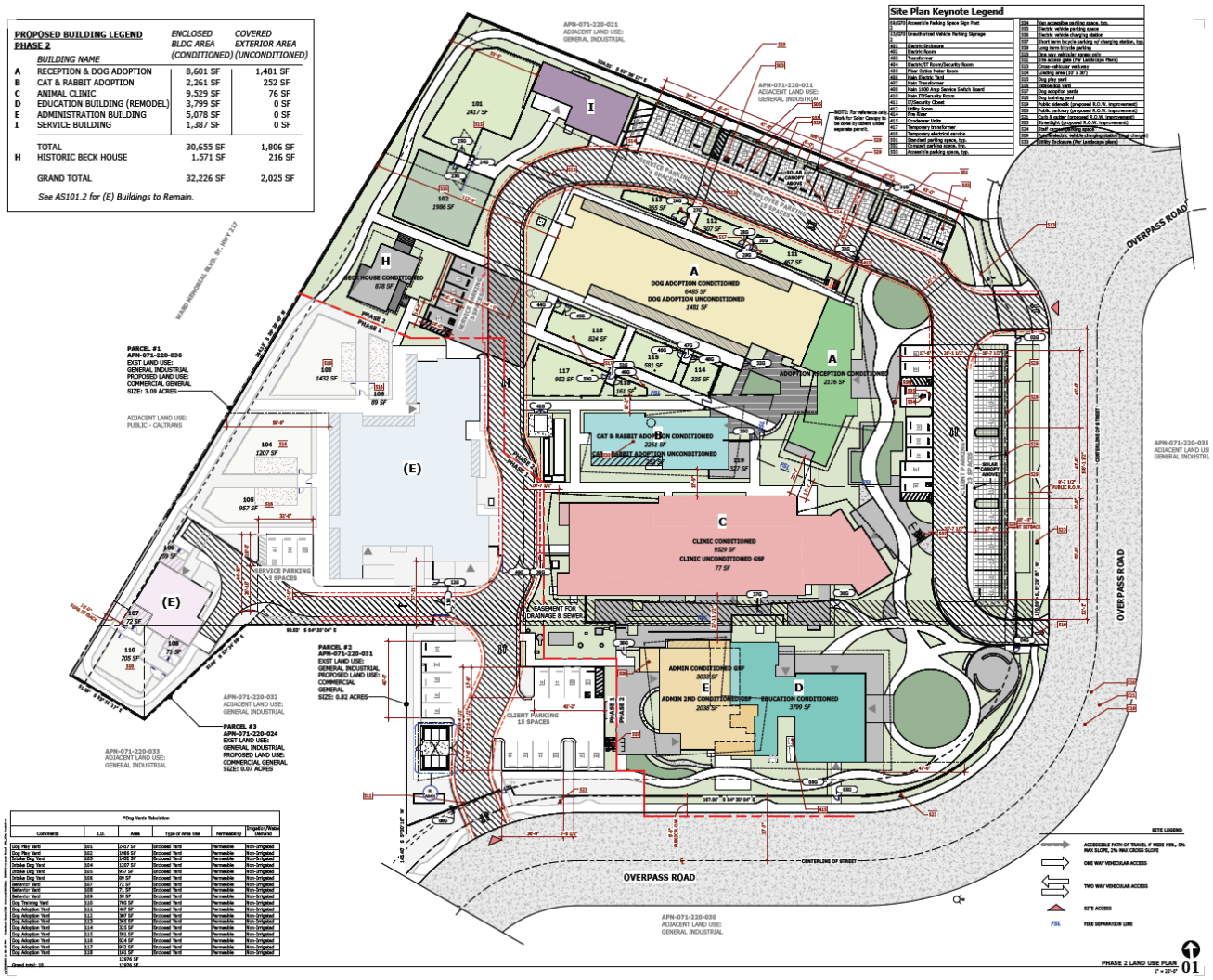
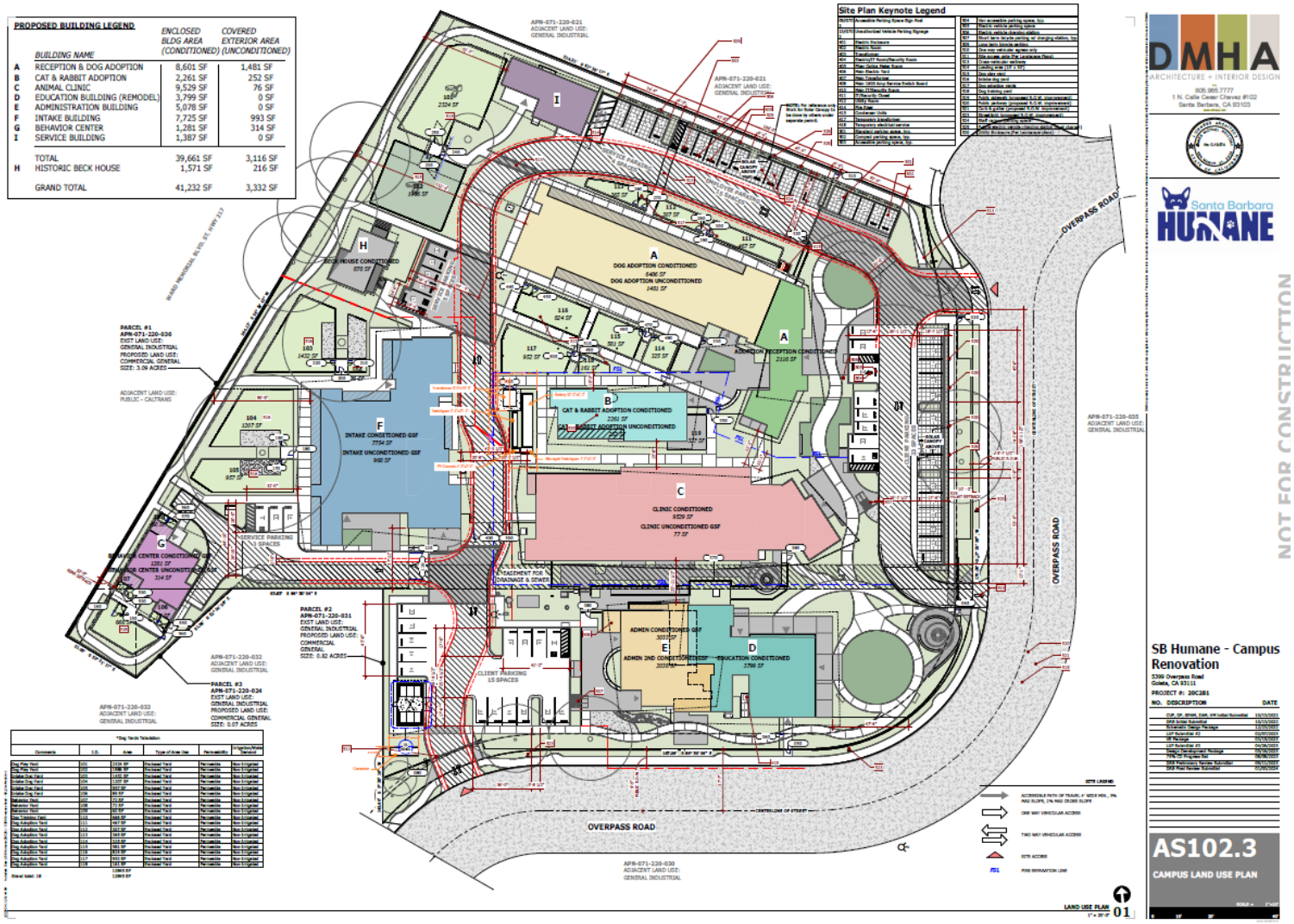
Site progress set



Completed site

Site progress set



Campus roof plan and reference solar design

Campus roof plan, landscaping plan, and reference solar design

Campus roof plan with solar

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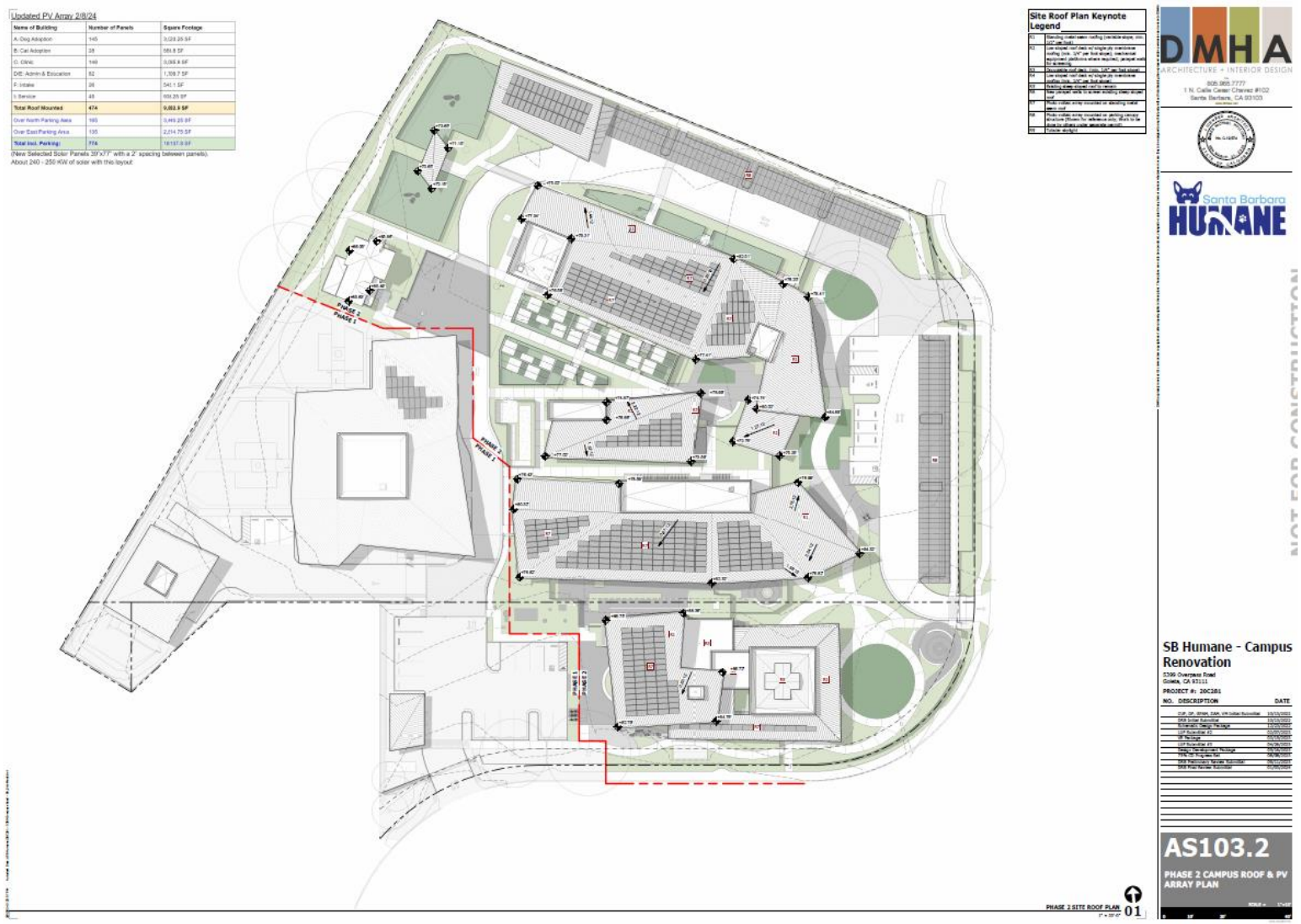
[Campus roof plan](#)



Campus landscaping plan phase 1

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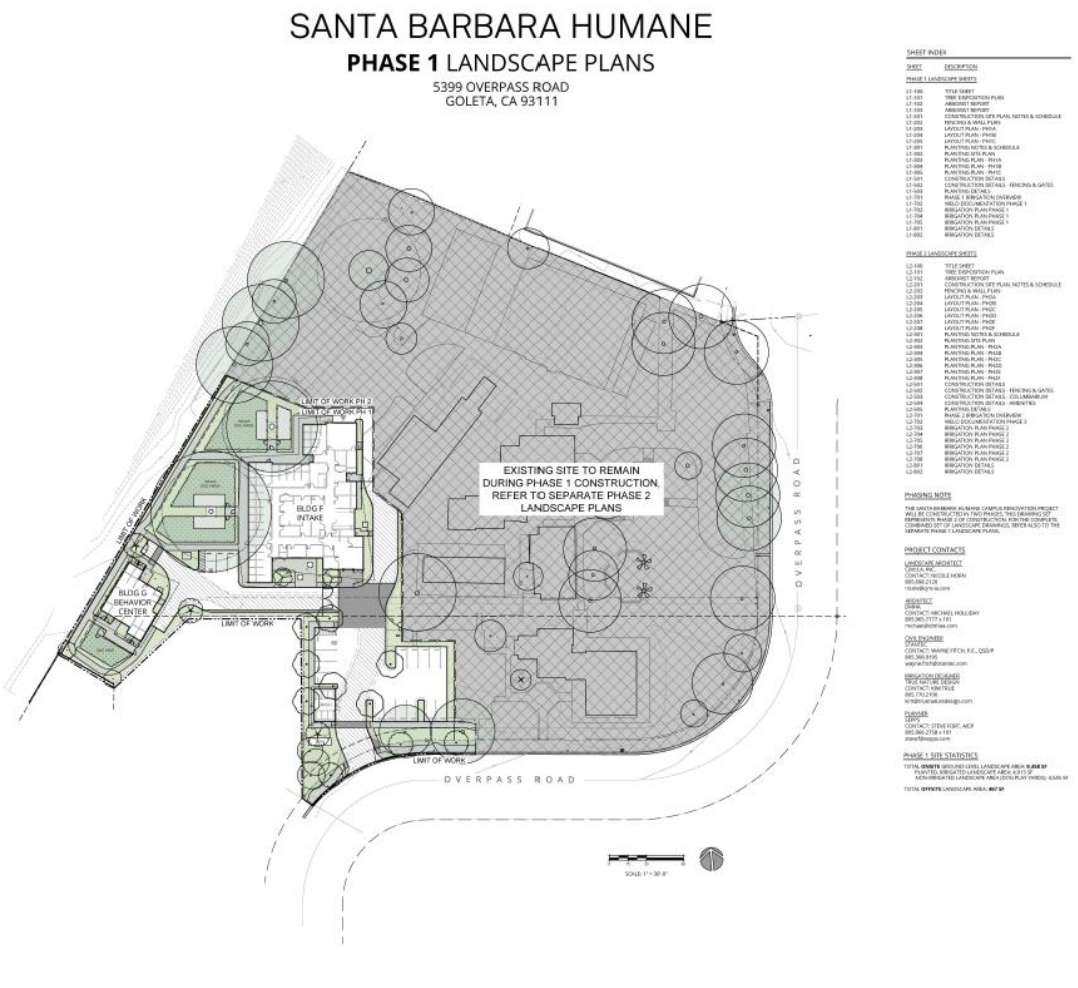
[Landscaping plan](#)



Campus landscaping plan phase 2

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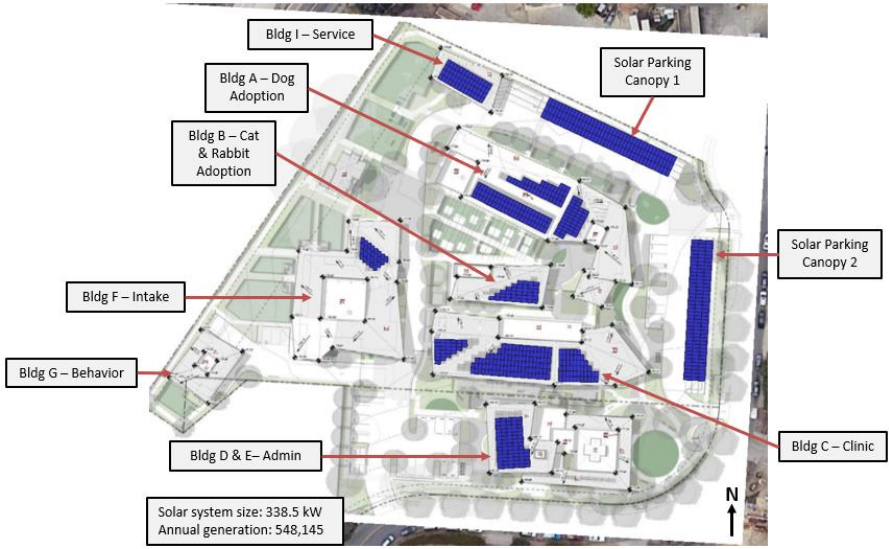
[Landscaping plan]

Reference solar sizing - 338.5 kWdc total

The solar generation reference profile can be found in the Aggregated Profiles Spreadsheet and is based off an outdated roof plan. This reference solar system design and generation profile should be used as a running start and proposers should create their own solar system designs based on the updated roof plans shown on slide 12. Also, proposers are recommended to site additional solar if deemed favorable given any landscaping or building proximity conflicts.



SB Humane Solar Segment Size, Generation, and layout details					
Solar Segment	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 (Northern)	63.2	101,674	1,609	540	117
Solar Parking Canopy 2 (Eastern)	63.2	98,939	1,566	540	117
Totals & Averages	338.5	548,146	1,611	-	771

North solar parking canopy

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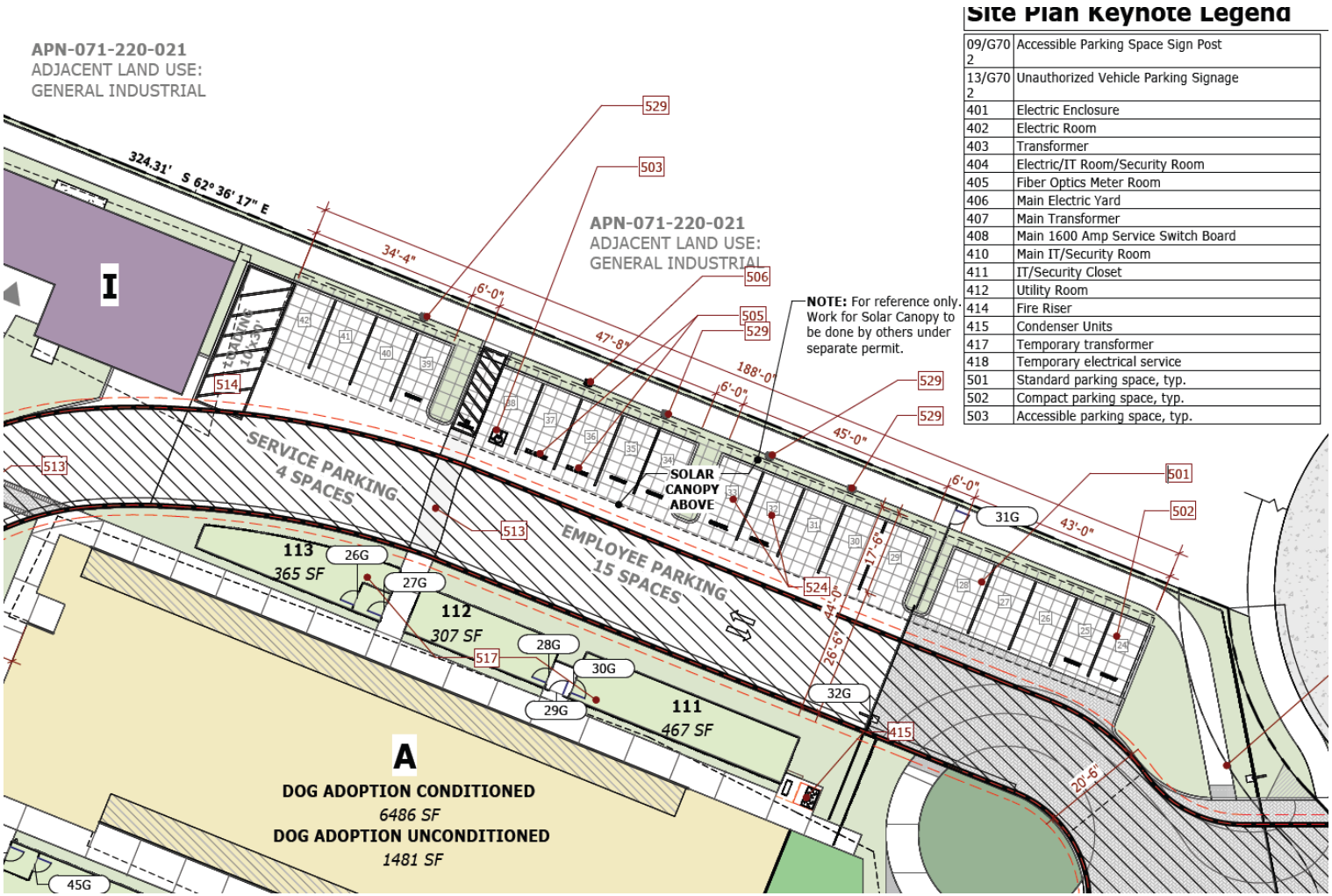
[Site plan with dimensions]



Site Plan Keynote Legend

09/G702	Accessible Parking Space Sign Post
13/G702	Unauthorized Vehicle Parking Signage
401	Electric Enclosure
402	Electric Room
403	Transformer
404	Electric/IT Room/Security Room
405	Fiber Optics Meter Room
406	Main Electric Yard
407	Main Transformer
408	Main 1600 Amp Service Switch Board
410	Main IT/Security Room
411	IT/Security Closet
412	Utility Room
414	Fire Riser
415	Condenser Units
417	Temporary transformer
418	Temporary electrical service
501	Standard parking space, typ.
502	Compact parking space, typ.
503	Accessible parking space, typ.

East solar parking canopy

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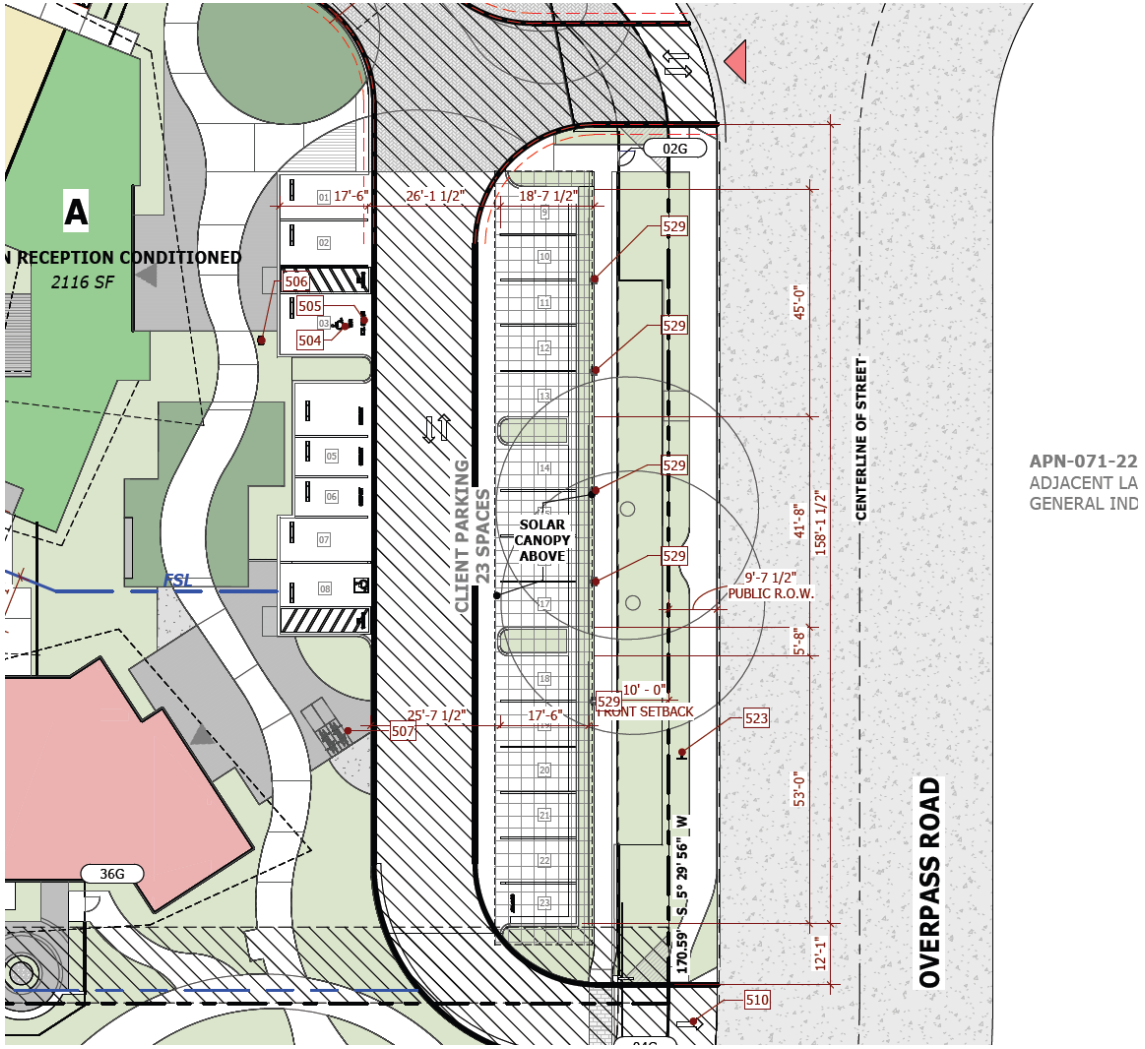
[Site plan with dimensions]



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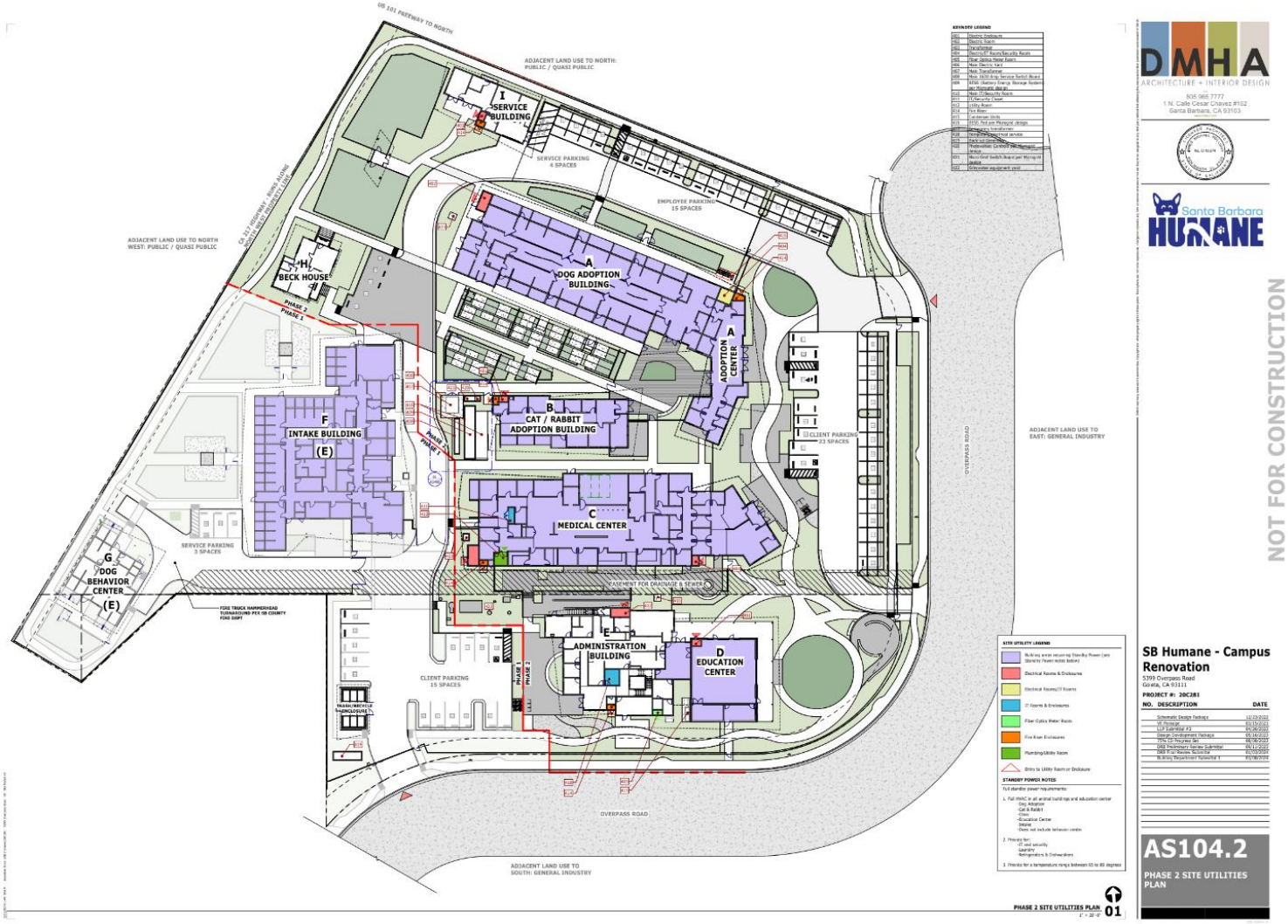
Electrical yard (Switchgear, PV controls, BESS, Microgrid Switchgear) and generator sizing & locations

Site plan with major electrical components

Site plan with dimensions



Electrical yard with switchgear, PV controls, BESS, & Microgrid Switchgear, and transformer dimensions

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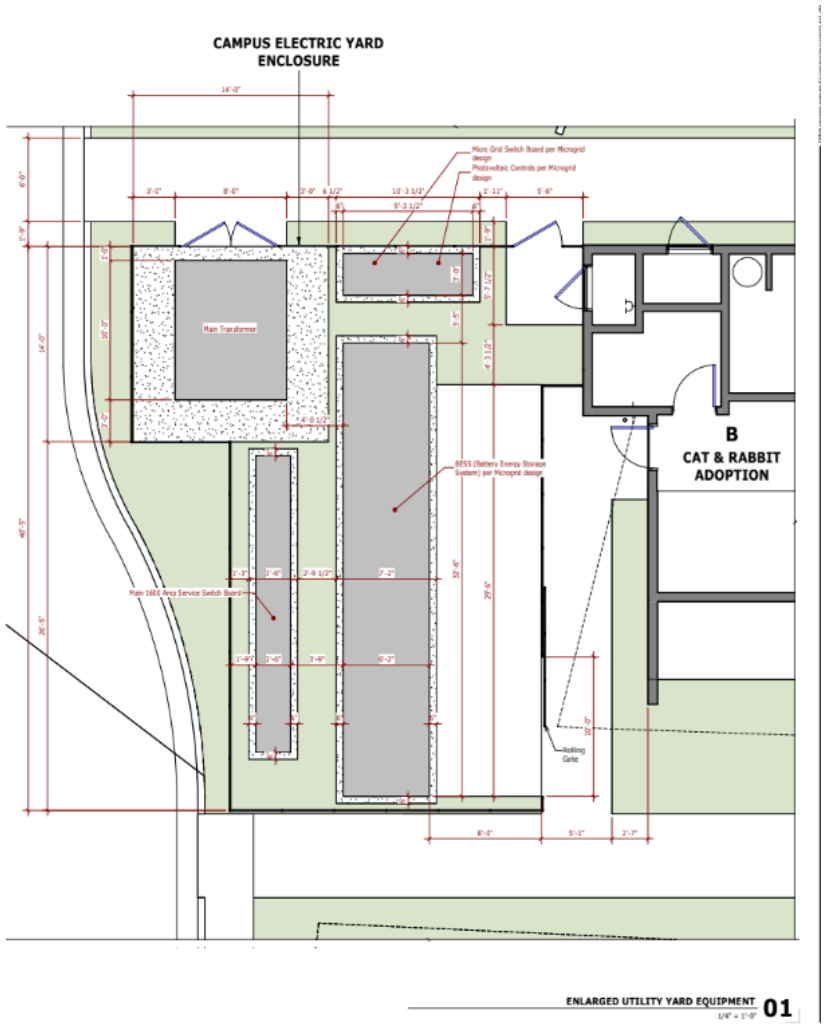
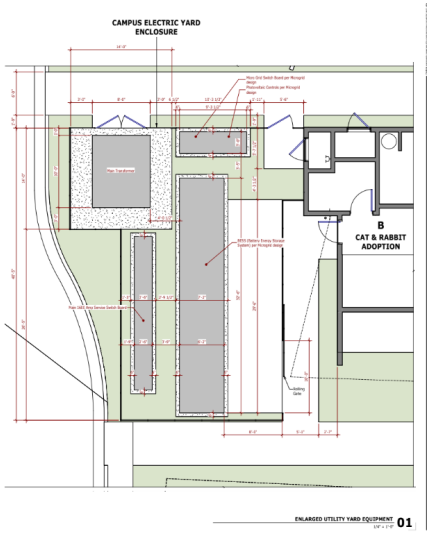
Site plan with dimensions



BESS siting and BESS reference design

BESS datasheet

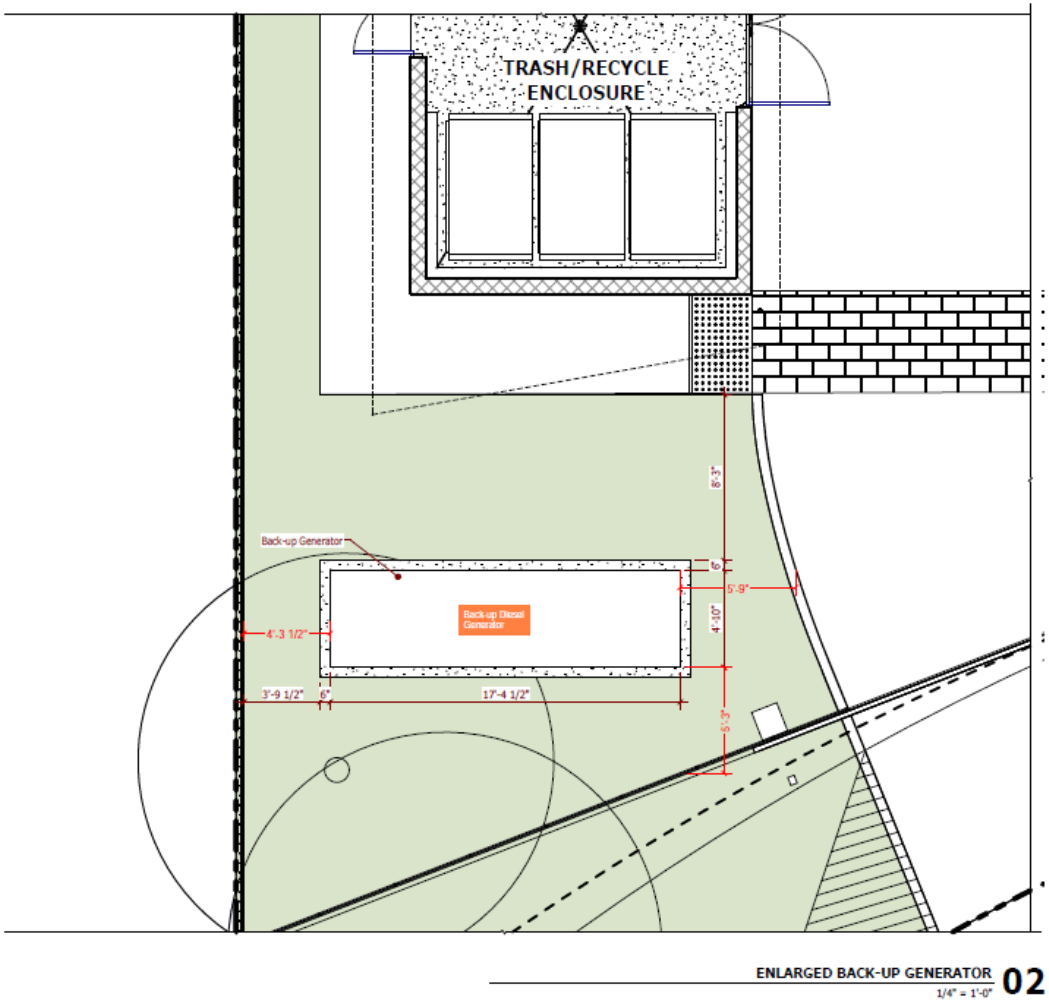
The reference BESS is a Tesla 326 kW & 1,305 kWh configuration can fit into the dimensions shown below and can be enclosed within a moveable fence for installation and servicing needs.



SB Humane - Battery Energy Storage Sizing and Resilience					
Critical Load Profile Peak Demand (kW)	Solar System Size Year 1 (kW)	Recommended Battery System Size (Year 1)		Indefinite Resilience (Critical Load Profile)	
		Standard Option Battery Power Capacity (kW)	Standard Option Battery Energy Capacity (kWh)	Total Percentage of Critical Load Kept Online Indefinitely (Year 1)	Total Percentage of Critical Load Kept Online Indefinitely (Year 15)
256	339	326	1,305	27%	24%

Diesel generator dimensions

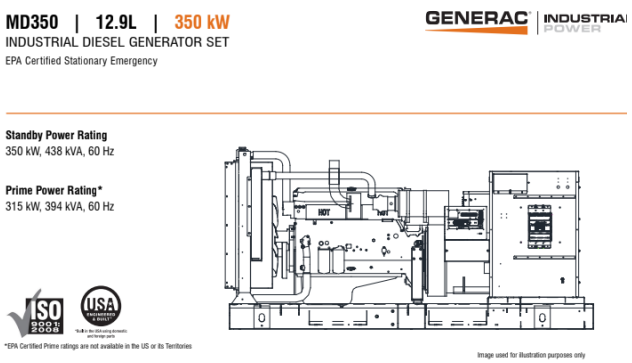
Site plan with dimensions



Reference diesel generator size and controller

Generator & controller datasheets

- The diesel generator plan-of-record is a 350 kW Generac MD350 with DeepSea 8610 MKII genset controller, with 946 gallons of usable capacity, and Level 2 acoustic enclosure.
- The generator should be configured to operate in only three possible modes:
  1. Charging the Battery Energy Storage System (BESS) to full when the BESS state-of-charge (SOC) hits 10% and then turn off until the same 10% SOC condition is reached again. While charging the BESS, the generator should operate at its optimized nameplate capacity.
  2. While the diesel generator is run for maintenance purposes, it should charge the BESS (there should be no added equipment, e.g. a load bank, required for maintenance runs).
  3. If the Solar Microgrid is non-functional for any reason, the diesel generator must be able to backup the SB Humane site.

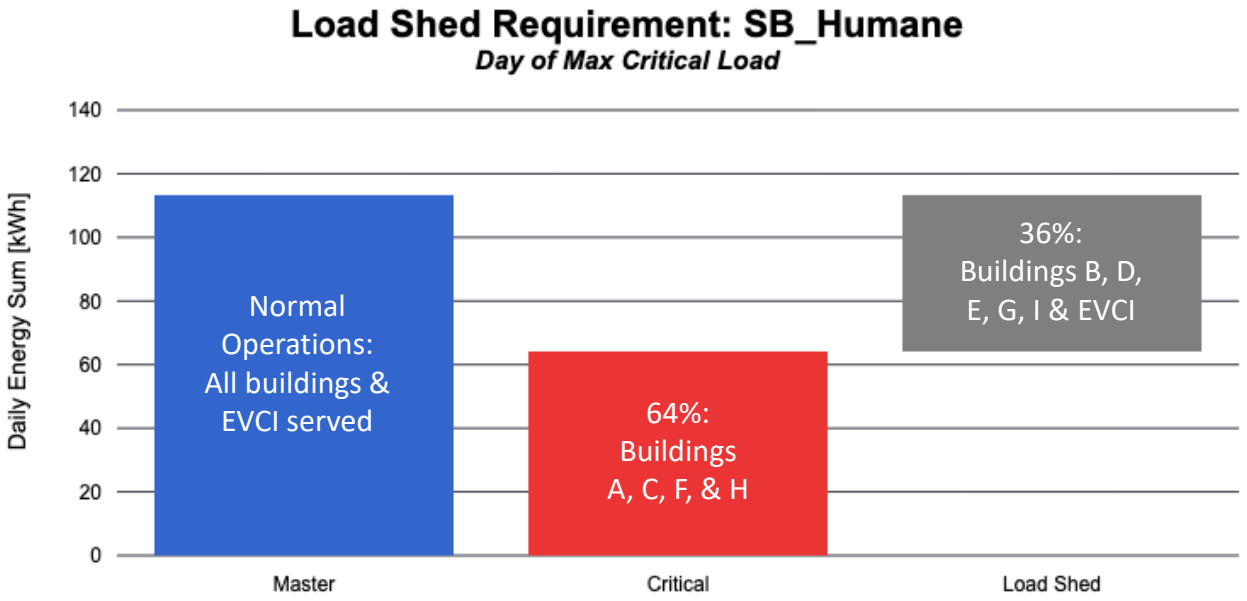


Solar Microgrid load management and sequence-of-operations (SOO)

Load management at SB Humane

In the case of the **SB Humane sites, two load groups are defined:**

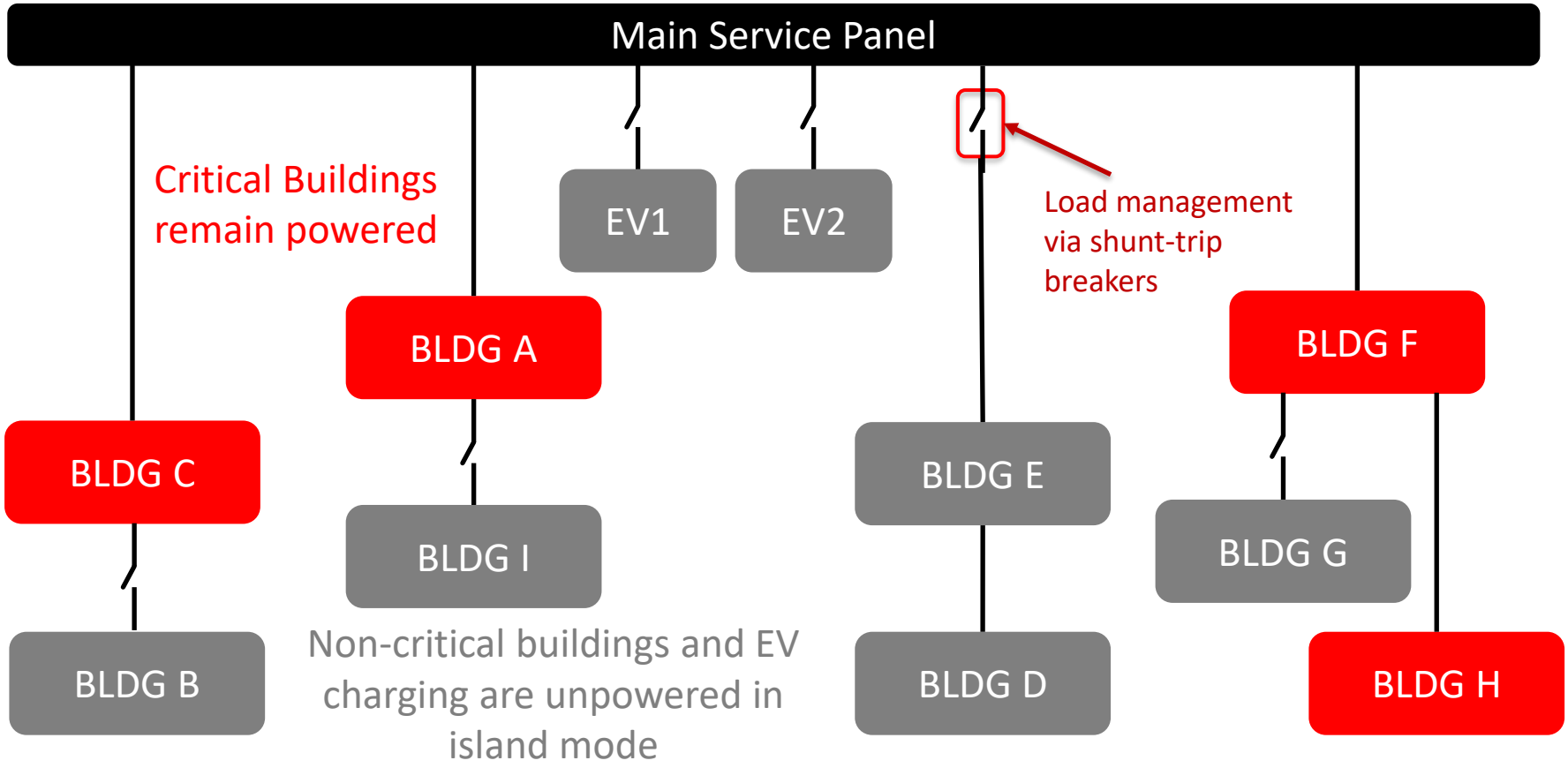
- **Tier 1: Buildings A, C, F, and H.** These buildings should remain powered through a grid outage.
- Tier 2: There are no Tier 2 loads.
- **Tier 3: Buildings B, D, E, G, and I, and all electric vehicle charging infrastructure (EVCI).** These buildings will be completely unpowered by default in island mode but can optionally be independently powered when excess solar generation is available.



Load management architecture at SBH

At the SB Humane campus, load management is **by building**. Five buildings and two EV charging circuits are non-critical and will be disconnected in island mode. The four critical buildings will remain fully powered; they do not have smart critical load panels and should operate normally throughout grid outages.

The microgrid controller is responsible for controlling shunt-trip breakers for load management.



EV Charging Infrastructure at SB Humane

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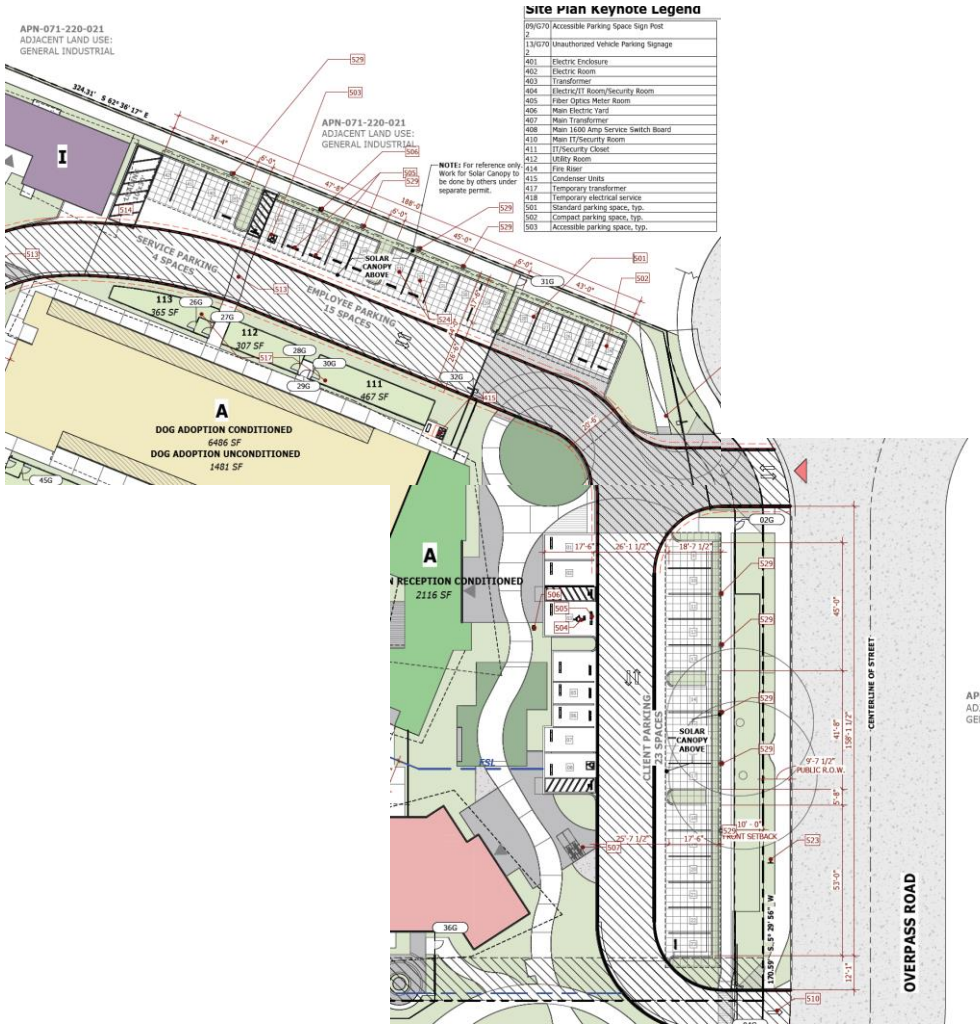
[Site plan with dimensions]

Two solar parking canopies (along the north and east of the site) will have 11 EV charging ports each, for a **total of 22 EV charging ports**.

Syksa carries responsibility for the breakers, transformers, trenching, and wiring all the way to stub-outs at the two EV charging locations.

The Designer-Building-Owner-Operator (DBOO) is responsible for is selecting and installing the EV charging stations and ensuring that the stations meet Solar Microgrid operational requirements, specifically:

1) Toggling the EVCI breakers at the switchgear
2) Controlling individual EV charging station



Solar Microgrid SOO

The SB Humane solar microgrid, by a SOO load service via dispatch of the solar, BESS, and fossil fuel generator (FFG). The SOO includes four principal steps:

1) Normal Operations, Grid Connected

2) Grid to Island Transition, in which the battery seamlessly assumes grid-forming for just the critical buildings, while all other circuits toggled off.

3) Island Operation

3a) Stable island operation, in which solar generation is maximized and FFG operating time is minimized.

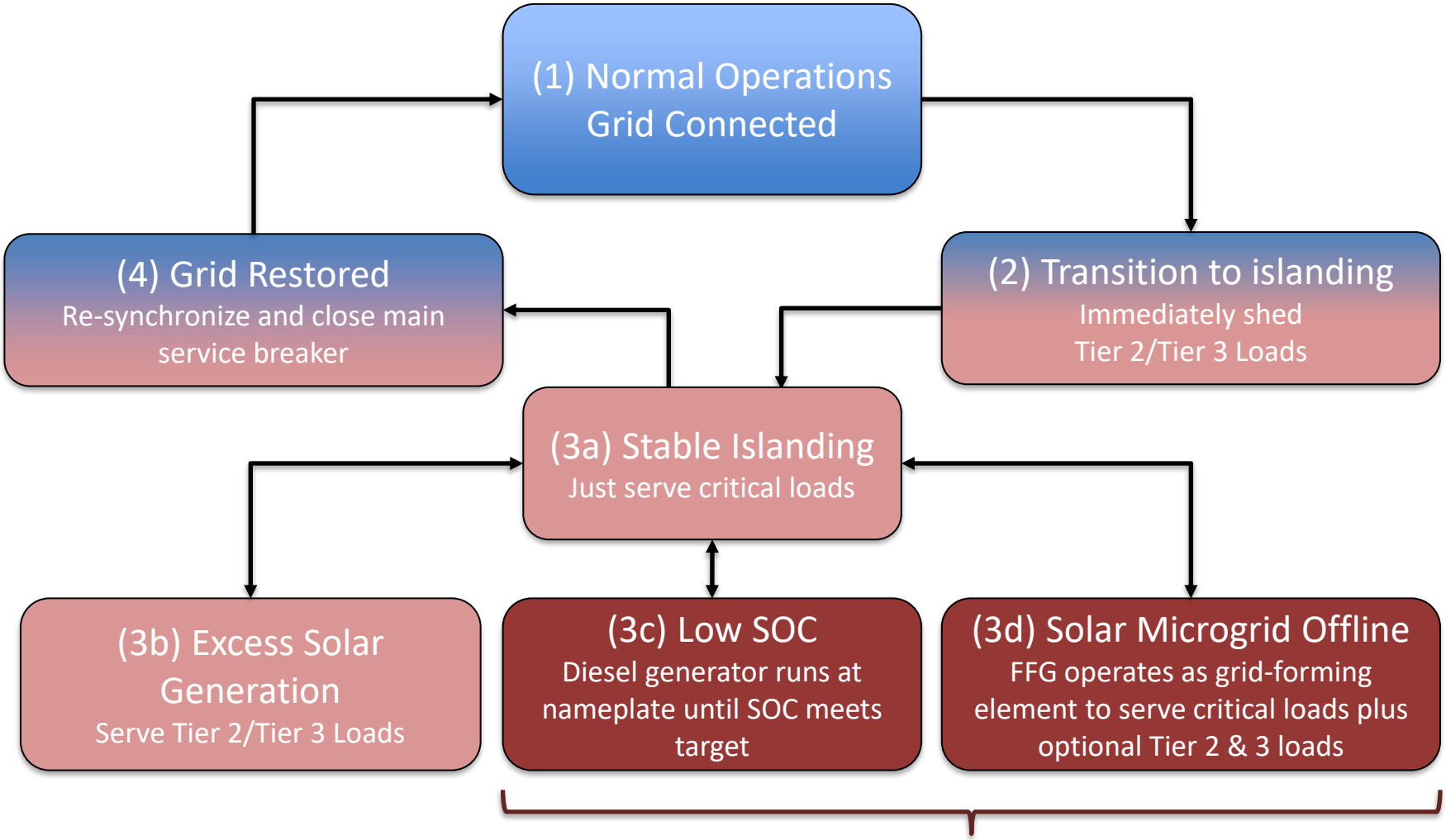
3b) If there is surplus solar generation, Tier 2 & Tier 3 load circuits can be toggled on.

3c) If BESS SOC falls below a threshold, the diesel generator (diesel generator operates at nameplate for the minimum time to charge the BESS).

3d) If the Solar Microgrid is non-operational, the diesel generator must act as the grid-forming master. Ie, the diesel generator must be configured to function as a backup to the backup.

4) Grid Resynchronization, in which the microgrid controller executes a seamless transition back to grid-connected mode.

SOO flow chart



FFG (diesel generator) operates as “backup to the backup”

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Electrical single-line diagram

ES004.2: Electrical single-line diagram (Syska)

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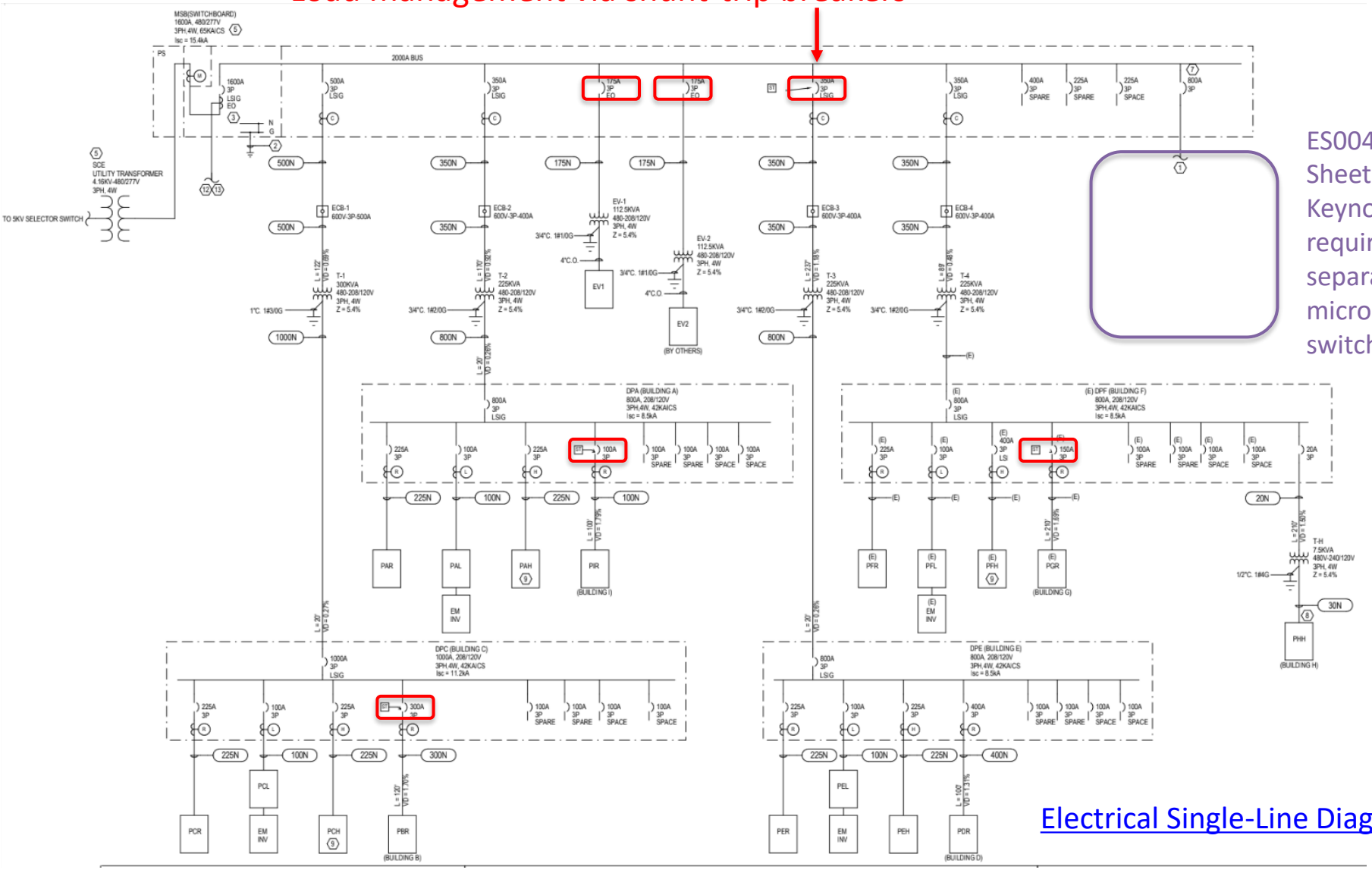
Load management via shunt-trip breakers



ES004.2 Sheet Keynote #1 requires separate microgrid switchgear

Electrical Single-Line Diagram

Developers' responsibility for microgrid layout

The "by others" sheet keynote in E004 implies that the Designer, Builder, Owner, Operator (DBOO) for the Solar Microgrid has design responsibility for a separate microgrid switchgear cabinet with integrates the BESS, diesel generator, and PV generation (likely through a separate PV combiner panel).

The DBOO must assume design responsibility for the dedicated microgrid switchgear, including **"stamping" of final project drawings**. DBOOs must be fully aware of this design responsibility.

Although it may be desirable to integrate the BESS, diesel generator, and PV generation directly into the main switchgear, such an integrated design is not allowed due to contractual limitations. RFP respondents should plan for a dedicated microgrid switchgear cabinet.

Electrical Design Responsibility Domains

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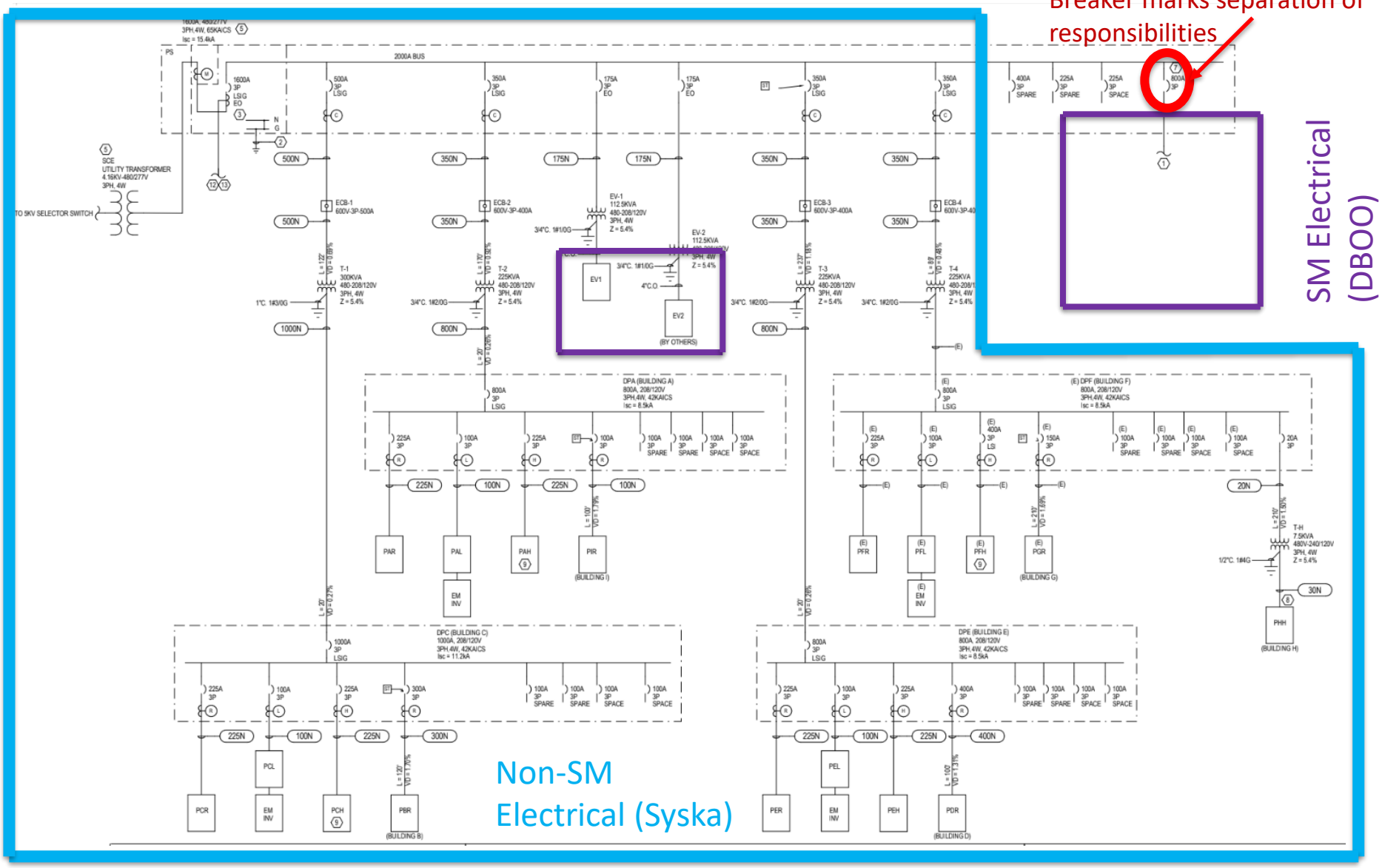

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Reference Solar Microgrid design

Reference Solar Microgrid single-line diagram

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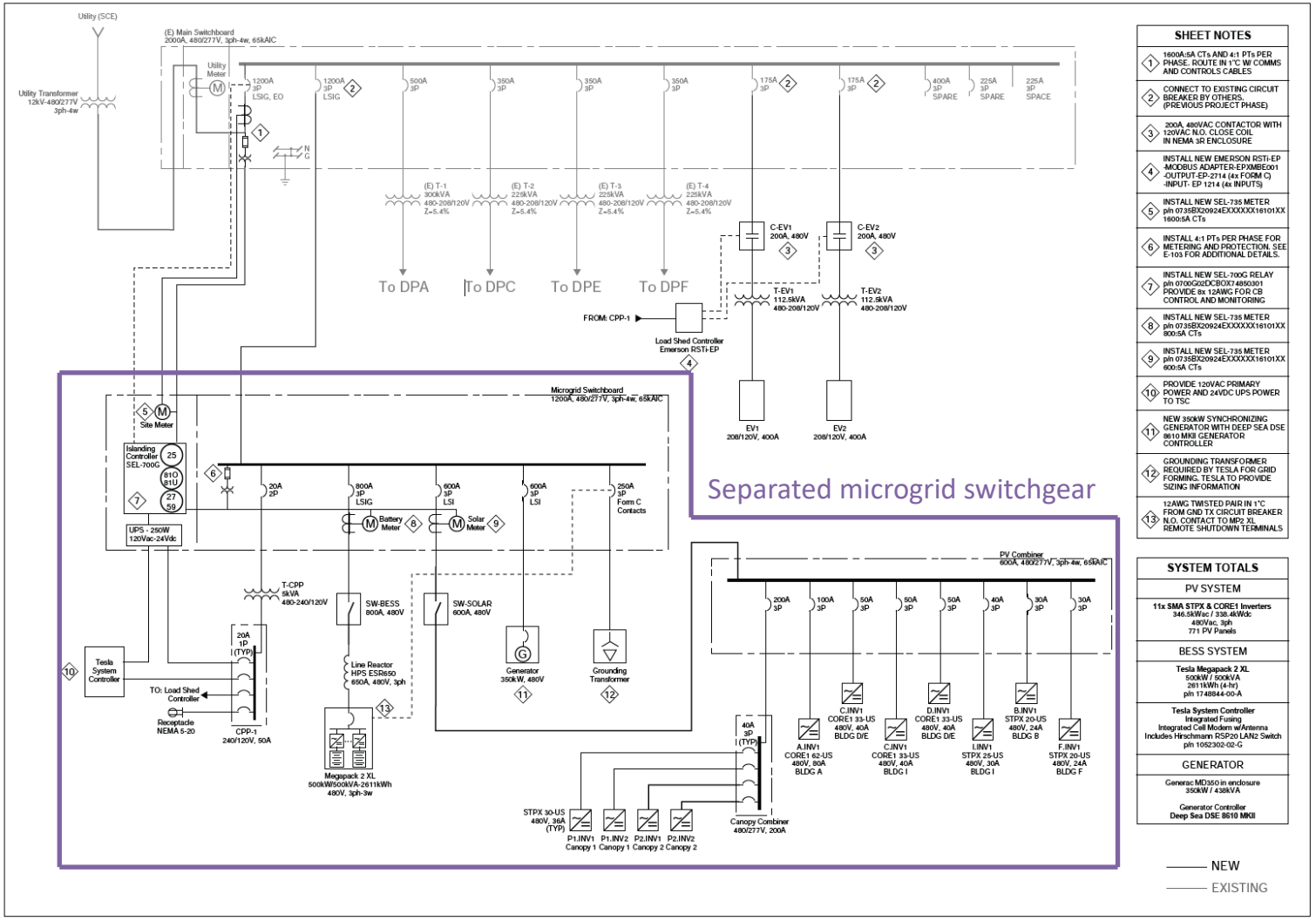
Reference electrical single-line diagram and key data sheets



SHEET NOTES

1. 1600A:5A CTs AND 4:1 PTs PER PHASE. ROUTE IN 1"C W/ COMMS AND CONTROLS CABLES
2. CONNECT TO EXISTING CIRCUIT BREAKER BY OTHERS. (PREVIOUS PROJECT PHASE)
3. 200A, 480VAC CONTACTOR WITH 120VAC N.O. CLOSE COIL IN NEMA 3R ENCLOSURE
4. INSTALL NEW EMERSON RSTi-EP -MODBUS ADAPTER-EPXMBE001 -OUTPUT-EP-2714 (4x FORM C) -INPUT- EP 1214 (4x INPUTS)
5. INSTALL NEW SEL-735 METER p/n 0735BX20924EXXXXXX16101XX 1600:5A CTs
6. INSTALL 4:1 PTs PER PHASE FOR METERING AND PROTECTION. SEE E-103 FOR ADDITIONAL DETAILS.
7. INSTALL NEW SEL-700G RELAY p/n 0700G02DCBOX74850301 PROVIDE 8x 12AWG FOR CB CONTROL AND MONITORING
8. INSTALL NEW SEL-735 METER p/n 0735BX20924EXXXXXX16101XX 800:5A CTs
9. INSTALL NEW SEL-735 METER p/n 0735BX20924EXXXXXX16101XX 600:5A CTs
10. PROVIDE 120VAC PRIMARY POWER AND 24VDC UPS POWER TO TSC
11. NEW 350kW SYNCHRONIZING GENERATOR WITH DEEP SEA DSE 8610 MKII GENERATOR CONTROLLER
12. GROUNDING TRANSFORMER REQUIRED BY TESLA FOR GRID FORMING. TESLA TO PROVIDE SIZING INFORMATION
13. 12AWG TWISTED PAIR IN 1"C FROM GND TX CIRCUIT BREAKER N.O. CONTACT TO MP2 XL REMOTE SHUTDOWN TERMINALS

SYSTEM TOTALS

PV SYSTEM
11x SMA STPX & CORE1 Inverters
346.5kWac / 338.4kWdc
480Vac, 3ph
771 PV Panels

BESS SYSTEM
Tesla Megapack 2 XL
500kW / 920kVA
2611kWh (4-hr)
p/n 1748844-00-A
Tesla System Controller
Integrated Fusing
Integrated Cell Modem w/Antenna
Includes Hirschmann RSP20 LAN2 Switch
p/n 1052302-02-G

GENERATOR
Generac MD350 in enclosure
350kW / 438kVA
Generator Controller
Deep Sea DSE 8610 MKII

SBHS Microgrid
5399 Overpass Road
Goleta, CA 93111

Santa Barbara Humane

Drawing by EFM

SINGLE LINE DIAGRAM

Revision	Date
75% CD	2023-10-09
75% CD r-1	2023-10-10

E-101

Microgrid components (PV combiner, BESS, and diesel generator) come together at a dedicated microgrid switchgear cabinet, then connect to the main site switchgear via a single breaker.

Project schedule

Solar Microgrid project schedule

- **29 Dec 2023 – 29 Mar 2024:** Solar Microgrid RFP Process and Selection of Microgrid Design/Build Contractor
- **01 Apr 2024 – 28 June 2024**: Microgrid Construction Permit Documents (Phase 2)
- **01 Jul 2024**: City of Goleta Building Department Solar Microgrid Plan Change Submittal (Phase 2)
- **12 Jul 2024 to 01 Aug 2024**: City of Goleta Building Department Re-submittal (2) & Permit Approval (Phase 2)
- **02 Aug 2024**: Building Permit Approved – (Phase 2)
- **02 Aug 2024 to 22 Aug 2024**: Review & Respond to Plan Check Comments (3) – (Phase 2)
- **15 Aug 2024 to 04 Sep 2024**: Selection of GC and Finalized Contract – (Phase 1 & Phase 2)
- **23 Aug 2024 to 06 Sep 2024**: City of Goleta Building Department Re-submittal (3) & Permit Approval – (Phase 2)
- **06 Sep 2024**: Building Permit Approved – (Phase 2)
- **06 Sep 2024:** Construction Buy Out – (Phase 1 & Phase 2)
- **09 Sep 2024 to 18 Oct 2024**: Procurement – (Phase 1)
- **09 Sep 2024 to 30 Sep 2024:** Client Review & Approval for Construction to Begin – (Phase 1)
- **04 Oct 2024**: Pre-Construction Meeting – (Phase 1)
- **21 Oct 2024**: Start Construction – (Phase 1)
- **21 Oct 2024 to 19 Dec 2025**: Assume 14 months for demo, site work and construction (Phase 1)
- **15 Sep 2025 to 19 Dec 2025**: Procurement – (Phase 2)
- **08 Dec 2025**: Pre-Construction Meeting – (Phase 2)
- **22 Dec 2025**: Start Construction – (Phase 2)
- **22 Dec 2025 to 12 Nov 2027**: Assume 22 months for demo, site work and construction (Phase 2)

PPA pricing requirements

PPA pricing requirements

- Complete system cost: solar, storage, all components, installation to operational.
- PPA price: $/kWh, 25 years, must be fixed with no escalation.
- Provide PPA price increment for each $100K of potential system cost increase.
- PPA payments are the only source of revenue for PPA Holders – unless future grid services offer mutually agreed revenue-share opportunities.
- Provide numeric buy-out values for year-end 10, 15, 20 and 25 years.
- SB Humane is retaining all environmental attributes.
- The minimum storage energy capacity available for daily cycling must be specified, as this significantly effects the economic benefits of the storage.
- The anticipated storage replacement and/or augmentation strategy must be specified in order to ensure the minimum storage capacity available for daily cycling can be maintained for the full 25-year duration.
- Storage and load management solutions can optimize economics via demand charge management & arbitrage.
- Data access showing real-time and historic performance of all Solar Microgrids and allowing easy load management control, including for real-time load management changes, must be specified in final proposals.
- SB Humane has operational control to toggle Tier 3 loads remotely when there is excess energy available in island mode. Excess energy means energy beyond real-time Tier 1 loads.

Pricing requirements should be reflected in the pricing spreadsheets here