

Battery Energy Storage Systems (BESS) Pros & Cons



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Background

Mission

To accelerate the transition to renewable energy and a modern grid through technical, policy, and project development expertise.

Renewable Energy End-Game

100% renewable energy; 25% local, interconnected within the distribution grid and ensuring resilience without dependence on the transmission grid; and 75% remote, fully dependent on the transmission grid for serving loads.

Battery Energy Storage System (BESS): A system that stores electrical energy using rechargeable batteries, allowing for energy to be stored and discharged on demand.

Power Capacity: The maximum power output a battery system can deliver at a given time.

Megawatt (MW): The dimension used to measure the power of an electrical system, representing how much electricity is being produced at any given moment – or the peak power that could be produced.

Energy Capacity: The total amount of energy a battery can store, measured in watt-hours (kWh).

Megawatt-hour (MWh): The dimension used to measure electrical energy. In the context of a BESS, a MWh represents how much energy a BESS can store. MWh and MW are related by time with 1 MWh being the amount of energy associated with a BESS charging or discharging at a constant 1 MW for 1 hour.

Peak Shaving: Utilizing a BESS to reduce peak demand on the grid by discharging energy that is stored during non-peak periods during peak periods, when the grid is most stressed, typically in the 4-9pm timeframe daily.

Curtailement: Deliberate reduction of the energy output of an energy resource to balance the grid or forced reduction due to reaching the capacity of transmission infrastructure.

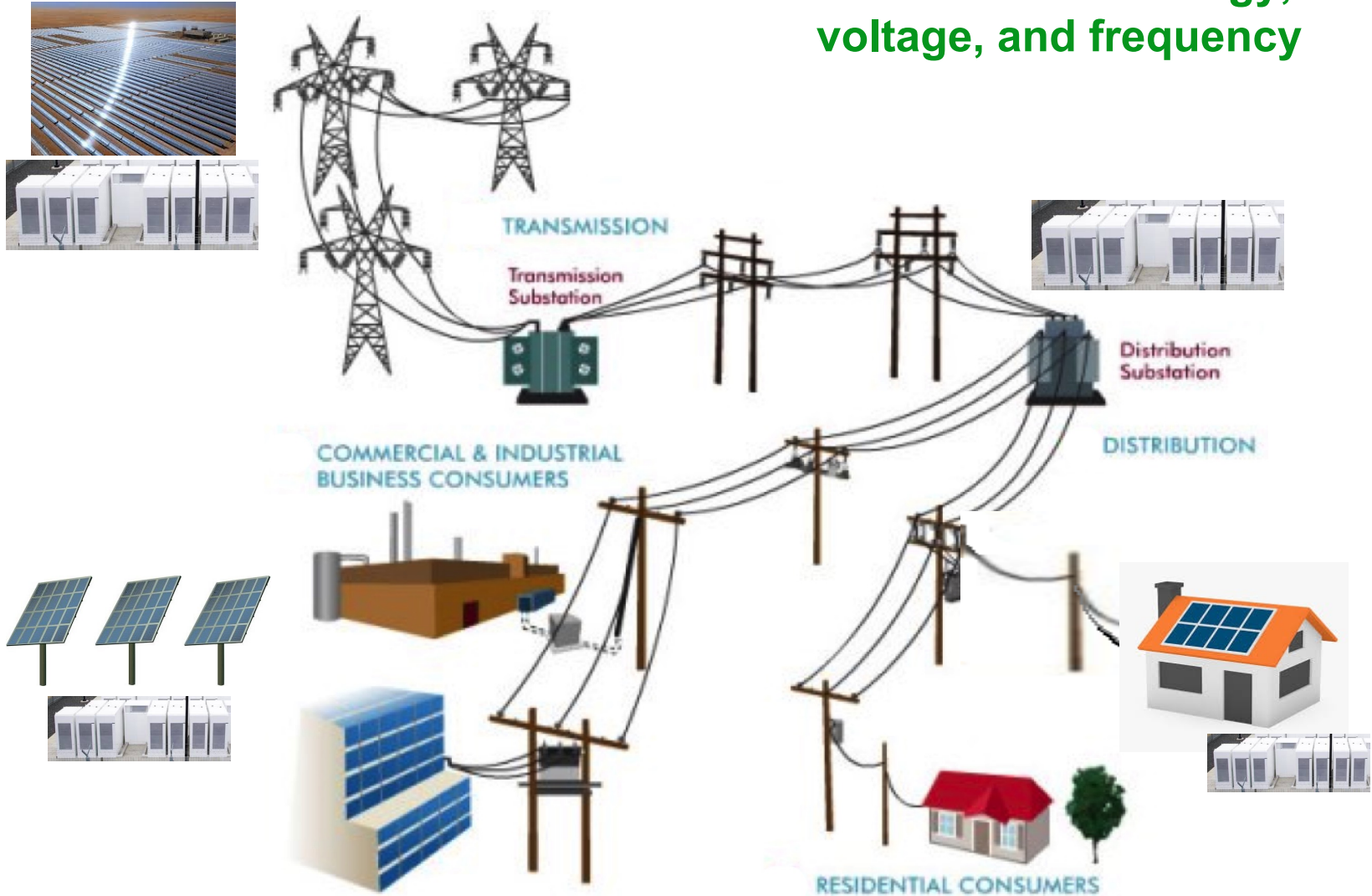
State-of-Charge (SOC): The current level of charge stored in a battery, typically expressed as a percentage.

Li-ion: The fundamental chemistry of the most common BESS deployed in the world today.

Lithium Ferrous Phosphate (LFP): A Li-ion chemistry, also referred to as Lithium Iron Phosphate, that is the new standard for Li-ion BESS. LFP has superior safety performance compared to other Li-ion chemistries and LFP is also less expensive than prior chemistries.

1. The Clean Coalition is a leading proponent of Solar Microgrids and Community Microgrids to deliver an unparalleled trifecta of economic, environmental, and resilience benefits to communities.
2. The Clean Coalition has supported supported several grid-scale BESS that are thoughtfully sited, including to deliver key benefits to the grid.
3. Craig Lewis serves on the Board of Advisors of a flow battery technology company called BioZen, which is developing solutions that are founded in biomimicry – using naturally occurring materials and mimicking natural systems.

Grid balances energy, voltage, and frequency



The future is hard to predict, but do extreme technophiles really want to live under the sea?



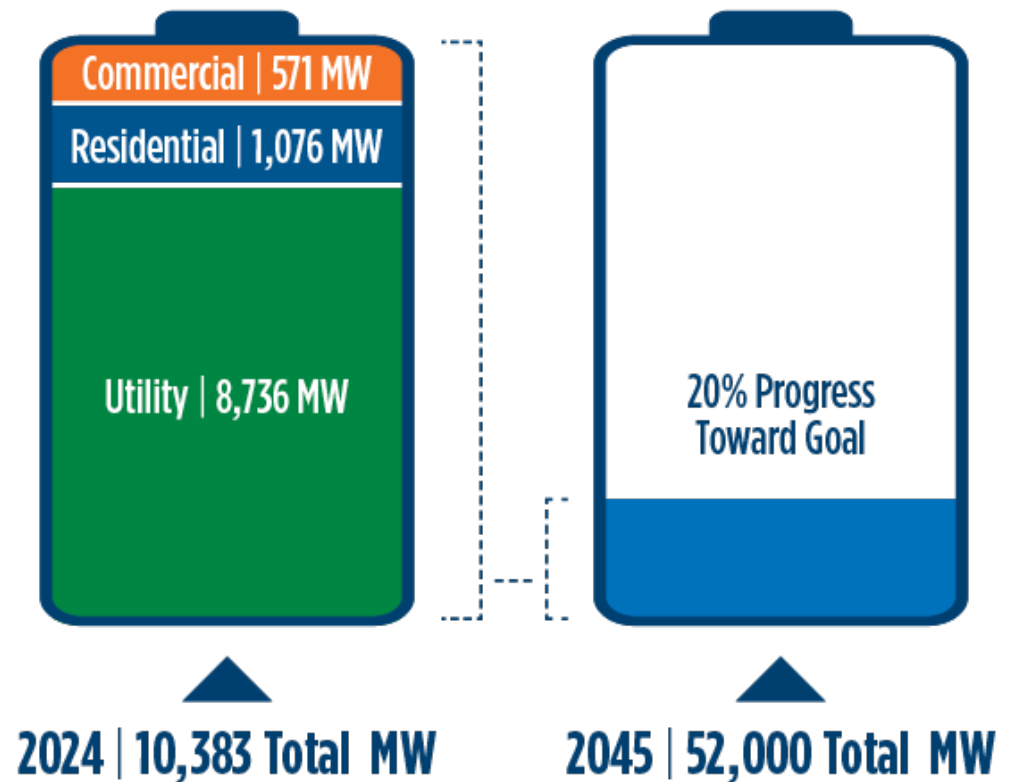
Similarly, do extreme technophobes want to revert to horse & buggy?



- From 2018 to 2024, battery storage capacity in California increased from 500 megawatts (MW) to more than 10,300 MW, with an additional 3,800 MW planned to come online by the end of 2024.
- The state projects 52,000 MW of battery storage will be needed by 2045.

Energy Storage in California by Type

** As of April 15, 2024*



Source: California Energy Commission, April 2024

BESS Pros & Cons

- 1. Enabling intermittent renewables** by storing solar & wind energy to be spread 24x7.
- 2. Saving ratepayers money** by preempting much more expensive investments in the grid. Location matters, and interconnecting at load, substations, and generation can all provide high value.
- 3. Providing grid services** by balancing energy, voltage, and frequency – and staging to do so even when the broader grid
- 4. Yielding economic benefits** in the form of direct and indirect economic stimulation where the BESS are located, including via job creation and tax benefits to the local jurisdictions, and enhancing the grid to enable other forms of economic expansion.

BESS deliver a bevy of grid services



		Grid Domains		
Services to Grid and Cust.		Tran.	Dist.	Cust.
Energy & AS Markets and Products	Energy	✓	✓	✓
	Frequency Regulation	✓	✓	✓
	Spin/Non-Spin Reserve	✓	✓	✓
	Flexible Ramping	✓	✓	✓
	Voltage Support	✓	✓	✓
	Blackstart	✓	✓	✓
Resource Adequacy	System RA Capacity	✓	✓	✓
	Local RA Capacity	✓	✓	✓
	Flexible RA Capacity	✓	✓	✓
T & D Related	Transmission Investment Deferral	✓	✓	✓
	Distribution Investment Deferral		✓	✓
	Microgrid/Islanding		✓	✓
Site-Specific & Local Services	TOU Bill Management			✓
	Demand Charge Management			✓
	Increased Use of Self-Generation			✓
	Backup Power			✓

Source: [CPUC Energy Storage Procurement Study \(May 2023\)](#)

- 1. Safety questions** that experience is indicating are equivalent to Class A fires, same class as house fires.
- 2. Land use concerns** that can impact the natural and/or cultural environments.
- 3. Lifecycle considerations** that span from mineral extraction to recycling etc.

- Otay Mesa was one of the first large BESS deployed.
- Used BESS technology & designs from 7 years ago.
- Batteries are enclosed in a building, allowing gases to accumulate.



Source: The San Diego Union-Tribune, 26 May 2024

BESS have impacts on the environment, as do all developments

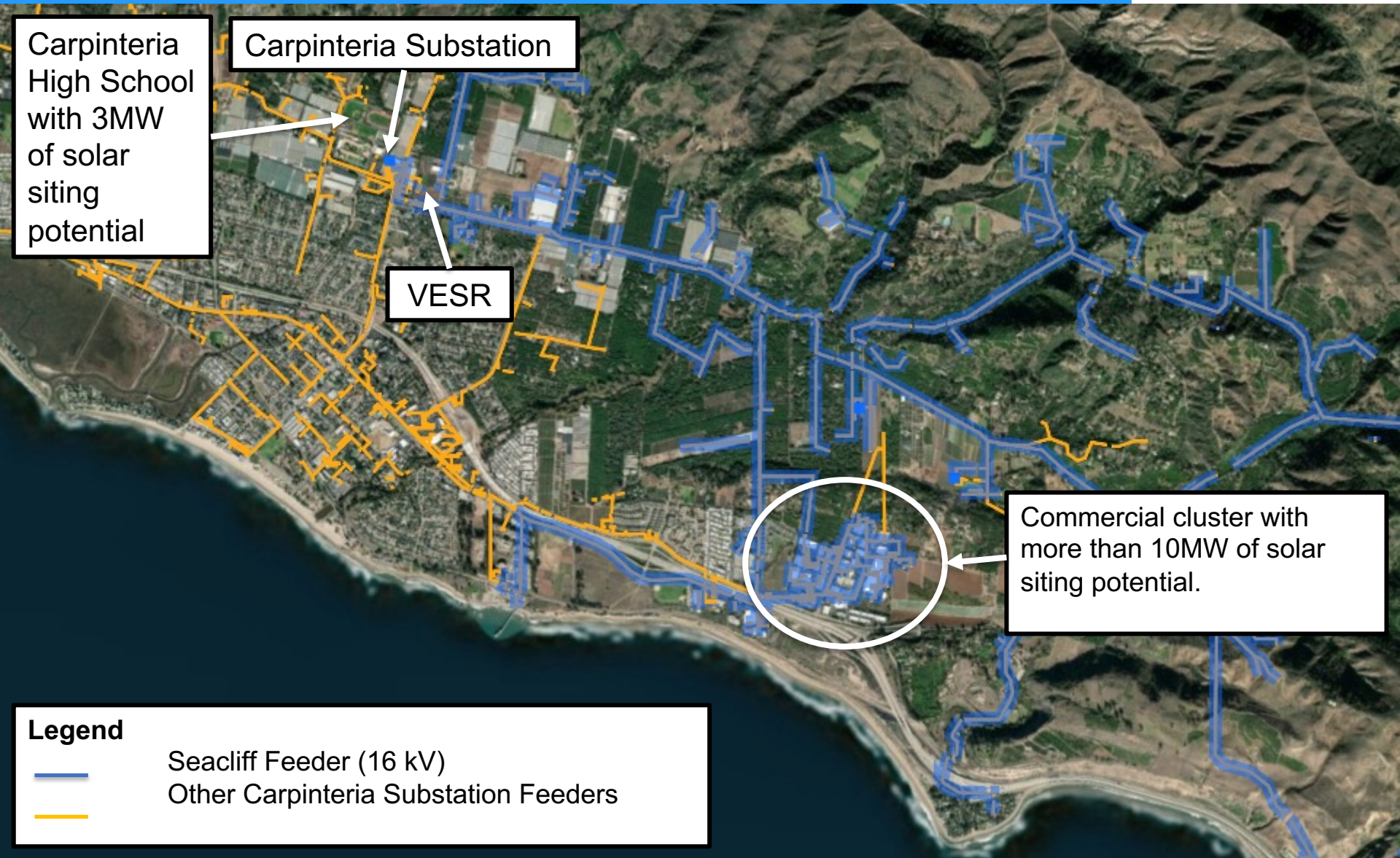


BESS examples



- VESR is the first grid-scale BESS in Santa Barbara County, on 1 acre of leased agricultural land and 200 feet from a residential neighborhood and 1,000 feet from Carpinteria High School.
- Tesla BESS, 10MW & 40MWh, successfully operating since January 2021.
- Providing reliability & resilience to an extremely grid-constrained community.

VESR enables resilience for the community



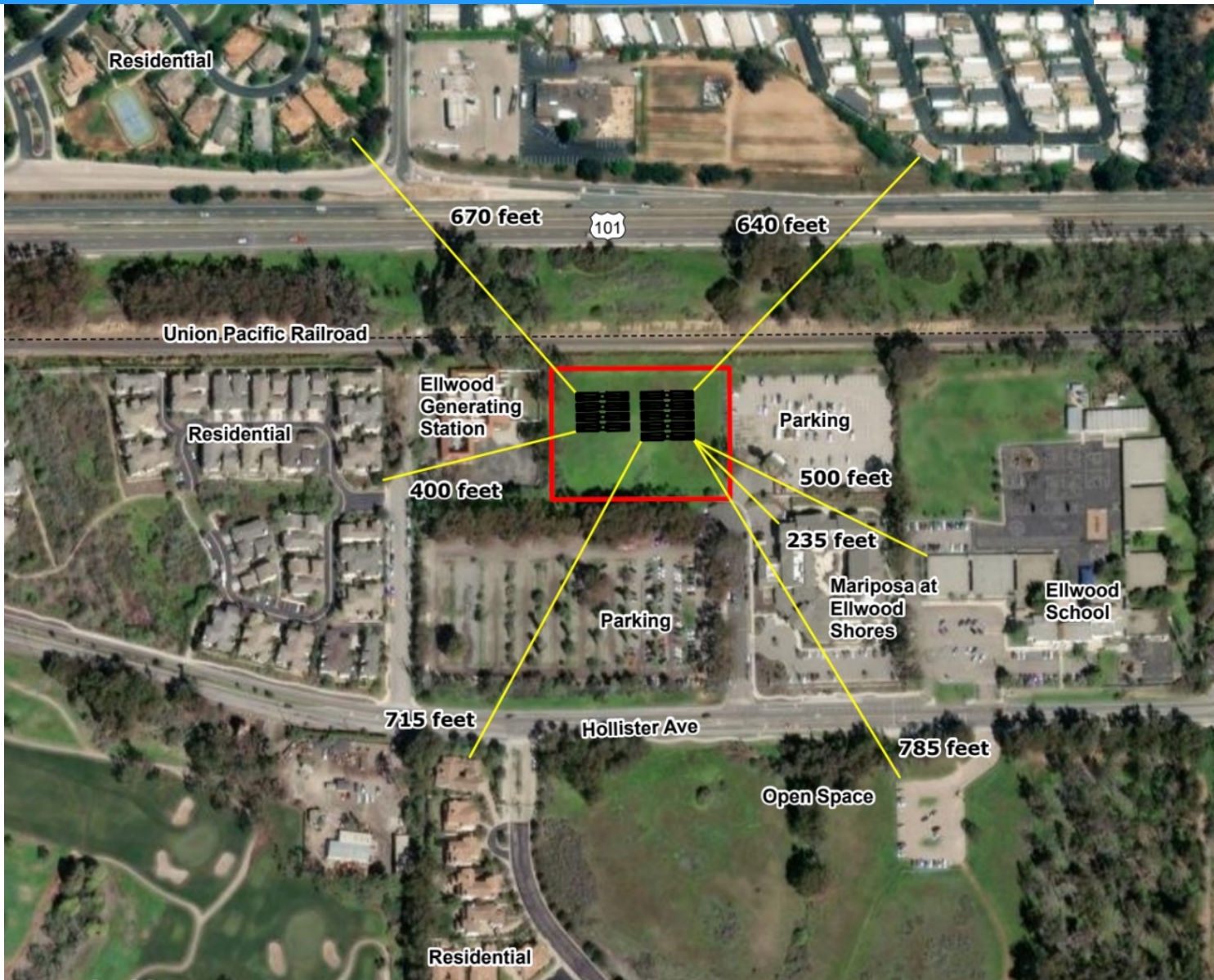
Goleta Load Pocket (GLP)

The GLP is the perfect opportunity for a comprehensive Community Microgrid



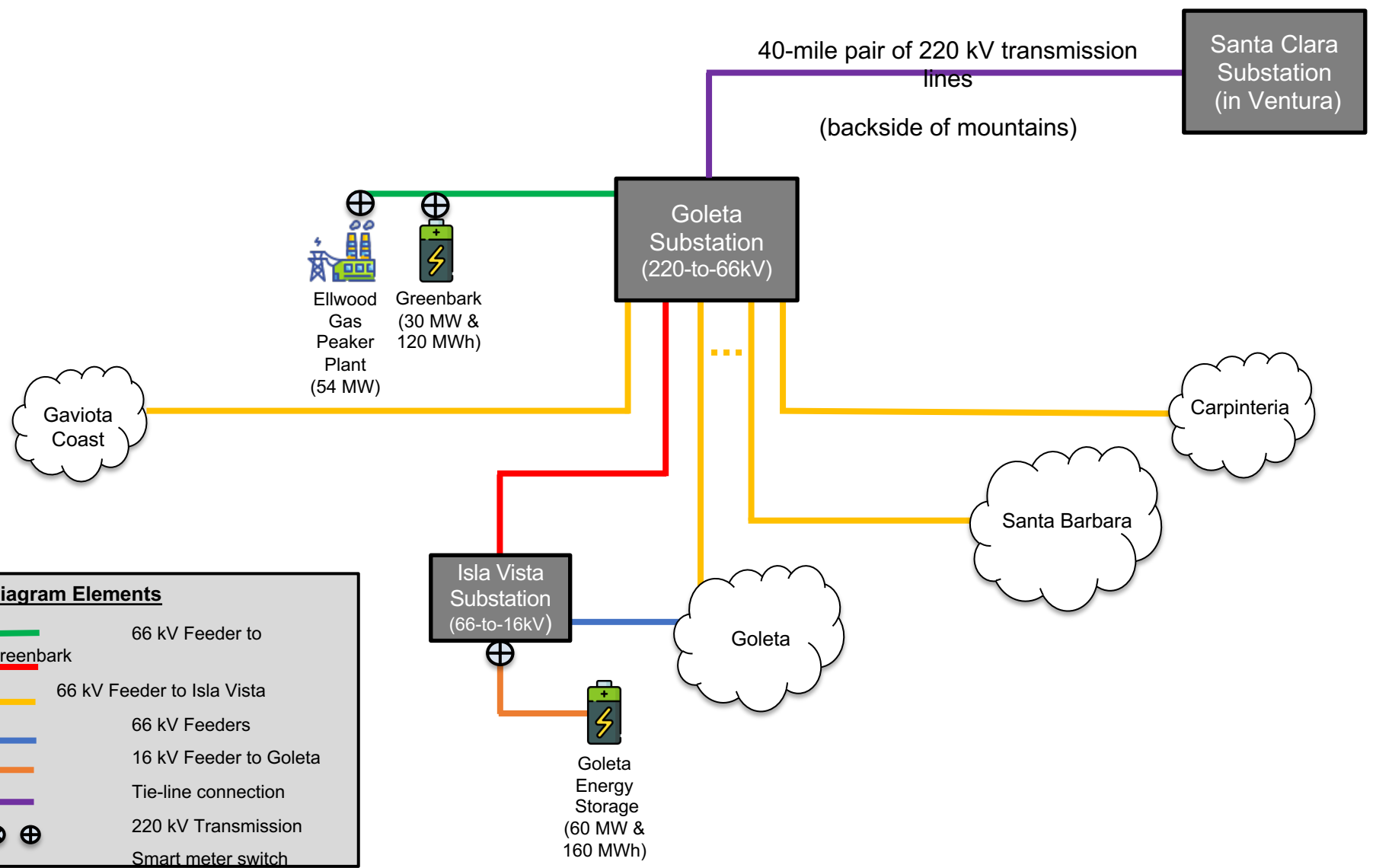
- GLP spans 70 miles of California coastline, from Point Conception to Lake Casitas, encompassing the cities of Goleta, Santa Barbara (including Montecito), and Carpinteria.
- GLP is highly transmission-vulnerable and disaster-prone (fire, landslide, earthquake).
- **200 megawatts (MW) of solar and 400 megawatt-hours (MWh) of energy storage** will provide 100% protection to GLP against a complete transmission outage (“N-2 event”).
 - 200 MW of solar is equivalent to about 5 times the amount of solar currently deployed in the GLP and represents about 25% of the energy mix.
 - Multi-GWs of solar siting opportunity exists on commercial-scale built-environments like parking lots, parking structures, and rooftops; and 200 MW represents about 7% of the technical siting potential.
 - Other resources like energy efficiency, demand response, and offshore wind can significantly reduce solar+storage requirements.

Greenbark will be the third BESS in the GLP

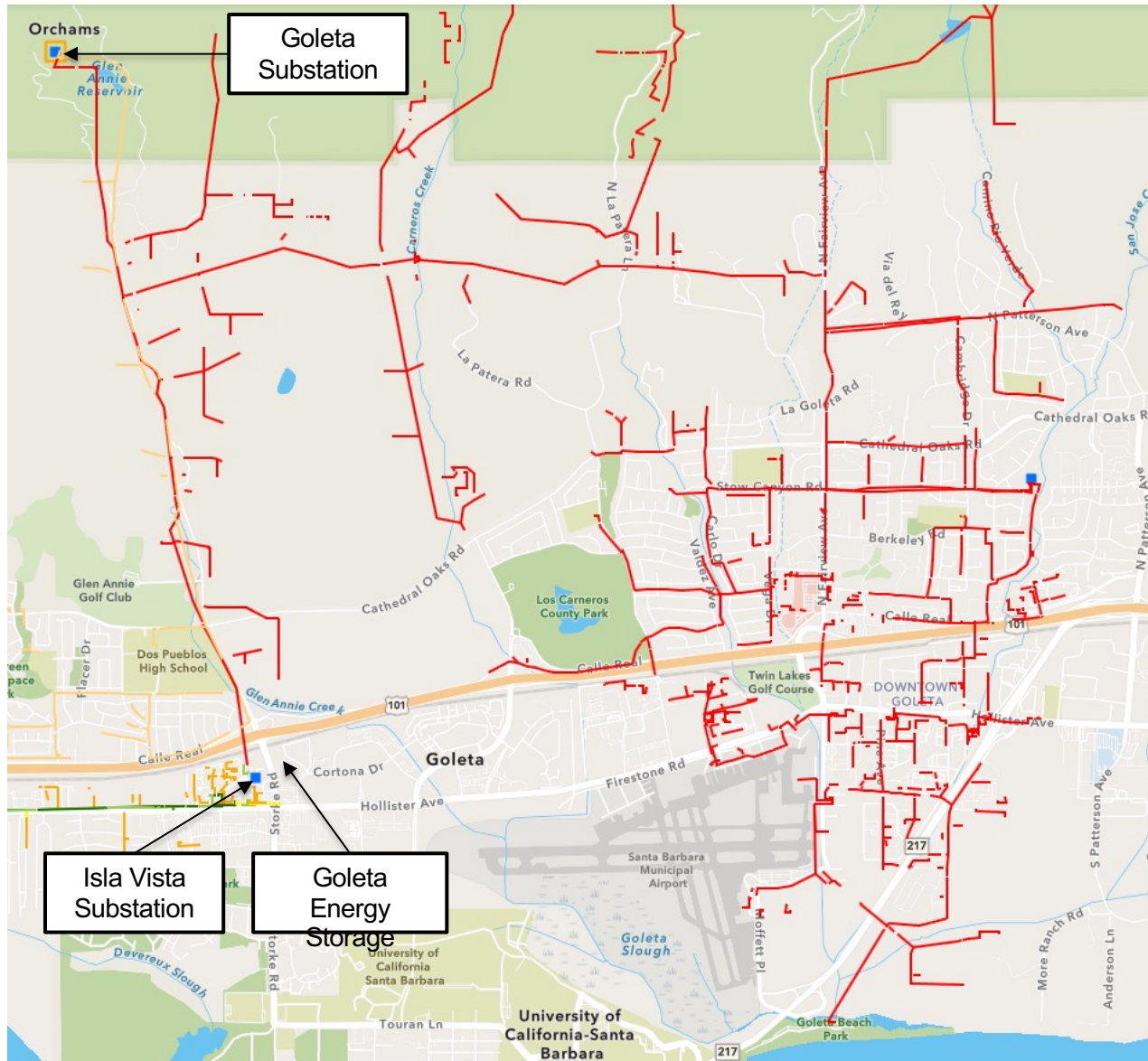


1. Perfect location adjacent to the Ellwood gas peaker plant such that resilience can be provided across the entire Goleta Load Pocket (GLP) – and retirement of the gas peaker will be accelerated.
2. Significant distances from other facilities, including housing (235 feet to the closest housing).
3. Same safe BESS technology that is already deployed in multiple GLP locations.
4. Negligible traffic & noise impacts.
5. Significant economic benefits to the local community.

Greenbark in perfect location to serve entire GLP



Backfeeding energy to the Goleta Substation from other Goleta locations is highly constrained

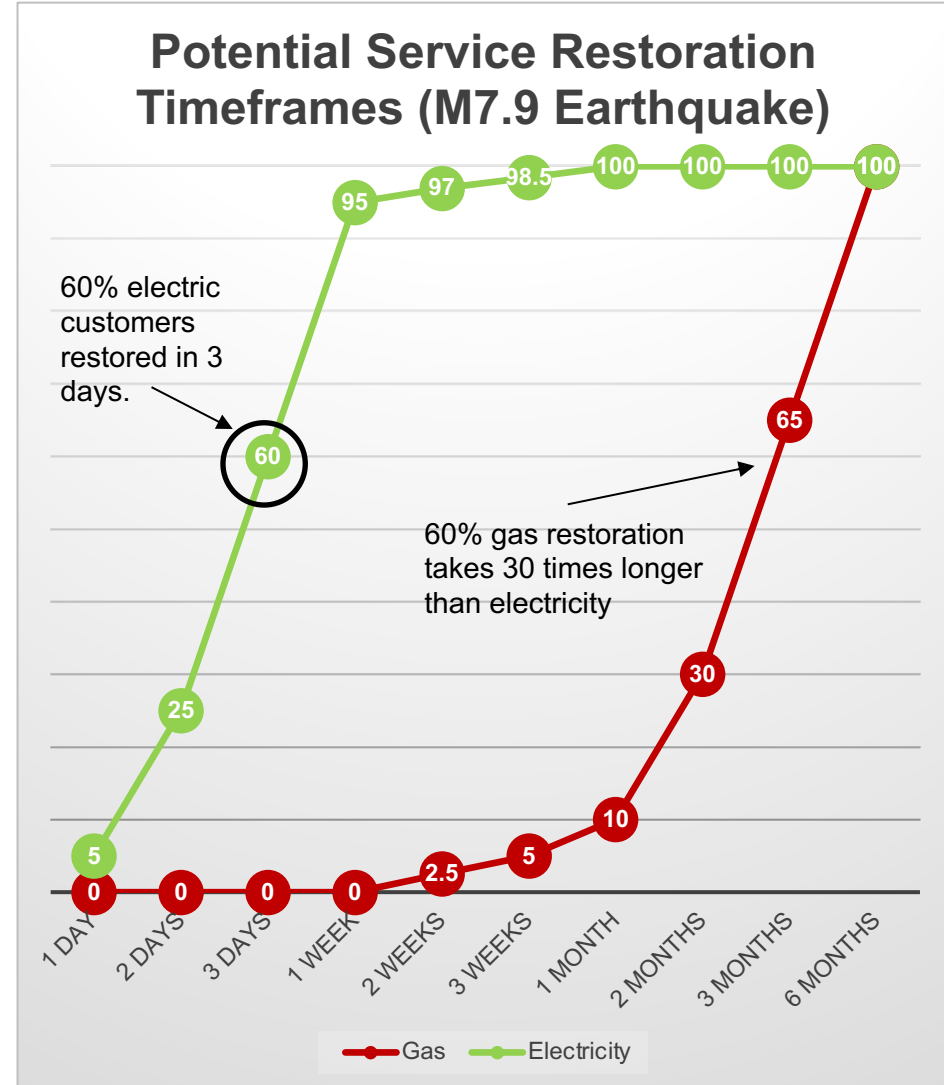


Natural gas infrastructure is not resilient

- **Assertion:** Gas-driven generation is often claimed to be resilient.
- **Reality:** Gas infrastructure is not resilient and takes much longer to restore than electricity infrastructure.
- **Threats:** Gas infrastructure can be flat-out dangerous and highly vulnerable to earthquakes, fires, landslides, and terrorism.



2010 San Bruno Pipeline Explosion



Source: The City and County of San Francisco Lifelines Study

- 400 MW & 1,200 MWh Battery Energy Storage System (BESS)
- Located on 12 acres in North Los Angeles County, about midway between Glendale and Lancaster, and interconnecting to a major substation.
- Designed to enhance grid reliability across California and to bridge renewables into the Los Angeles basin, the State's largest load pocket and one of the dirtiest.
- Utilizes disturbed land on industrial zoning, surrounded by roadways, rail lines, and industrial facilities.
- Generates substantial economic benefits:
 - \$2 million per year in tax revenue for LA County.
 - 100 high paying union jobs during construction and several ongoing jobs once operational.
 - \$100,000 of annual benefits to be paid for local community initiatives

Humidor will enhance California grid reliability while maximizing solar and preempting the dirtiest gas



Power Plants in the U.S.

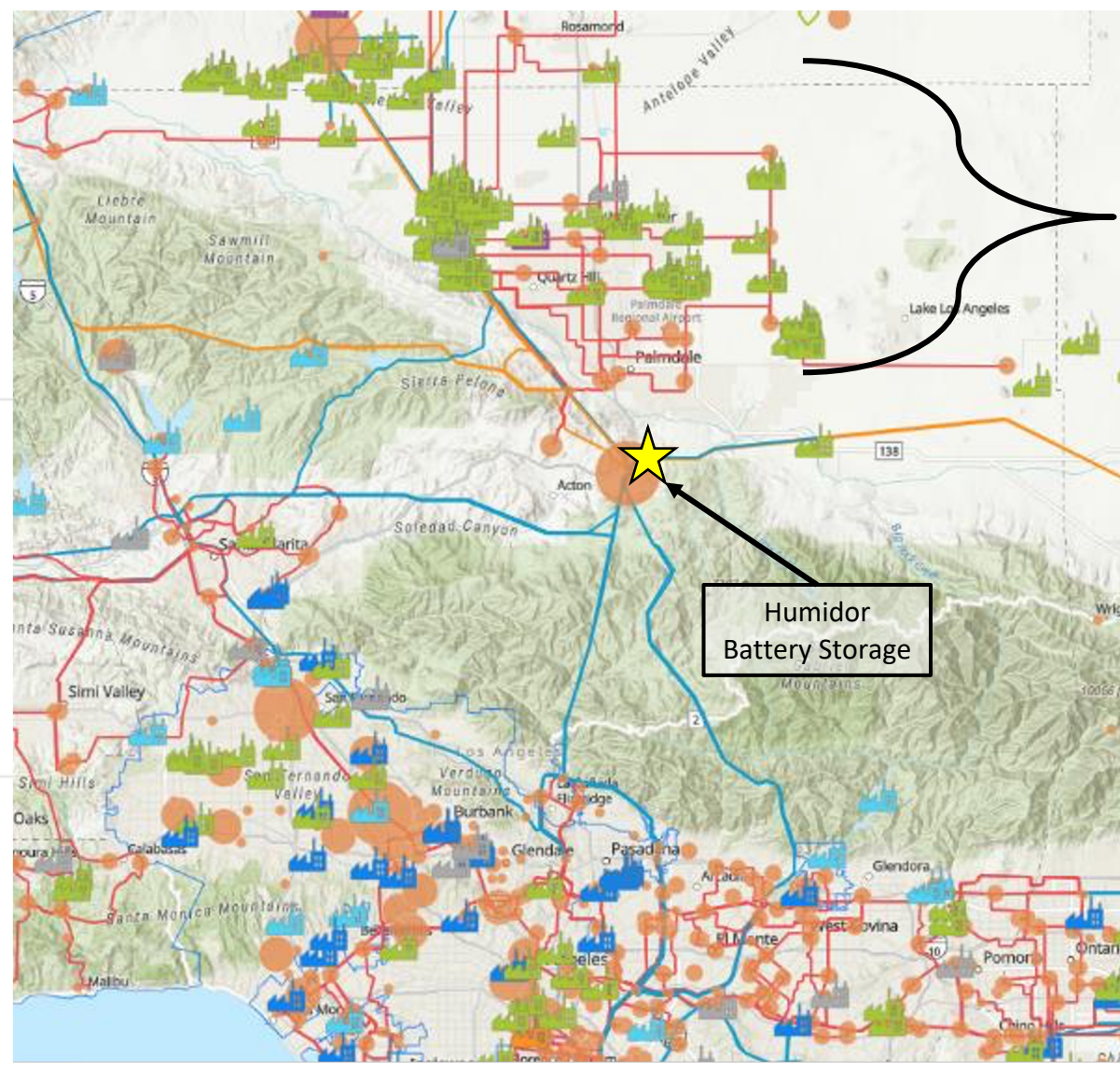
- Solar
- Natural Gas
- Hydroelectric
- Wind
- Petroleum
- Other

CA_Substations_Final

- Max_Voltg
- > 500
 - 400
 - 250
 - 100
 - < 0

ICA_Layer - Transmission Circuits

- 66
- 220
- 115
- 33
- 500
- 55
- 161

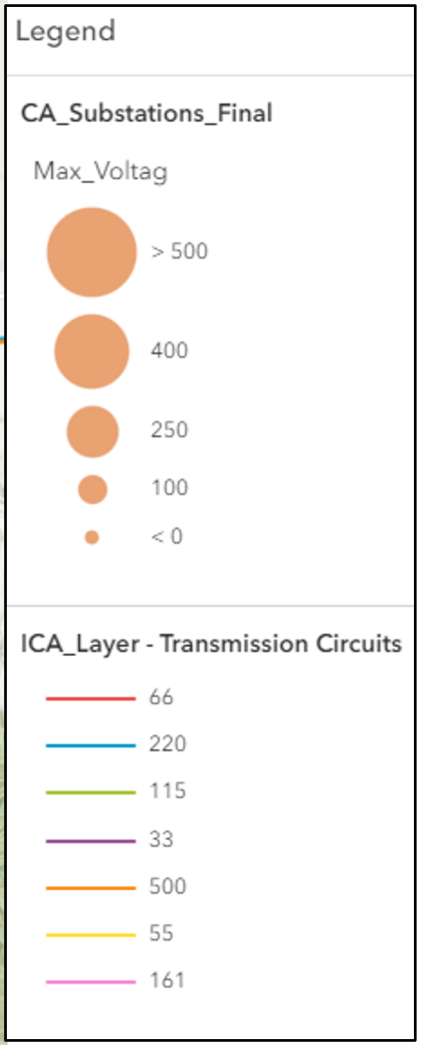
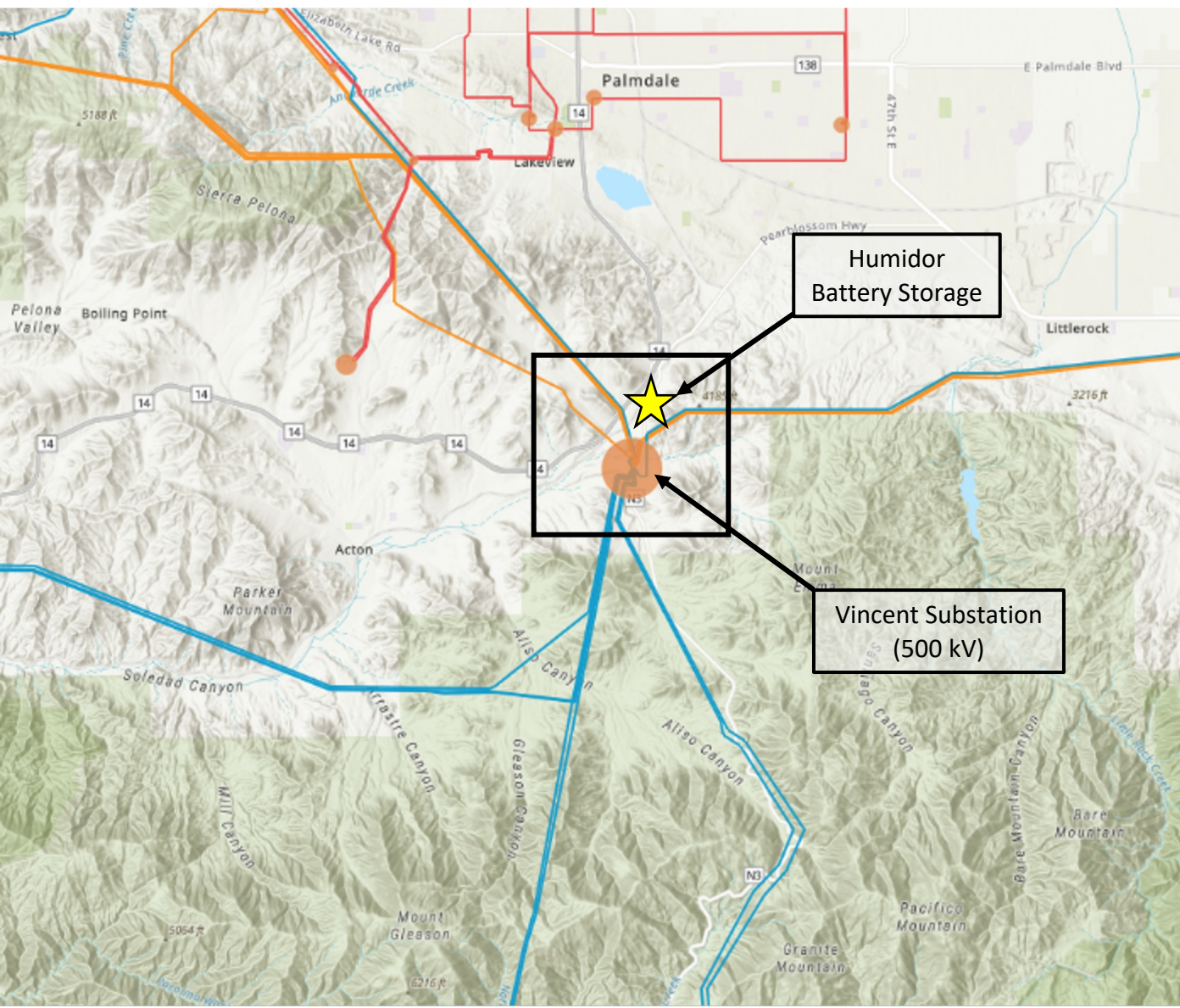


There is a significant amount of solar in the central valley that is attempting to flow down into Los Angeles (LA).

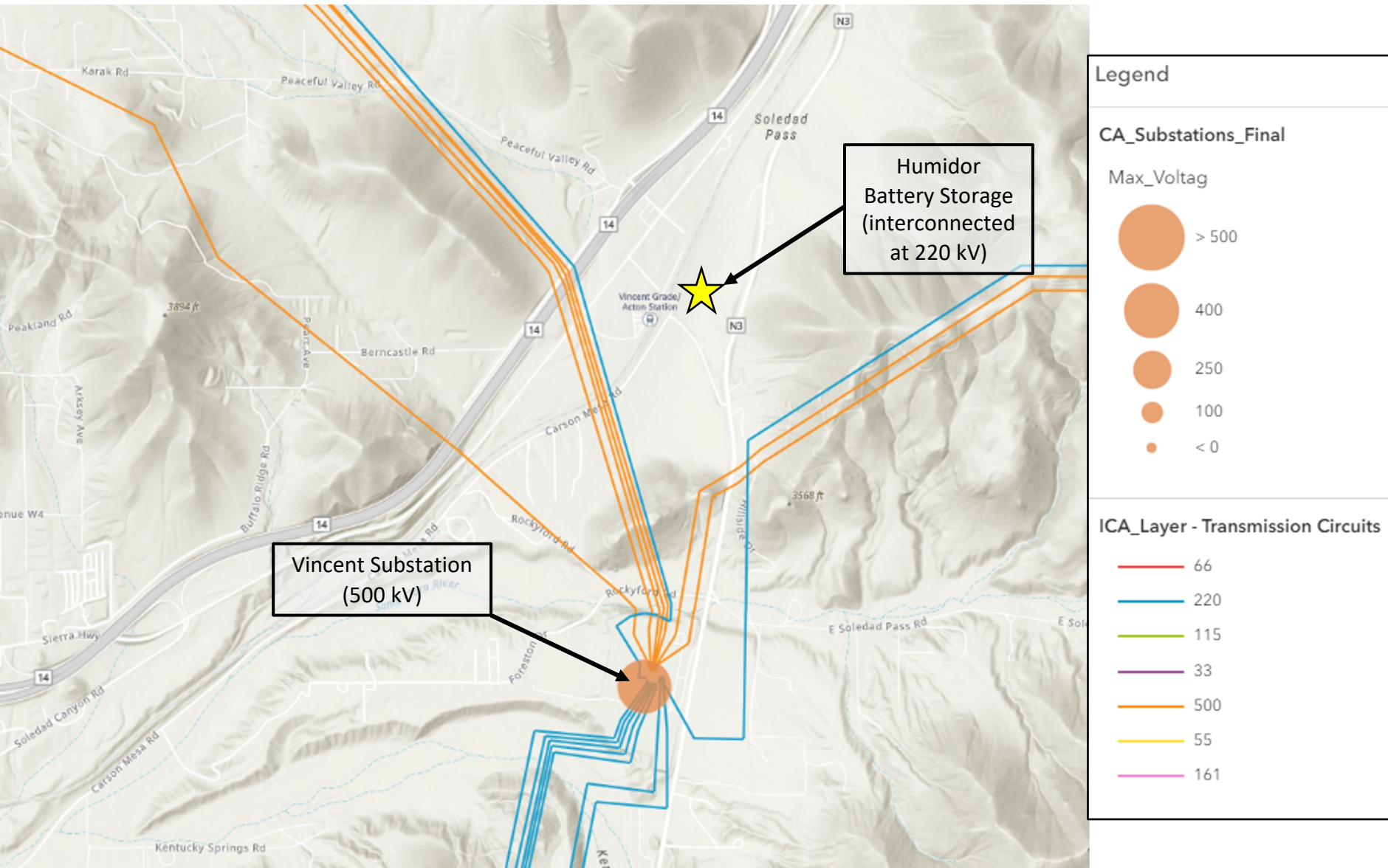
CAISO is careful about adding more solar in the central valley due to grid congestion, so it is slowing down the deployment of additional solar. Too much grid congestion can cause grid outages.

The Humidor Battery Storage Project will address multiple challenges: deliver solar energy to Los Angeles, prevent curtailment, meet peak grid demand, and alleviate congestion. This will help smooth supply and demand, reducing blackout risks.

Humidor energy storage is located at a major California grid intersection



Humidor is located at a major grid intersection, less than one mile from the massive Vincent Substation



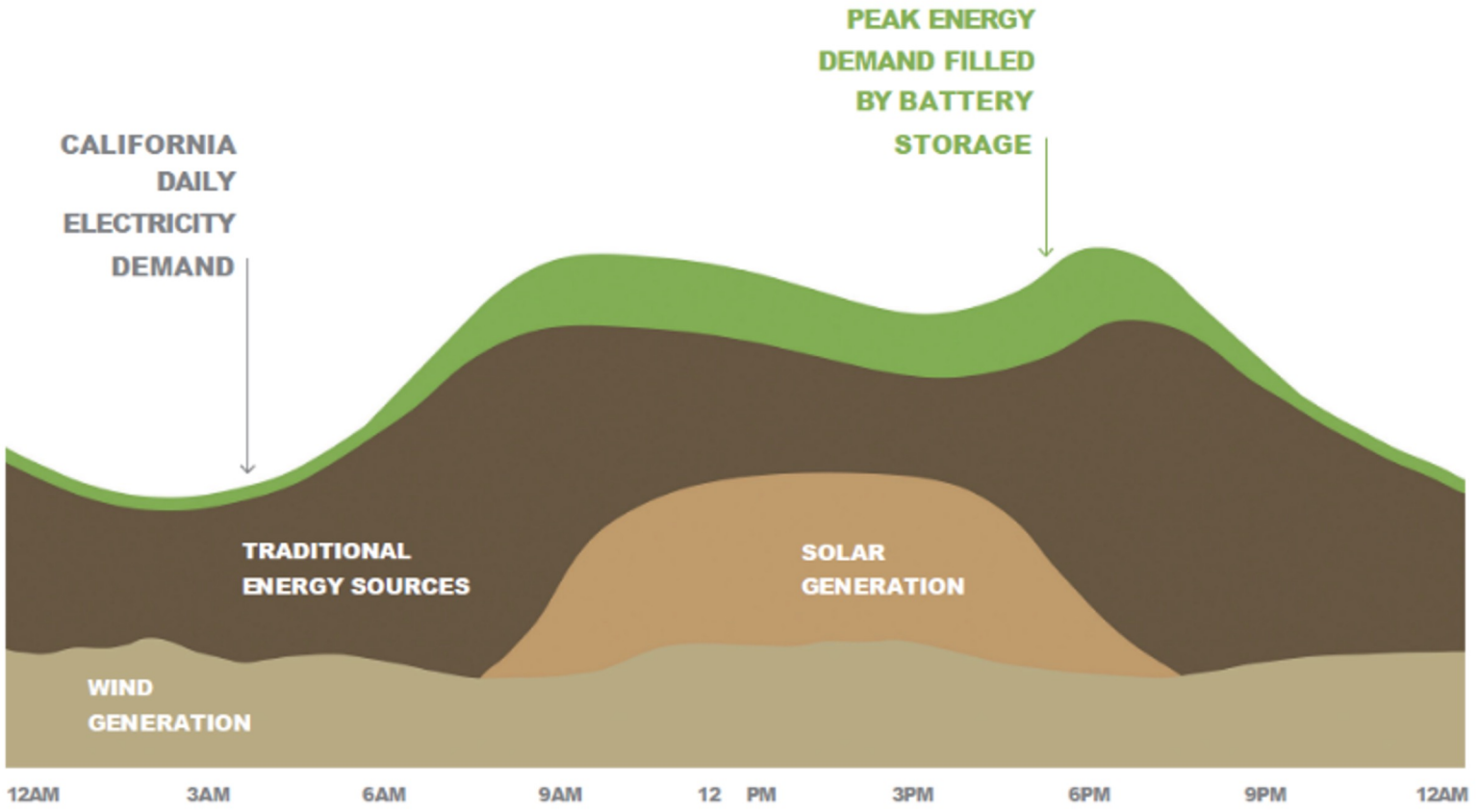
Effects of energy storage on peak demand

MEETING PEAK ENERGY DEMAND WITH BATTERY STORAGE

Every day, California enjoys energy production from wind 24/7 and solar during the day, with traditional sources such as natural gas power plants filling the gap. As California energy demand peaks with a growth in daily use, battery storage is being called upon to fulfill the additional demand to avoid brownouts or blackouts.

"ELECTRICITY STORAGE COULD HELP THE UTILITY GRID OPERATE MORE EFFICIENTLY, REDUCE THE LIKELIHOOD OF BROWNOUTS DURING PEAK DEMAND, AND ALLOW FOR MORE RENEWABLE RESOURCES TO BE BUILT AND USED."

- U.S. ENVIRONMENTAL PROTECTION AGENCY, ELECTRICITY STORAGE, ENERGY & ENVIRONMENT WEBPAGE

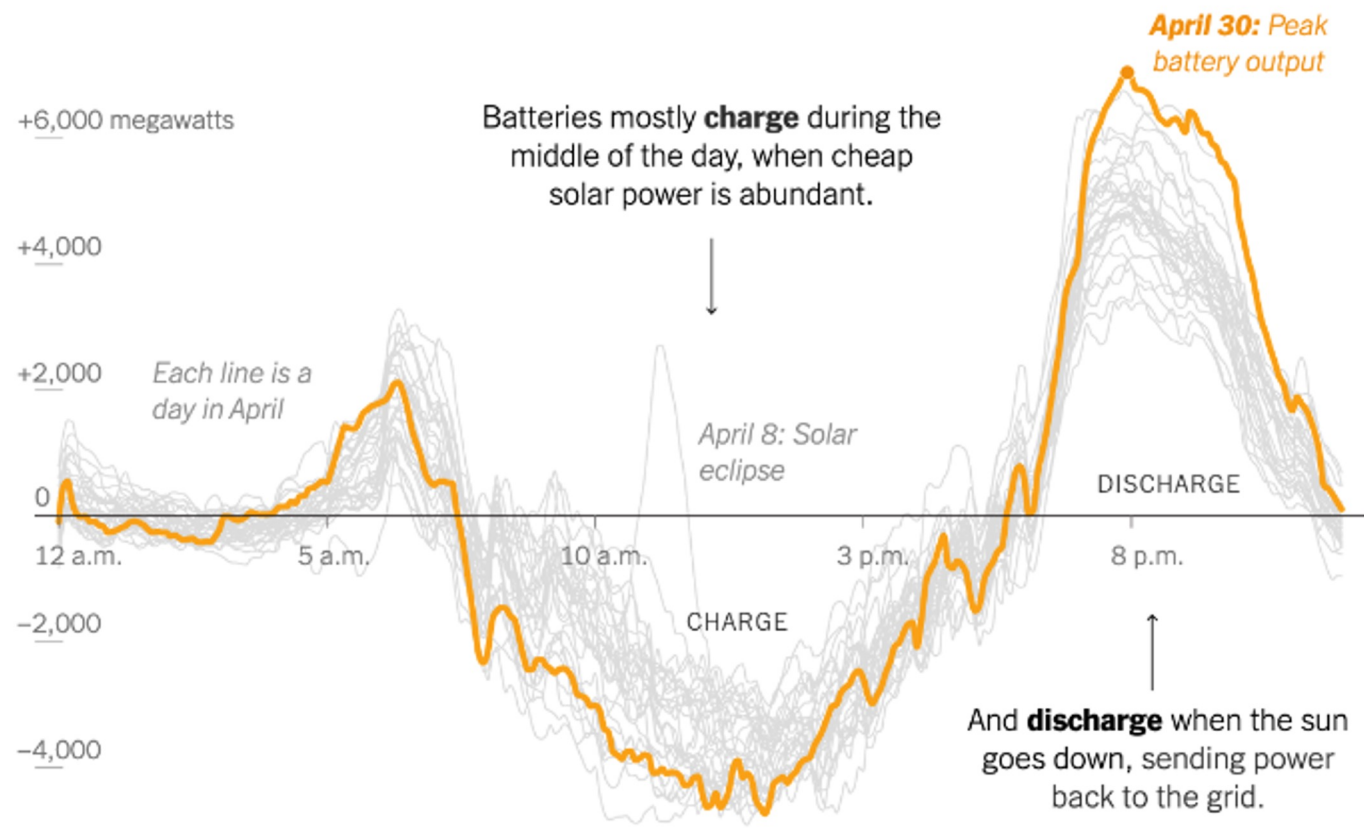


U.S. Energy Information Administration, Today in Energy Webpage

Batteries help midday solar serve evening load



California How Batteries Operated on the Grid in April 2024



Sources: California Independent System Operator via [Grid Status](#) - By The New York Times

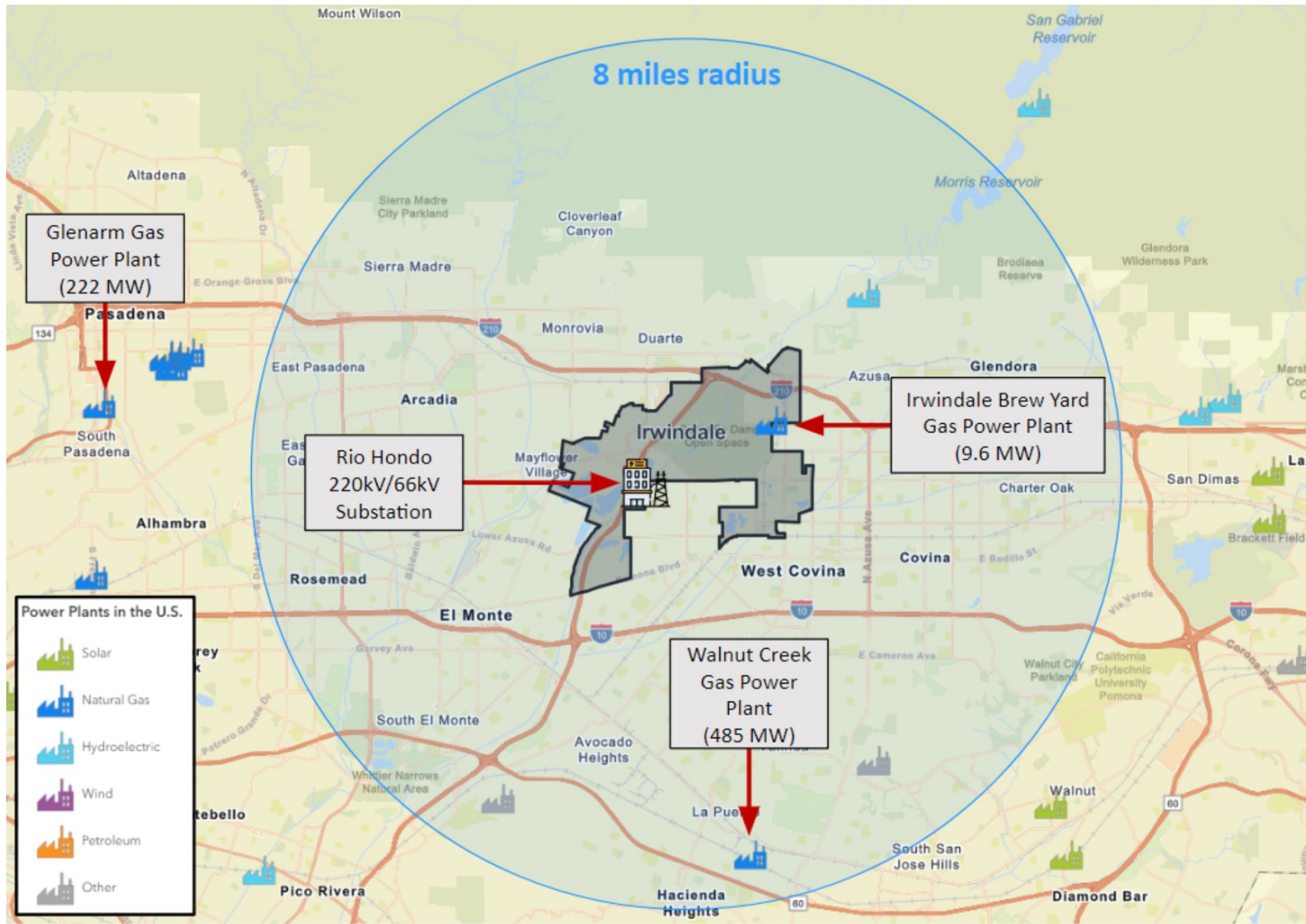
Irwindale-specific considerations for local BESS

Los Angeles County Fire Chief Anthony Marrone (ie, the Irwindale Fire Chief) provided full confidence about the safety of BESS in his testimony at the recent Los Angeles County Board of Supervisor hearing that fully approved the Humidor BESS. Details of this 26 November 2024 hearing can be found at Item 65 in the agenda, which is accessible at this link and which provides additional links that lead to lots of excellent fire safety and other useful information:

https://assets-us-01.kc-usercontent.com/0234f496-d2b7-00b6-17a4-b43e949b70a2/bc1fc18b-a867-45c3-b1e5-5beed480d46b/Agenda%20112624_links.pdf

Based on the comprehensive Environmental Impact Report associated with the two options for the Gateway project that were approved by the Irwindale Planning Commission last month, the option that includes the BESS will significantly reduce pollution in Irwindale. This is primarily due to the reduction in truck traffic with about a third of the Gateway warehouse space being utilized for the Gateway BESS.

Any BESS in Irwindale will reduce pollution from gas power plants that are prevalent in the region

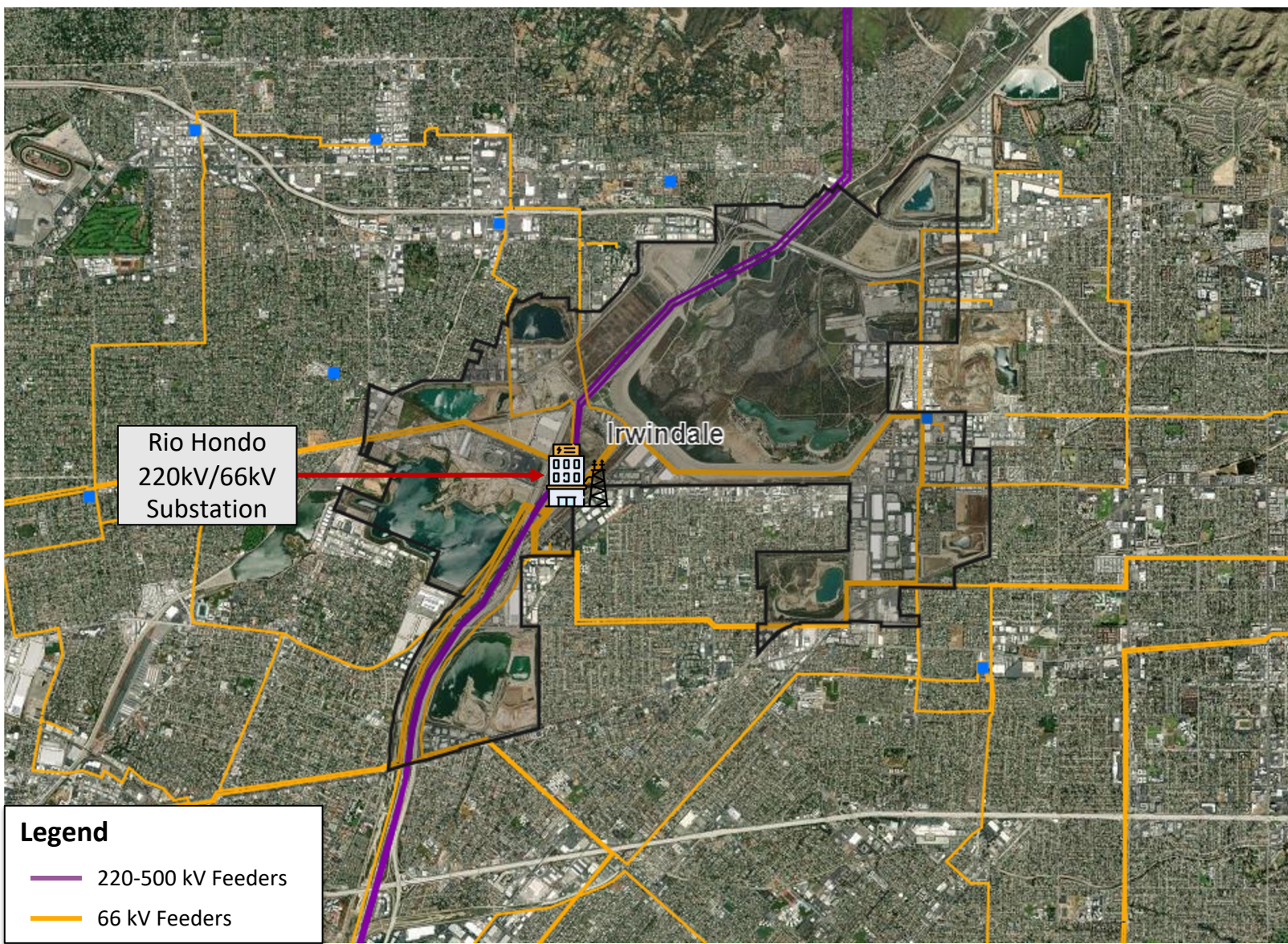


Based on the comprehensive economic analysis that was included in the Irwindale Planning Commission meeting last month that approved the two options for the Gateway project, **the Gateway BESS will deliver significant economic benefits to Irwindale.** At about 20 pages, the report is extensive – and it is consistent with other reports I have reviewed.

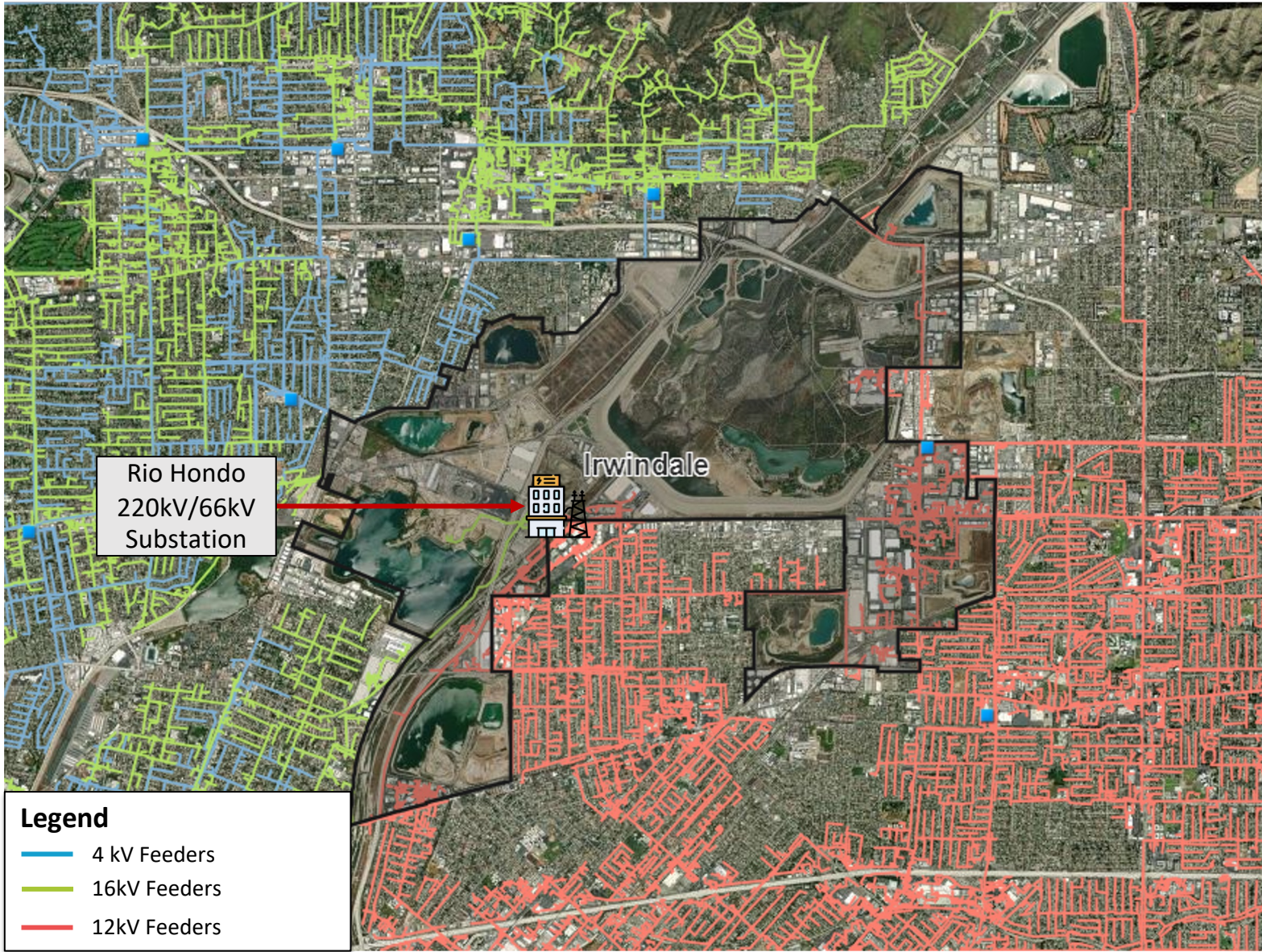
The economic analyses were performed by DTA and reported in the 14 November Irwindale Planning Commission package on pages 146-163.

Local grid benefits from BESS connecting to the
Rio Hondo Substation in Irwindale

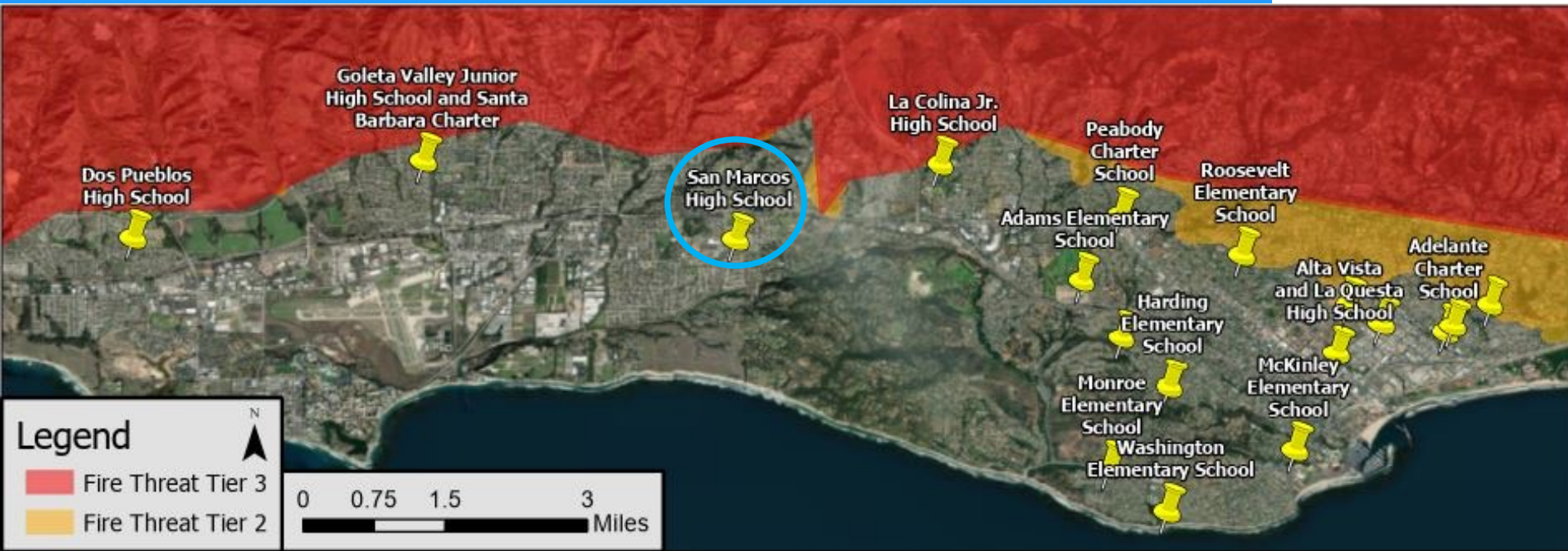
Transmission and high voltage distribution feeders near Irwindale



Distribution feeders near Irwindale



Community Benefits possibility for Irwindale



- The entire Santa Barbara region is surrounded by extreme fire risk (earthquake & landslide risk too) and is extremely vulnerable to electricity grid outages.
- The SBUSD is a major school district that increasingly recognizes the value-of-resilience (VOR) and has embraced the Clean Coalition's vision to implement Solar Microgrids at a number of its key schools and other critical facilities.
- SMHS is in the middle of the extensive SBUSD service area.

Six SBUSD Solar Microgrid sites



Dos Pueblos High School



San Marcos High School



La Cumbre Junior High School

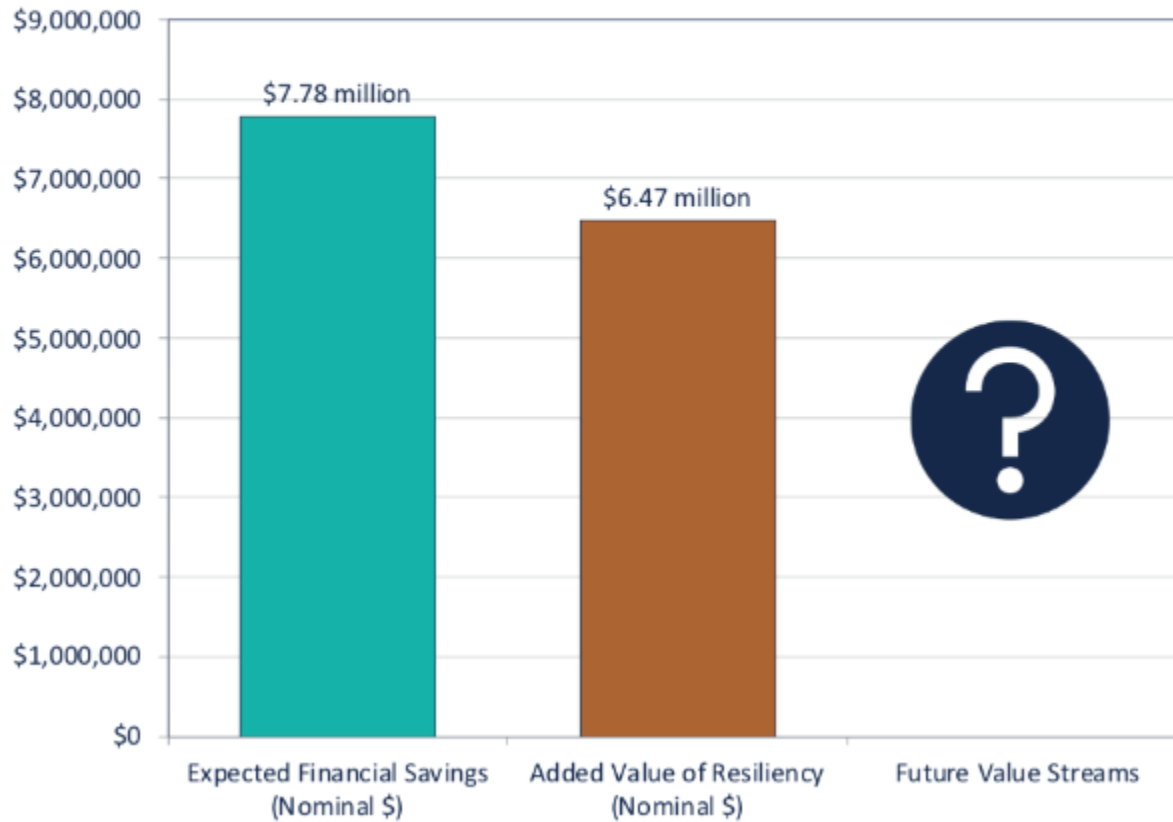


District Food Warehouse
& District Office



Santa Barbara High School

Lifetime (28-year) Bill Savings and Added Value of Resiliency



Backup

Humidor is in an industrially-zoned area

HUMIDOR STORAGE LOCATION | AN IMPORTANT LOCATION FOR BATTERY STORAGE

The proposed project site is far away from residential areas in Antelope Valley. It is located in an industrially-zoned area

between a highway and rail line with nearby grid infrastructure to efficiently hook-up to the energy grid.



A Fair Distance from Town Centers In Antelope Valley



Adjacent to Grid Infrastructure

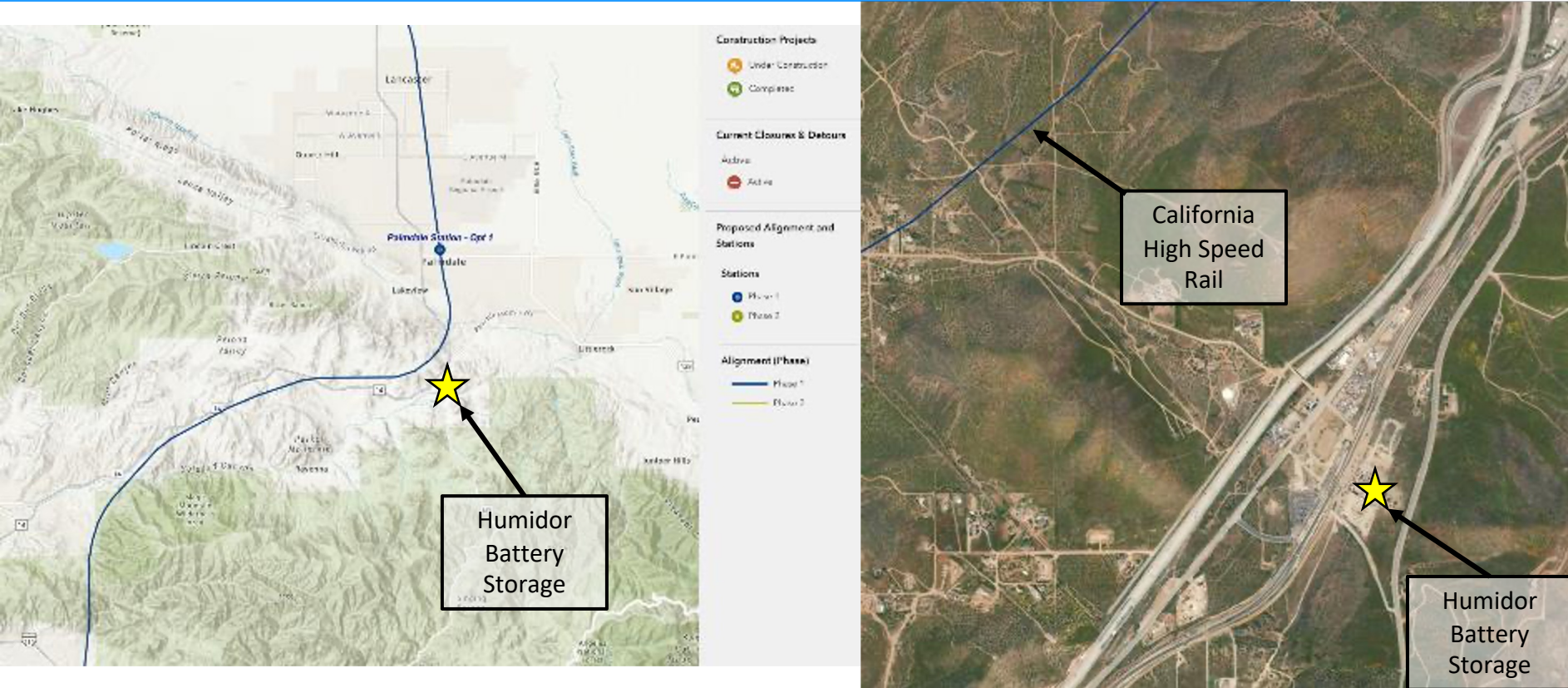


An Industrial Area Between a Freeway and Rail Line



Far Away From Residential Neighborhoods

Utilize already disturbed industrial land



Planned California High Speed Rail route

Source: <https://buildhsr.com/map/>

- Humidor will utilize already disturbed industrial land recently used for a commercial trucking and an electrical subcontractor yard.
- Humidor will also be located near the planned California High Speed Rail.



VISUALLY SCREENED & WELL-SECURED

THE PROJECT SITE WOULD INCLUDE AN 8-FOOT-HIGH PERIMETER WALL AND AN 8-FOOT HIGH INTERNAL CHAIN LINK SECURITY FENCE TO INCREASE THE PHYSICAL SAFETY OF THE FACILITY AND REDUCE VISUAL IMPACTS. THERE WILL ALSO BE LOCAL, NATIVE VEGETATION PLANTED AND MAINTAINED TO PROVIDE ADDITIONAL VISUAL BUFFERS AND MATCH THE AESTHETIC OF THE AREA.



SITE PLAN REVIEW

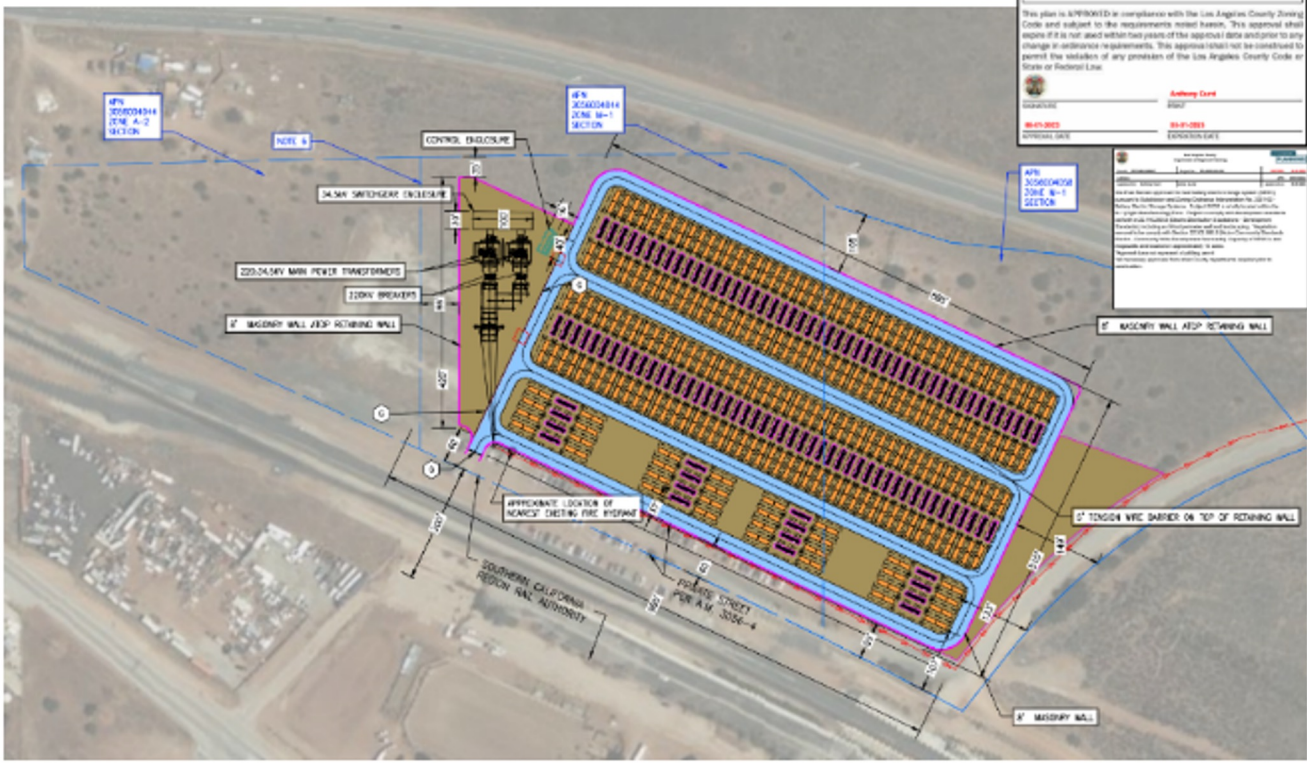
PERMIT #: **SPPL20200407**

PROJECT #: **PLU2020-04148**

This plan is SUBMITTED in compliance with the Los Angeles County Zoning Code and subject to the requirements noted herein. This approval shall expire if it is not used within two years of the approval date and prior to any change in ordinance requirements. This approval shall not be construed to permit the violation of any provision of the Los Angeles County Code or State or Federal Law.

Anthony Carr
SEAL

ALLI-1001
EXPIRES DATE



LEGEND PROJECT AREA THIS PAGE: 623,483 SQFT, 12,016 ACRES

- BATTERY CONTAINERS (12384/ 12384M PER DATE) WITH 2 INVERTERS AND 34.2KV BUS
- PROPOSED SITE FENCE
- PROPOSED ROAD EDGES
- PROPOSED OVERHEAD ELECTRICAL
- PROPOSED UNDERGROUND ELECTRICAL
- RETAINING WALL
- 6\"/>

NOTES

1. EQUIPMENT DETICED IS PRELIMINARY ONLY. MAXIMUM NAMEPLATE CAPACITY OF THE 7. BUSES IS 4000A.
2. BATTERY SYSTEM SIZED FOR MANUFACTURER ALLOWED/RECOMMENDATION OF 4HR DISCH. RATING ALLOWING FULL POWER OUTPUT AT END OF LIFE BASED ON A 20-YEAR LIFESPAN.
3. BATTERY SYSTEM SIZED UNDER FOLLOWING ASSUMPTIONS: 4 HOUR RUN TIME AT END OF LIFE.
4. RETAINING WALLS REQUIRED AS INDICATED ON DRAWING. EARTH-WORK TO REMAIN UNDER 100,000 CY TOTAL.
5. LIGHTING WILL COMPLY WITH CHAPTER 22.80 (RURAL OUTDOOR LIGHTING DISTRICT) OF THE LOS ANGELES COUNTY CODE.
6. PARCEL M1 ZONING BOUNDARY LOCATION PER LA COUNTY GIS.

SITE ADDRESS: 440 W. ORSON MESA RD, PASADENA, CA 92350

ASSESSOR'S PARCEL NO.: 355604041 - 5.26 ACRES, M1 ZONE; 355604042 - 5.8 ACRES, M1 ZONE

VEGETATION REMOVAL
 COMBINED FENCE, AVERAGE 25.4 ACRES

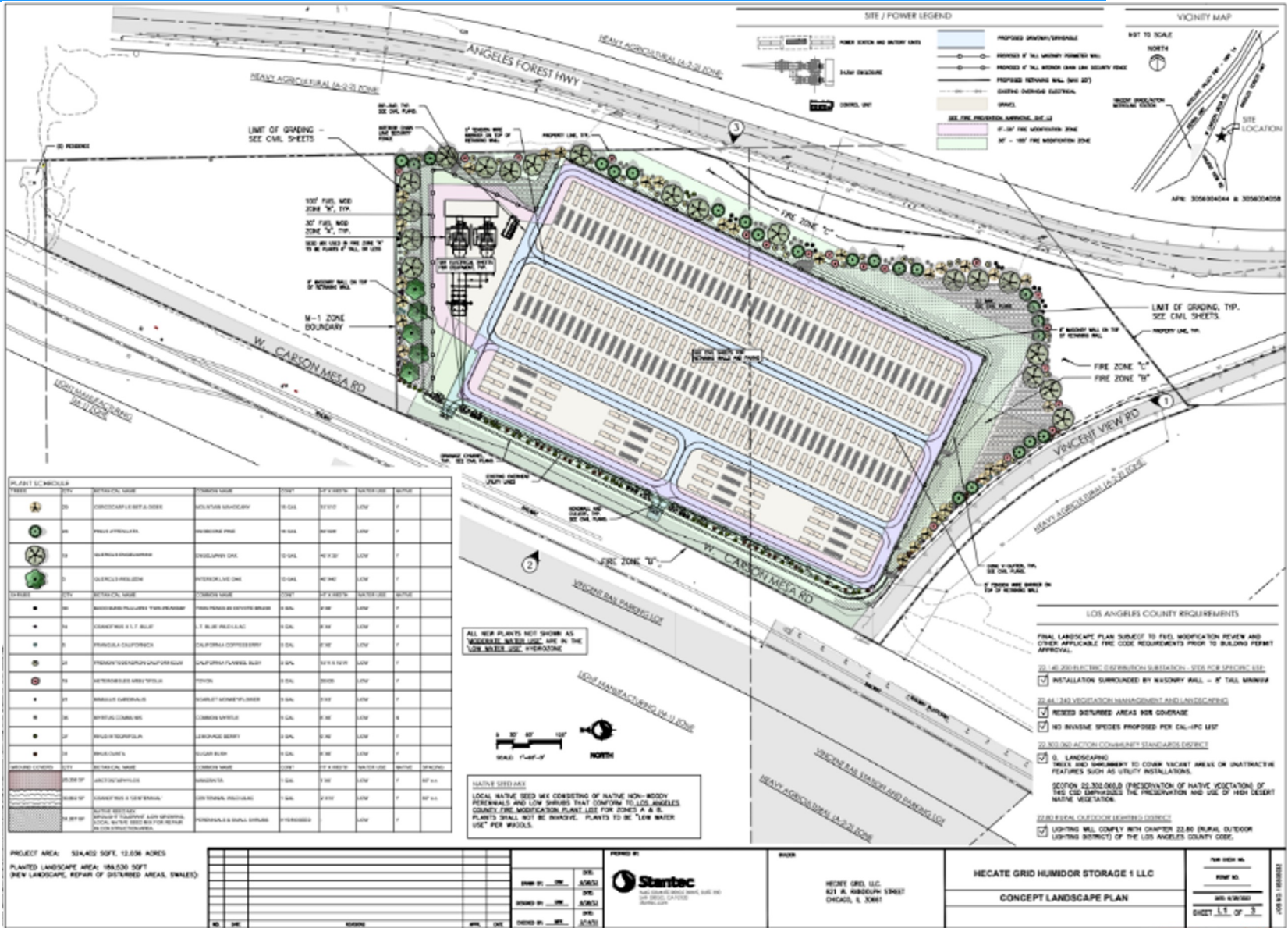
APPLICANT / DEVELOPER:
 LEVITE ONE NUMBER STORAGE LLC
 401 W. BIRCHMOUNT STREET
 CHICO, CA 95926

ESTIMATED EARTHWORK QUANTITIES:
 MAX. RETAINING HEIGHTS = 20'
 APPX. TOTAL CUT: 54,129 CY
 APPX. TOTAL FILL: 56,596 CY
 APPX. TOTAL EARTHWORK: 110,725 CY
 APPX. EXPORT: 2,262 CY
 EARTHWORK QUANTITIES TO BE VALIDATED PRIOR TO GRADING AND BUILDING PERMIT APPROVAL.

SCALE: 1" = 100'-0"

- NOTES**
7. SITE IS TO BE CONSTRUCTED FOR CURRENT CALIFORNIA FIRE CODE (2022), NATIONAL FIRE PROTECTION AGENCY 880 (NFPA-2020), AND LA COUNTY FIRE CODE (2023).
 8. ALL CONTAINERS ARE TO BE CONSTRUCTED IN ACCORDANCE WITH UL 9540A.
 9. ALL ROADS TO BE ALL-WEATHER ACCESS AND CONFORM TO LA COUNTY FIRE CODE (2023) 404 AND 405.4. FIRE-RESISTANT TO BE 10', CONCRETE HEIGHT 40', AND EXTERIOR FINISH 40'. WIDTH TO BE 20'.
 10. ALL CONTAINERS TO BE SET BACK FROM LOT LINES A MINIMUM OF 10'.
 11. PROPOSED LANDSCAPING RESISTANCE TO BE COMPLIANT WITH LA COUNTY FIRE DEPARTMENT FUEL MODIFICATION REQUIREMENTS.





Humidor concept materials and colors

TENSION WIRE BARRIER (SAFETY RAIL FOR INTERIOR DRIVES)
MATERIAL: METAL



PERIMETER WALL CONCEPT - CMU 8' HEIGHT
MATERIAL: MASONRY



INTERIOR 6' TALL CHAIN-LINK SECURITY FENCE (AT EQUIPMENT AREA)
MATERIAL: METAL



POWERSTATION
MATERIAL: METAL COLOR: WHITE



BATTERY UNIT
MATERIAL: METAL COLOR: WHITE



TRANSFORMER ON PAD
MATERIAL: METAL COLOR: WHITE



PROJECT MV SWITCHGEAR
MATERIAL: METAL COLOR: WHITE



NO.	REV.	DATE	BY	CHKD BY	APP.

DESIGNED BY: STANTEC
100 WEST 72ND STREET
CHICAGO, IL 60638

HECATE GRID, LLC
627 N. WAGOYH STREET
CHICAGO, IL 60641

HECATE GRID HUMIDOR STORAGE 1 LLC
CONCEPT COLORS & MATERIALS BOARD

REVISED NO.	
REVISED DATE	
DRAWN BY	
CHECKED BY	
SHEET NO. OF TOTAL SHEETS	13 OF 23