



CampusEnergy2021

BRIDGE TO THE FUTURE

Feb. 16-18 | CONNECTING VIRTUALLY

WORKSHOPS | Thermal Distribution: March 2 | Microgrid: March 16

Cal Poly Electrical Master Planning in the Age of Utility Power Shutoffs and Natural Gas Bans

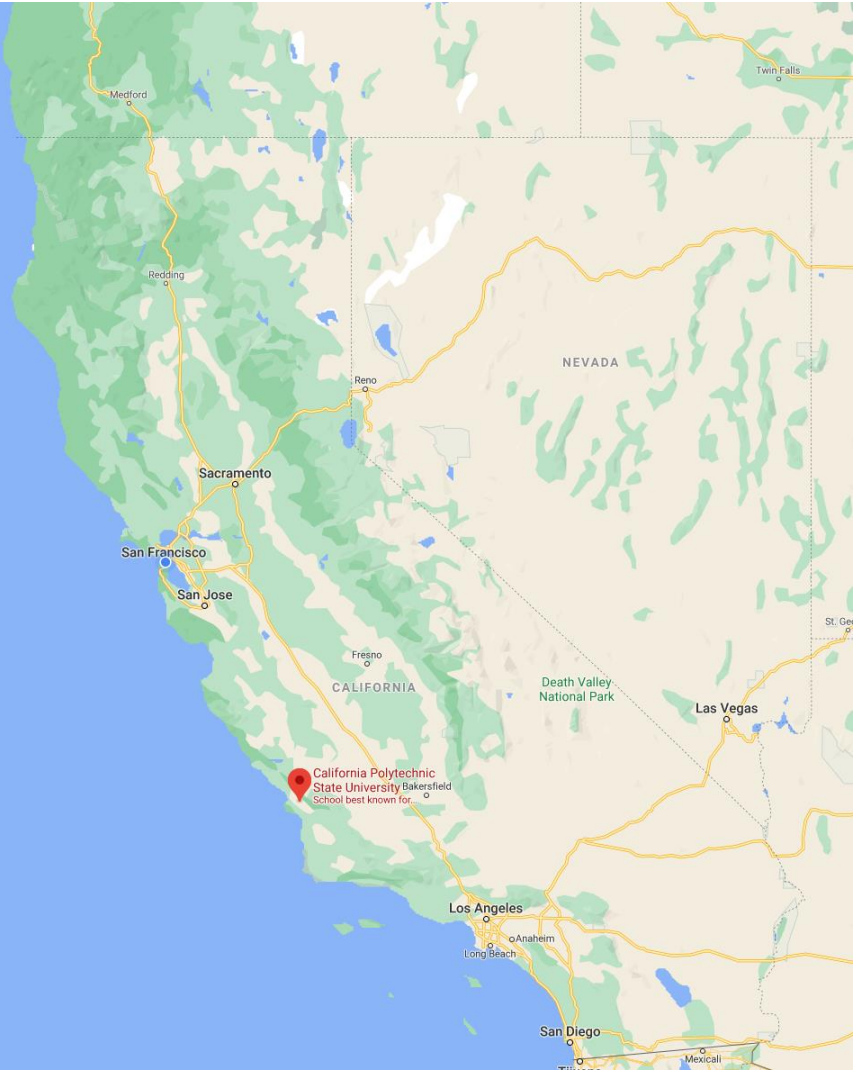
Krista Murphy, PE, LEED AP BD+C
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California State University, Cal Polytechnic in San Luis Obispo



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Electrical Master Plan Challenge at Cal Poly:

- Campus served by single PG&E electrical utility line routed through a wildfire zone from a single substation
- Upgrades required at existing 70kV:12.47kV Mustang substation
- Certain components of distribution switchgear reaching end of life
- Limited number of distribution feeders; some nearing rated capacity
- Legacy 4.16kV electrical distribution to be converted to 12.47kV
- Existing ductbank system essentially exhausted of spare capacity
- PG&E service interconnection agreement limits import of power
- Interconnect agreement limits onsite campus renewable energy generation to 1MW or less

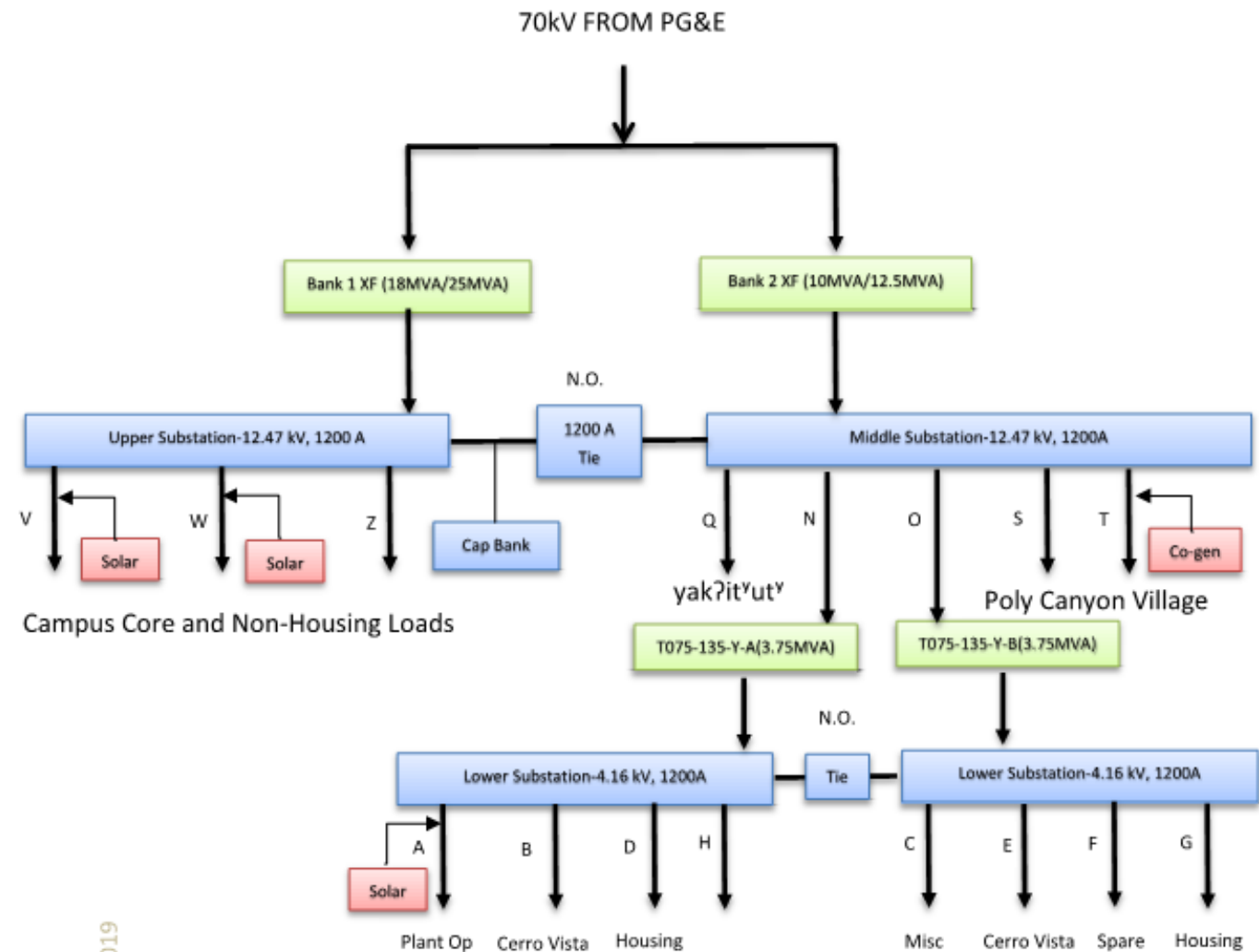


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Existing Electrical Arrangement at Cal Poly:



Utility Master Plan Objectives:



Comprehensive analysis to support full master plan build-out over the next 15 years



Flexible planning tools which can be adjusted by the University over time



Consider multiple criteria:

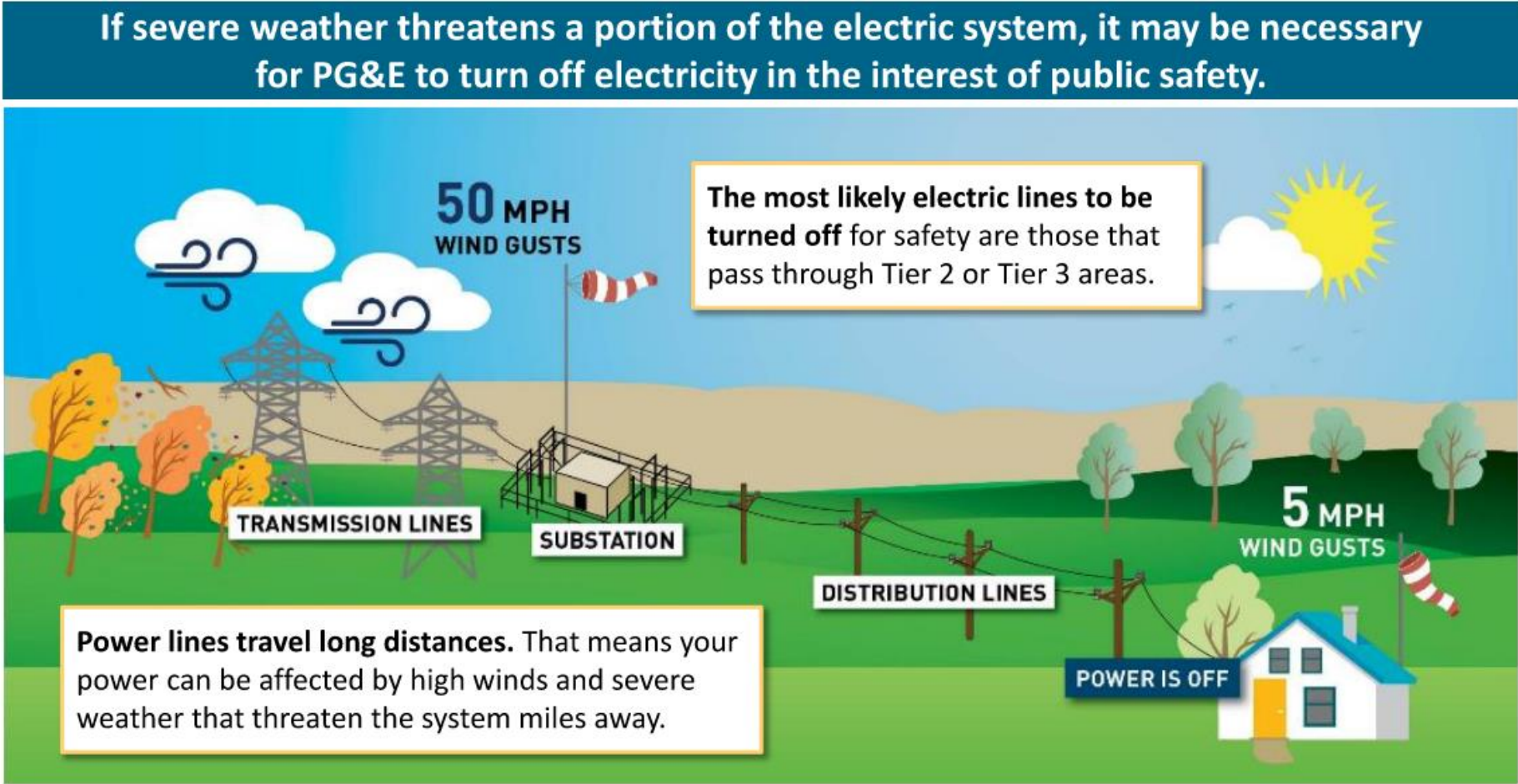
- Capacity
- Condition
- Life safety
- Redundancy
- Reliability
- Efficiency
- Climate resilience



Total life cycle cost of ownership analysis:

- Capital
- Sustainability (energy, water, carbon reduction)
- Operations & maintenance

Context: PG&E Public Safety Power Shutoff (PSPS) events



All data is preliminary and based on early 2020 work planning. Data as of April 2020.






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Context: PG&E Wildfire Mitigation Plan Progress

PROGRAM	 2019 COMPLETE	 2020 TARGET	 2020 PROGRESS
SYSTEM HARDENING Stronger poles, covered lines and/or targeted undergrounding	171 LINE MILES	241 LINE MILES	105 LINE MILES
ENHANCED VEGETATION MANAGEMENT Inspecting, pruning and removing vegetation	2,498 LINE MILES	1,800 LINE MILES	939 LINE MILES
HIGH-DEFINITION CAMERAS Improving real-time monitoring of high-risk areas and conditions	133 CAMERAS	200 CAMERAS	50 CAMERAS
WEATHER STATIONS Enhancing weather forecasting and modeling	426 STATIONS	400 STATIONS	116 STATIONS
SECTIONALIZING DEVICES Separating the grid into smaller sections to increase flexibility and reduce customer impact of PSPS events	287 DEVICES	592 DEVICES	216 DEVICES
TRANSMISSION LINE SWITCHES Enabling targeted transmission outages to lessen downstream customer impacts	0 DEVICES	23 DEVICES	29 DEVICES
COMMUNITY RESOURCE CENTERS (CRCs) Safe, energized locations for customers to receive basic resources and information	111 SITES ACTIVATED	80* SITES TARGETED	5* SITE READY

DATA AS OF 5/23

* PG&E originally targeted 201 CRC sites for the 2020 PSPS season, due to COVID we have adjusted PSPS customer support programs during this time including creating multiple deployment strategies for CRCs (hardened sites, temporary sites, open-air tents and mobile, vehicle-based CRCs).

Some of the measures included in this presentation are contemplated as additional precautionary measures intended to further reduce the risk of wildfires.

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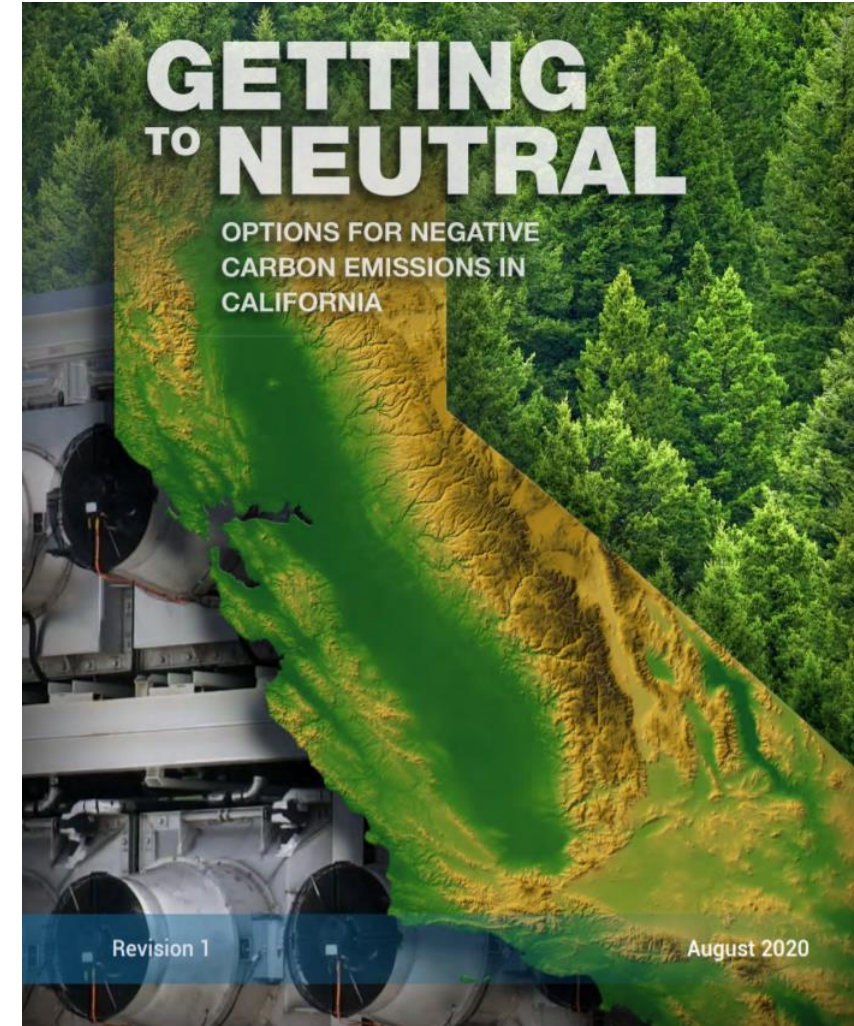


Context: California Goals for Carbon Neutrality

State of CA requires carbon neutrality by 2045.

As of December 2020, over 40 California counties have adopted local REACH ordinances stricter than the state requirements.

Many REACH ordinances require all electric construction or ban natural gas altogether in new construction.



Context: Local county REACH ordinances enacted beyond state code

Approved Zero Emission Building Codes in California as of 12/22/2020

Jurisdiction	Approach			Systems			Building Types								Add-Ons	
	Natural Gas Infrastructure Moratorium	All-Electric Reach	Electric-Preferred	Whole Building	Water Heating	Space Heating	Low Rise Residential	City-Owned Properties	High Rise Residential	Hotel	Retail	Office	Restaurant	Life Sciences	Additional Solar	Electric Vehicles
Alameda	X			X				X								
Berkeley**	X		X	X			X	X	X	X	X	X	X	X	X	X
Brisbane		X			X	X	X	X	X	X	X	X	X			X
Burlingame		X		X	X	X	X	X	X	X	X	X		X		X
Campbell		X			X	X	X									X
Carlsbad	X	X			X		X								X	X
Cupertino*		X		X			X	X	X	X	X	X	X			X
Davis			X	X			X									
East Palo Alto		X		X			X	X	X	X	X	X		X		X
Hayward		X	X	X			X	X	X	X	X	X	X	X	X	X
Healdsburg		X			X	X	X	X	X	X	X	X	X	X		
Los Altos*		X		X	X	X	X	X	X	X	X	X				X
Los Altos Hills		X			X	X	X	X	X	X	X	X	X			
Los Gatos		X		X			X									X
Marin County			X	X			X	X	X	X	X	X	X	X		X
Menlo Park*		X			X	X	X	X	X	X	X	X	X		X	X
Millbrae		X			X	X	X	X	X	X	X	X	X	X		X
Mill Valley			X	X			X		X							X
Milpitas			X	X			X	X	X	X	X	X	X	X		X
Morgan Hill	X			X			X	X	X	X	X	X	X	X		
Mountain View*		X		X			X	X	X	X	X	X	X		X	X
Oakland		X		X			X	X	X	X	X	X	X	X		
Ojai		X		X			X	X	X	X	X	X		X		
Pacifica		X			X	X	X	X	X	X	X	X	X		X	X
Palo Alto*		X	X	X			X	X	X	X	X	X	X	X		X
Piedmont		X		X			X								X	
Redwood City*		X		X			X	X	X	X	X	X				X
Richmond		X		X	X	X	X	X	X	X	X	X				X
San Anselmo			X	X			X	X	X	X	X	X	X	X		
San Francisco**	X		X	X			X	X	X	X	X	X	X	X	X	X
San Jose**	X			X			X	X	X	X	X	X	X	X	X	X
San Luis Obispo			X	X			X	X	X	X	X	X	X	X		X
San Mateo**		X		X			X		X			X			X	X
San Mateo County		X		X			X	X	X	X	X	X	X			X
Santa Cruz	X			X			X	X	X	X	X	X		X		
Santa Monica			X	X			X	X	X	X	X	X	X	X	X	X
Santa Rosa		X		X			X									
Saratoga		X			X	X	X	X	X	X	X	X	X	X		X
Sunnyvale*		X		X			X	X	X	X	X	X	X	X		X
Windsor		X		X			X									

* Council went beyond staff recommendation
** Multiple ordinances passed to strengthen/expand scope



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**BUILDING
DECARBONIZATION
COALITION**



**INTERNATIONAL
DISTRICT ENERGY
ASSOCIATION**

Context: CSU Cal Poly Carbon Neutrality Goals

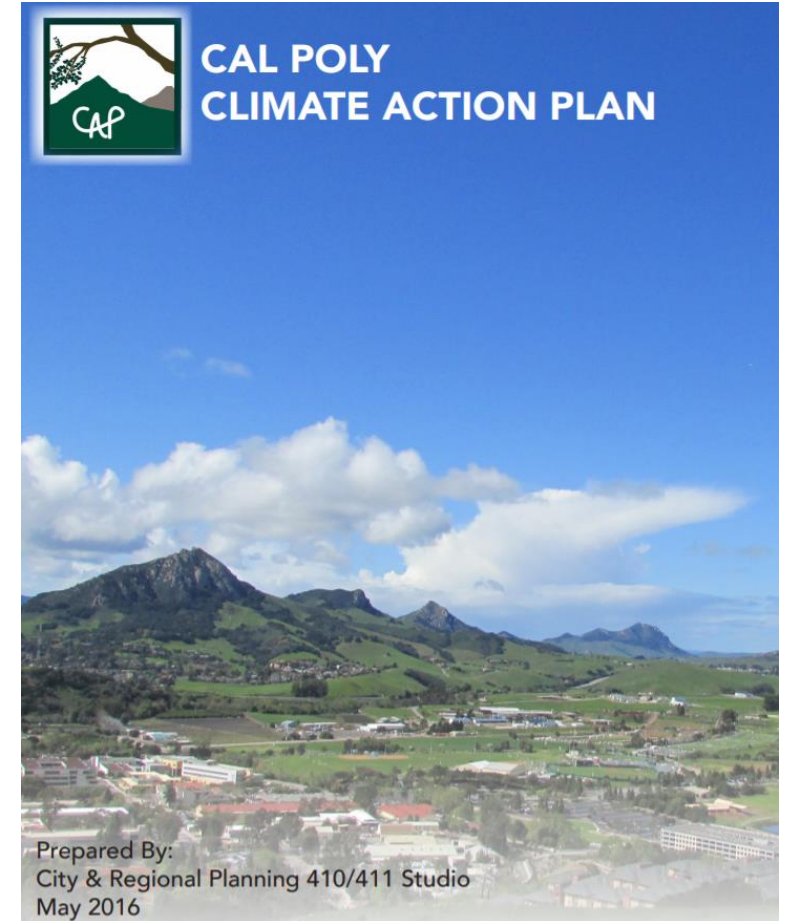
CSU Sustainability Policy and Cal Poly Commitment to Climate Neutrality

CSU's 2014 Sustainability Policy set forth a number of goals to guide campus planning, including mandated reductions in GHG emissions to meet and exceed state policy set forth in AB32. These include:

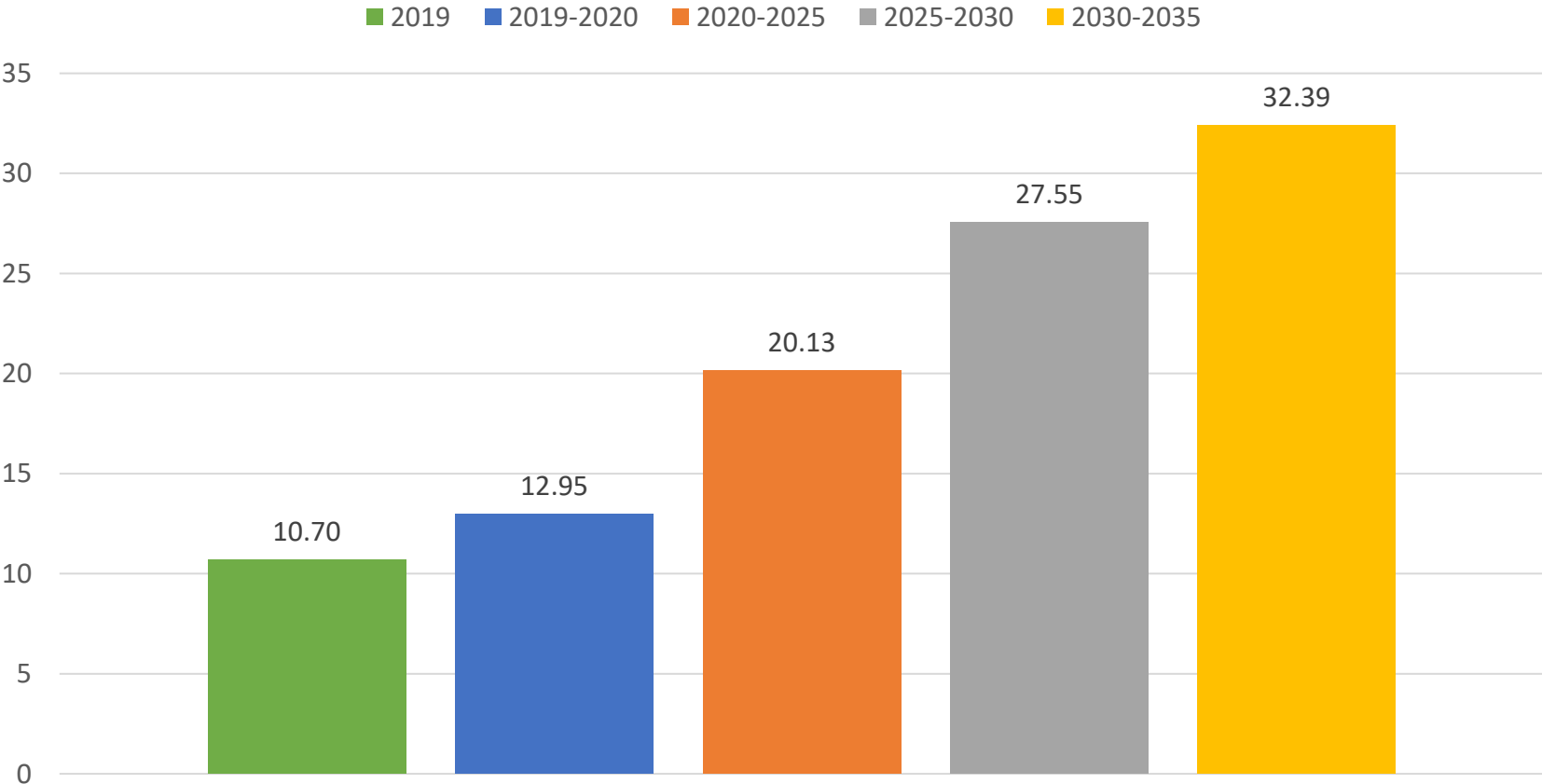
- Reducing Scope I and II GHG emissions to 1990 levels by 2020

- Reducing Scope I and II GHG emissions to 80% below 1990 levels by 2040

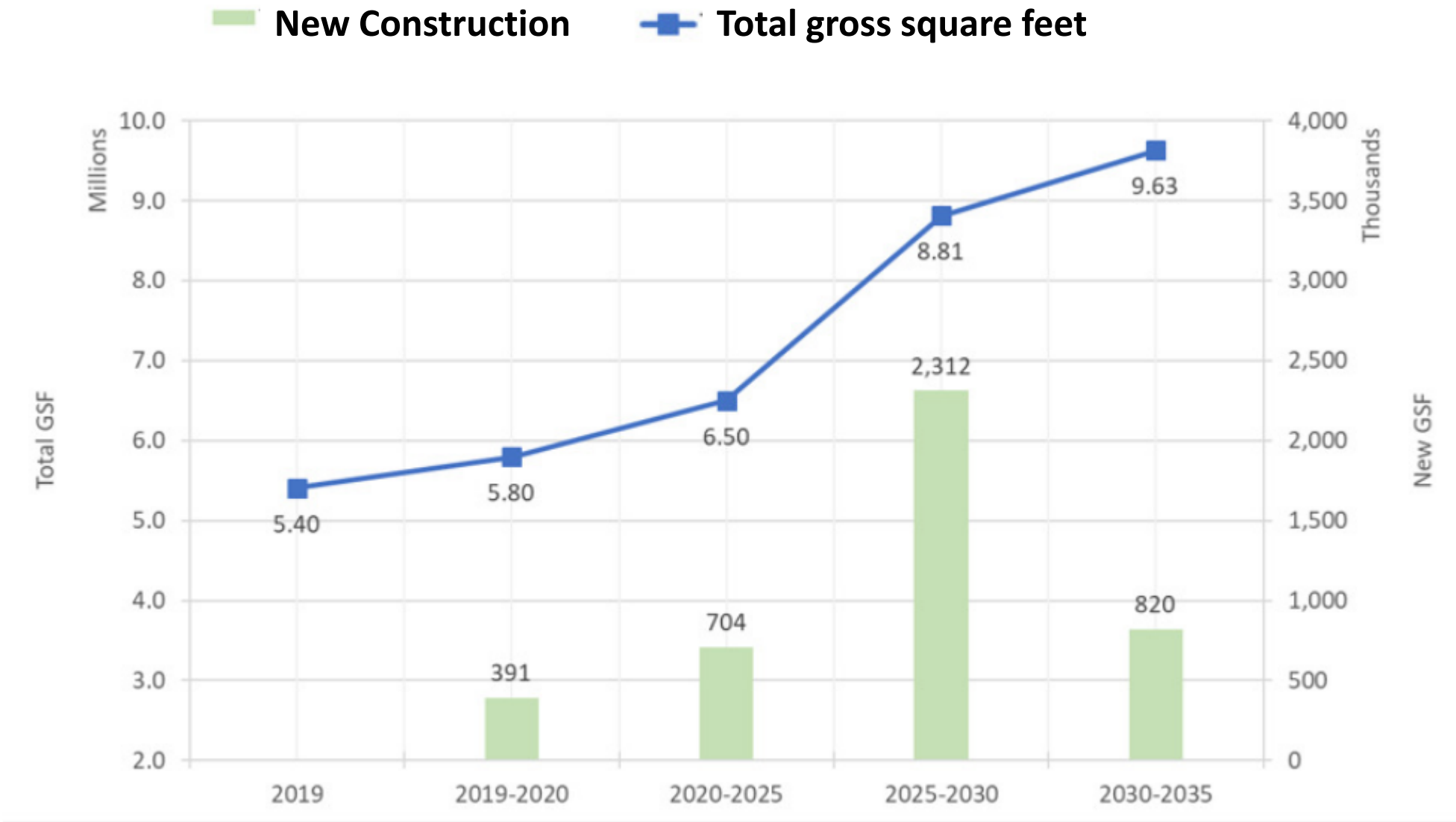
In addition to these goals and as a Charter Signatory to the Second Nature Climate Commitment, Cal Poly has committed to achieving carbon neutrality of Scope I, II, and III emissions by 2050, and climate resilience in coordination with regional partners. Scope III emissions from commuting and business travel account for over 50% of the campus' total greenhouse gas (GHG) emissions and present a number of challenges for reduction, as they are heavily dependent on individual behavior by commuters.



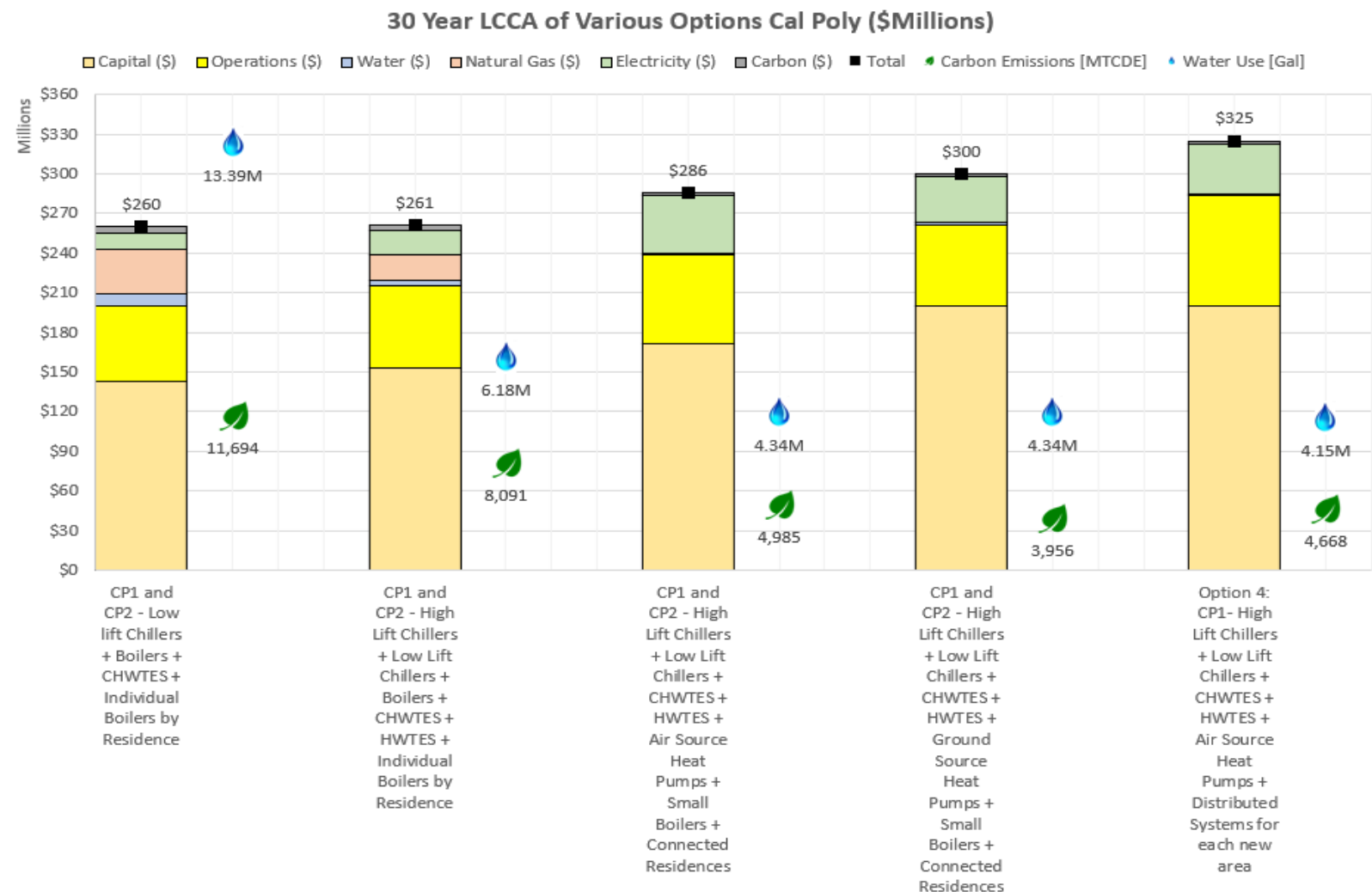
Analysis: Projected Campus Electrical Load MVA Summaries



Analysis: Projected Campus New Building Load Growth



Analysis: Electrification of Campus Thermal Utilities



Analysis: Electrification of Transportation



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Electrical Master Plan Multiple Stakeholder Collaboration



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Recommendation: Continue expanding CalPoly's previous investment of 4.5MW onsite solar photovoltaics



“

This is a huge step towards our goal of climate neutrality and we are very excited about using this new facility to support student hands-on Learn by Doing.

Dennis Elliot

DIRECTOR OF ENERGY, UTILITIES,
AND SUSTAINABILITY
CAL POLY SAN LUIS OBISPO

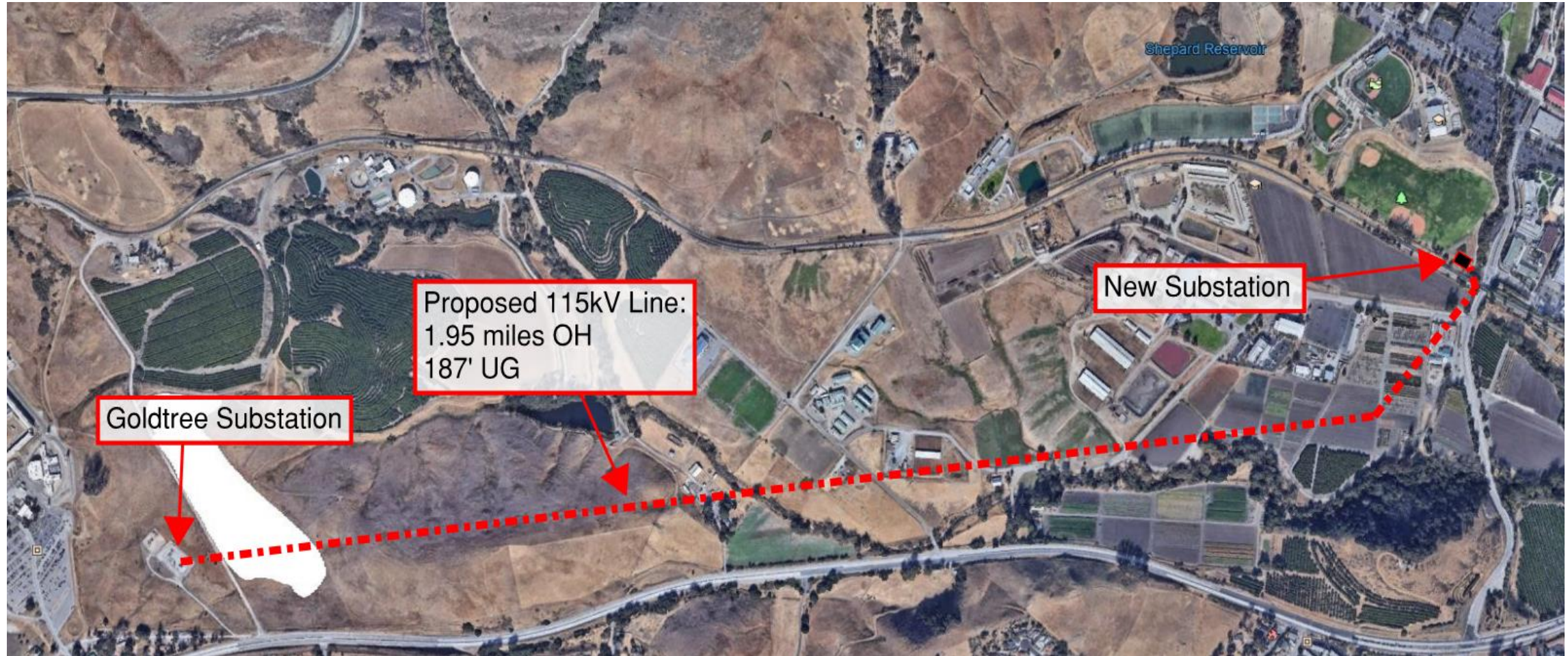


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Recommendation: Add 2nd Utility Incoming Service for Capacity



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Recommendation: Add 2nd Utility Incoming Service for Reliability

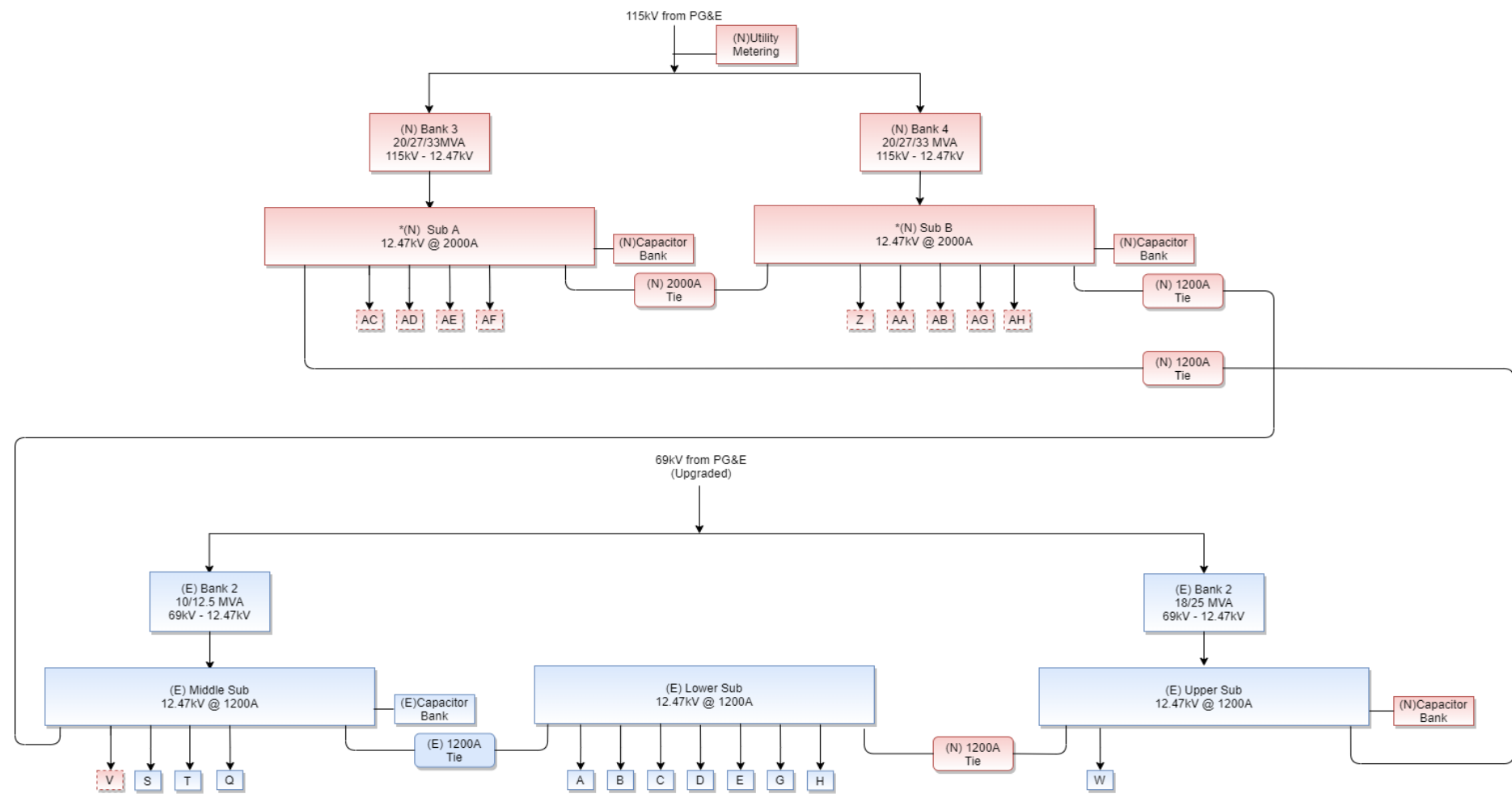


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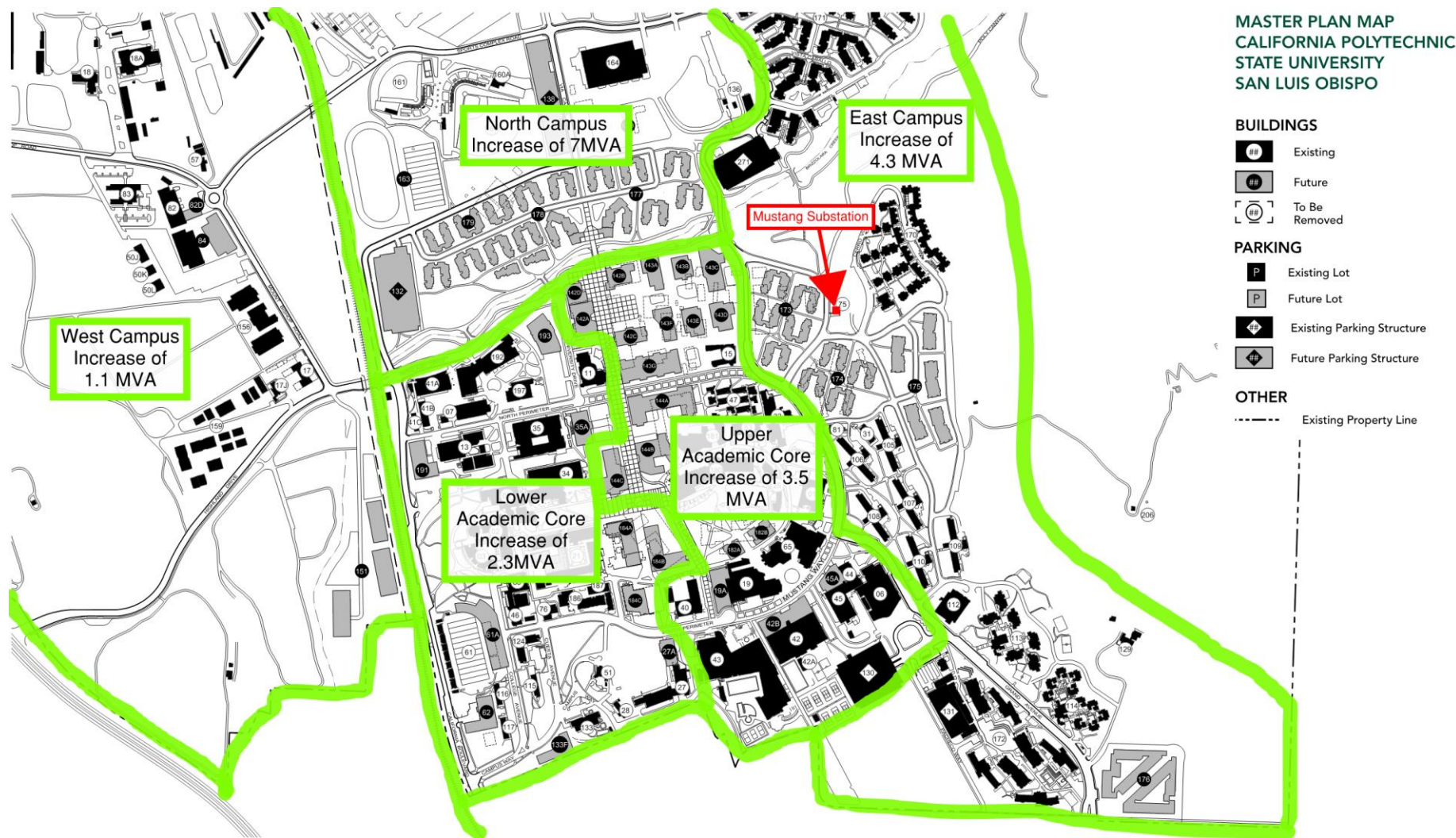
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Recommendation: Substation Infrastructure Capacity Expansion



Recommendation: Electrical Distribution System Improvements



Recommendation: SCADA Upgrades

Existing Deficiencies

Automated fault recovery capabilities no longer needed.

Inaccuracies with low lead readings

Reliability of network architecture

Security issues with multiple fire walls

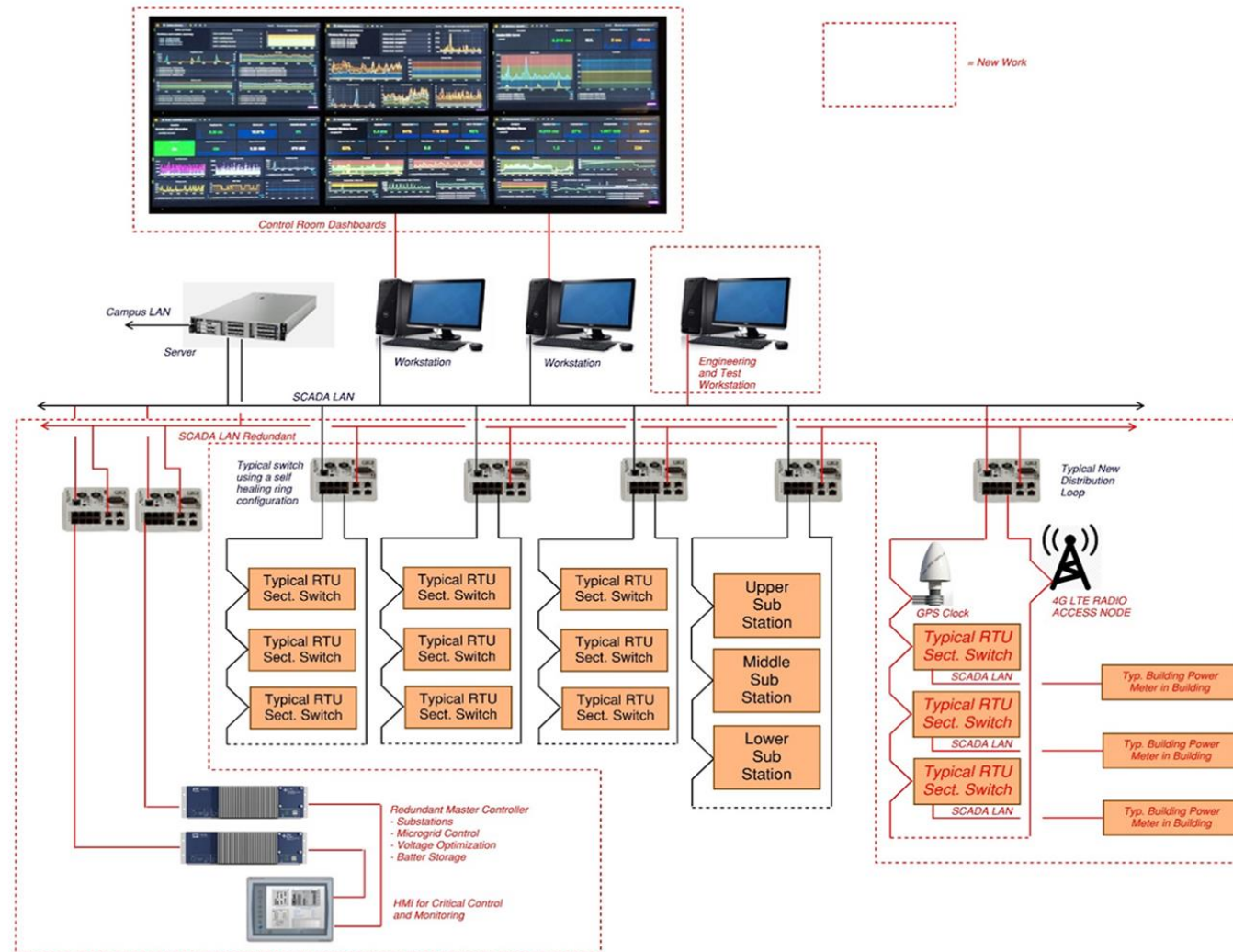
Future Improvements

PLC controller replacement

RTUs on medium voltage switches

New SCADA control room recommended

Upgrade communications protocol

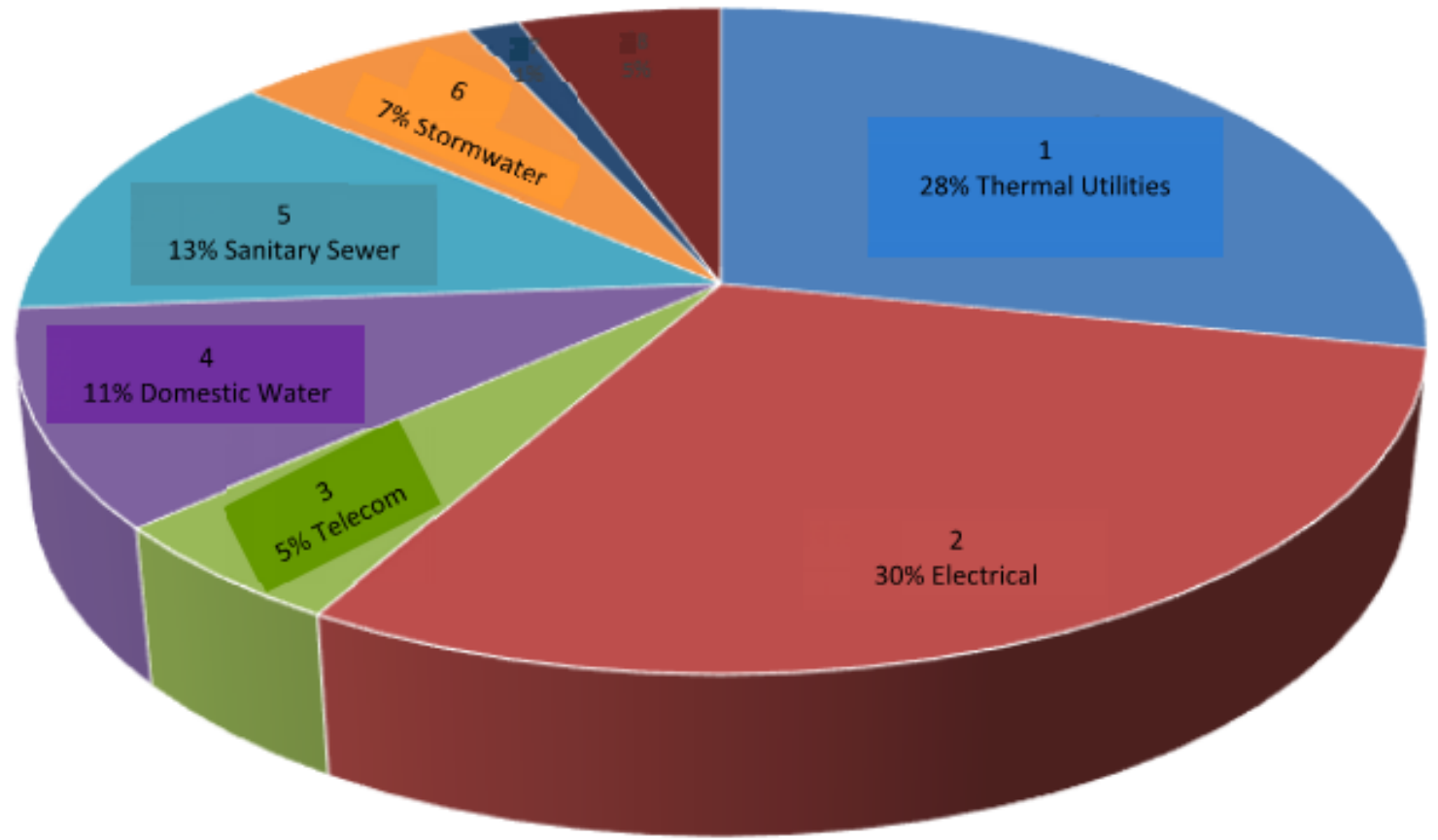
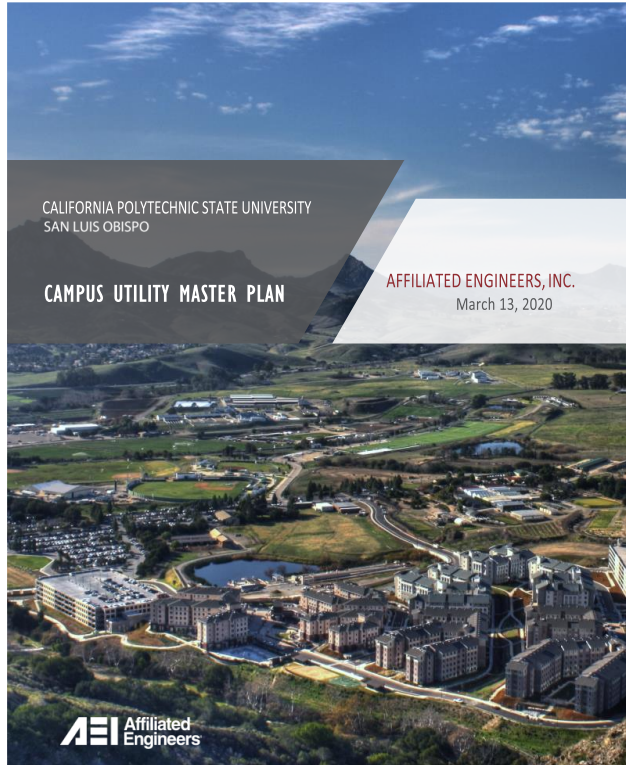


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Lesson Learned: Comprehensive utility master plan revealed electrical improvement costs may be most significant of all campus utilities





Questions?



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Thank You!

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