CPUC Diesel Alternatives Workshop

August 25, 2020

Executive summary

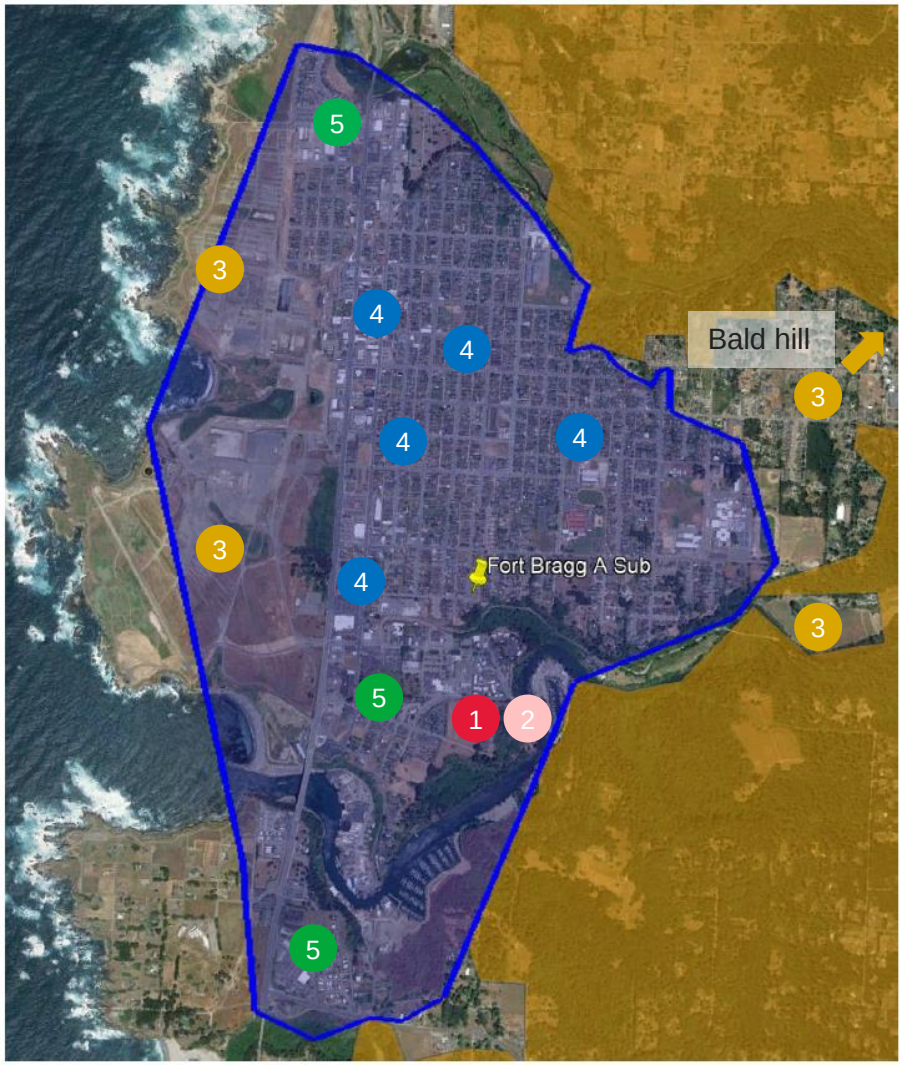
- With a combination of utility-scale and distributed solar and storage, **a clean solution is able to meet 100% of the substation load during a 48 hour PSPS event at approximately half the net cost of a diesel solution**, based on the modeled scenario

- Main advantages of this clean solution compared to diesel:
  - **Distributed & clean**
  - **Best financial outcome for end-customers**
  - **Modularity & robustness:**
    - Multiple assets that can be deployed in parallel, and complemented with other assets (e.g. diesel if needed short-term)
    - In case of a longer than expected outage, distributed systems will still be able to isolate from the grid and keep power on

- We explored a solution that would accommodate a **scenario with five PSPS events per year for 15 years**
  - For each PSPS event we considered a 48h outage, with conservative assumptions (the two day period that includes the peak hourly load during the May to December fire season)

- **We analyzed the Fort Bragg substation**, but we could perform similar analysis for the other substations, with some differences:
  - Alto substation: denser urban zone means less utility-scale PV, but more distributed solar & storage and potentially with load shifting opportunities
  - Covelo substation: a more rural area means more opportunity for utility-scale solar and less distributed solutions
  - Note: this is analysis based on the information available and more diligence would be required for a complete proposal

Proposed clean energy solution – Fort Bragg (17MW)



Issue: *5 PSPS events per year for the next 15 years; Substation: Fort Bragg –* ***17MW*** *peak load*
Solution: *Combination of large-scale and distributed PV and storage systems*

1 Utility Scale Storage – Stationary - **17MW / 117MWh**
- Power to match of historical max load; long duration (~7h) to carry load through PSPS
- Can be sited anywhere in the energized area, on one of the feeders (120sqft/MWh)

2 Utility Scale Storage – Mobile - **5MW / 35MWh**
- Best co-located where stationary storage is (simplified network architecture)
- Can be substituted for more stationary storage depending on PSPS frequency

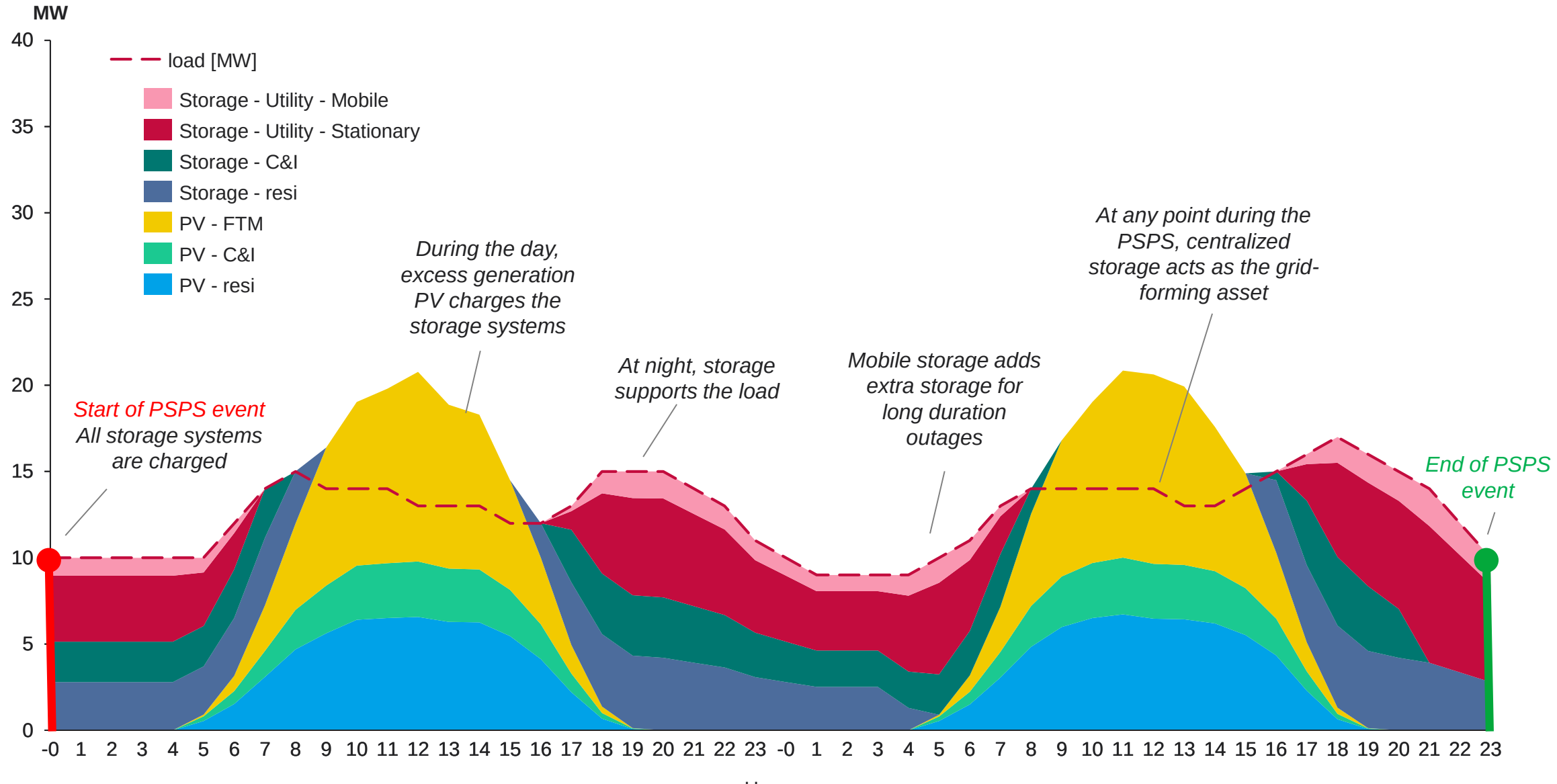
3 Utility Scale Solar – **20MW***
- 120 acres needed* (6 acres / MW)
- 260 acres available on the littoral zone, more on Bald Hill (East)

4 Residential Solar + Storage – **12MW / 41MWh**
- 1,000 customers
- Average system: 12kW PV and 41kWh storage

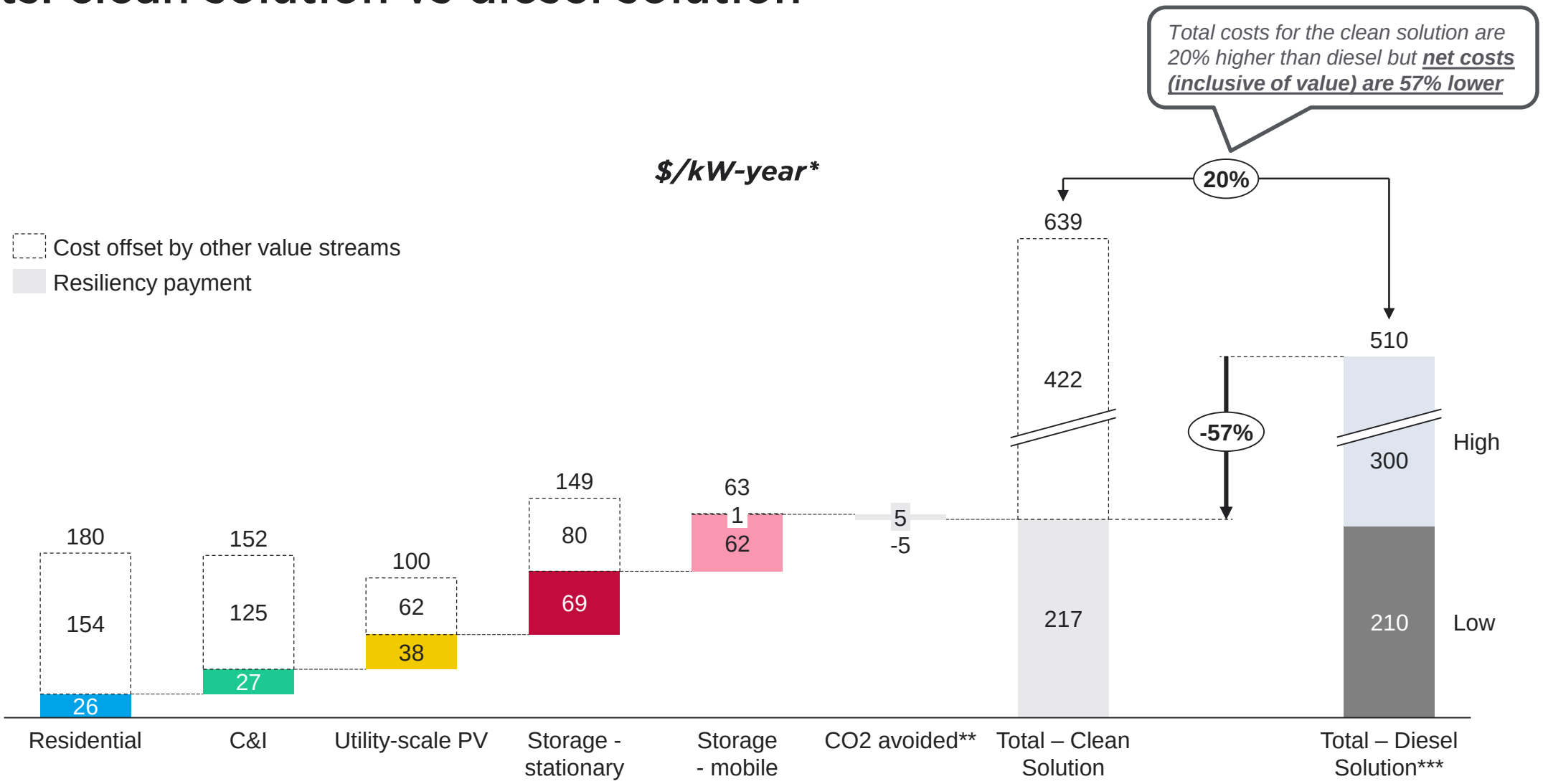
5 C&I Solar + Storage - **6MW / 70MWh**
- 50 PV + storage systems, 50 storage only systems
- Average system: 120kW PV and 700kWh storage

**20MW is not a maximum, but an estimate of the size of the Utility scale solar deployments – each additional MW is beneficial to the project overall, due to the low cost of utility-scale solar. Ultimately, the size reached will depend on land availability; there are multiple lots available on or near the substation but Tesla was not able to confirm if there are regulatory barriers preventing the deployment of utility-scale solar there*

Load profile with combined solutions during a 48 hour PSPS event



Costs: clean solution vs diesel solution



** Total annual costs of the solution divided by total MW needed (in this case, 17MWs)*
*** CO2 costs set at $30/ton and assume 1 ton per MWh of CO2 from diesel solution, conservatively excluding emissions from diesel test hours*
**** Other diesel emissions costs should be applied in an RFP using local air quality board emissions reduction credit costs*

Owners, offtakers, and value stack by technology

				Required Value stack		
	Solution	Owner	Offtaker	Primary value	Existing incentives	Resiliency payments
1	Utility-scale storage - standalone	Utility / IPP / CCA	Utility	RA + wholesale markets	N/A*	Needed to cover gap between costs and primary value
2	Utility-scale storage – mobile	Utility / IPP / Rental Company / CCA	Utility	TBD (use cases outside of fire season could include planned outages and/or distribution deferral)	N/A	Needed to cover gap between costs and primary value
3	Utility-scale PV	IPP / CCA	CCA	Wholesale markets	ITC	TBC (depending on local economics of utility-scale solar)
4	Residential Solar + Storage	Residential customer	Residential customer	Customer energy savings	SGIP (if available), ITC	Needed to drive adoption and ensure long duration storage is installed
5	C&I Solar + Storage	C&I customer	C&I customer	Customer energy & demand charge savings	SGIP, ITC	Needed to drive adoption and ensure long duration storage is installed

**Storage could benefit from ITC if co-located with Utility-scale PV; not modelled in this analysis*

Fall 2020 procurement recommendations for fire season 2021 and beyond

- Two-stage procurement – zero emissions first, followed by fossil resources for the residual need
- Benefits
  1. Prioritizes **zero emissions resources**
  2. **Lowers lifecycle cost** by taking portfolio NPV approach and holding zero emissions resources to 2020 $/kW-year diesel rental cost benchmark
  3. **Keeps the lights on** by still allowing residual RFP for fossil resource rentals

RFP	Goal	Eligible Resources	Annual RFP Dates	First Delivery Year	Contract Term (Years)	Valuation	Cost Benchmark
Zero Emissions Resilience RFP	Contract and/or buy lowest levelized-cost portfolio of stationary and mobile resources that meet forecasted hourly MW requirements and beat diesel costs	All stationary and mobile IFOM and BTM zero emissions resources (PV, ES, EE, DR, wind)	September - October	Either of Next Two Years	Up to 15 years	$/kW-yr portfolio valuation against 48h hourly load shape	• All-in $/kW cost of previous year's diesel rentals + • diesel emissions costs + • disadvantaged community adder + • mobile capacity multiplier
Residual Resilience RFP	Rent mobile diesel, or gas generators for residual hourly MW	Diesel and gas	December	Next Year	One	$/kW-yr portfolio valuation	N/A

Conclusions and recommendations

- **A clean solution is able to meet 100% of the substation load at a cost that is competitive with or less than diesel**
  - This is enabled by deploying **distributed assets that can generate additional value** to the end customer
  - This solution is **100% renewable**, and can be **rapidly deployed**
  - This cost comparison **does not include the public health benefits** associated with reduced criteria pollutant emissions

- To enable this clean solution, **we recommend**:
  - Run a specific **zero-emissions RFP** procurement to kick start the deployment of all renewable systems
  - Follow with a diesel RFP to cover the remainder of the load if necessary for the first year, given longer renewable development timeframes
  - **Rely on a 15 year or longer term** to take advantage of the longer lifetime of zero-emissions solutions
  - Work to **accelerate development, permitting, and interconnection timelines for utility-scale PV**, to enable deployments in 2021

- Though not necessary to enable our solution, **we also recommend the following:**
  - **Consider removing PV sizing limits** for customers in constrained locations, to enable provision of excess PV during an outage
  - **Enable non-NEM customers to feed back electricity to the grid from their batteries** to optimize discharge during an outage
  - **Explore additional value streams for mobile storage** (e.g. use during planned maintenance work) to accelerate return on investment
  - **Investigate use of utility-owned land** (e.g. at substations) to accelerate utility-scale storage and/or solar deployments
  - **Have utilities support with identification and enrollment of customers to utilize behind-the-meter systems**

Appendix

Fort Bragg – Utility scale land availability

Fort Bragg – littoral zone

Fort Bragg – Bald Hill

Source: https://www.daftlogic.com/projects-google-maps-area-calculator-tool.htm#