Financing and Deploying Community Microgrids via the Resilient Energy Subscription (RES):

Lessons learned from policy in California and projects in Washington

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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.

The Resilient Energy Subscription (RES) addresses three Community Microgrid financing challenges

The RES helps finance Community Microgrids while properly valuing their significant resilience benefits, addressing these three challenges:

1. **Establishing** initial Community Microgrids to provide resilience to Critical Community Facilities (CCFs).
2. **Enhancing** Community Microgrids to offer resilience opportunities within the initial Community Microgrid footprint.
3. **Expanding** Community Microgrids to larger footprints that can guarantee resilience to a wider list of facilities and include additional communities.

Critical Community Facilities (CCFs) in a Southern California community.

Resilient Energy Subscription (RES) defined

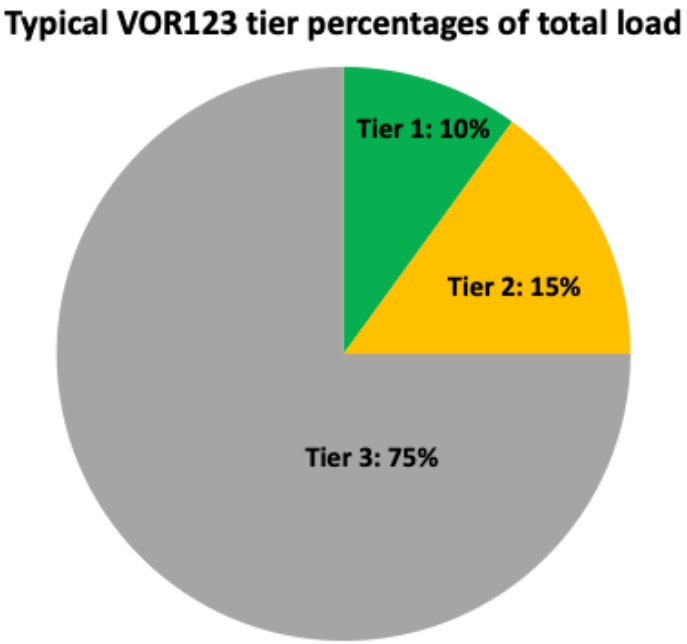
- A straightforward fee-based market mechanism that finances the enhancement and expansion of Community Microgrids
  - Community Microgrids provide guaranteed daily delivery of locally generated renewable energy during grid outages, ensuring unparalleled energy resilience.

- Allows any facility within the footprint of a Community Microgrid to procure this unparalleled energy resilience
  - A facility pays a simple monthly $/kWh fee — separate from any existing rate tariffs — on top of their normal electricity rates for guaranteed daily delivery of locally generated renewable energy during grid outages.
  - *Usually reserved for a facility's most critical loads.*

- Facilitates the deployment and expansion of Community Microgrids
  - Allows the Community Microgrid owner-operators to recover the cost-of-service (COS) required to meet contracted RES obligations.
  - COS is determined by the capital expenditures (capex) associated with Community Microgrid assets, operational expenditures (opex) associated with operations and maintenance (O&M), and an appropriate rate of return.

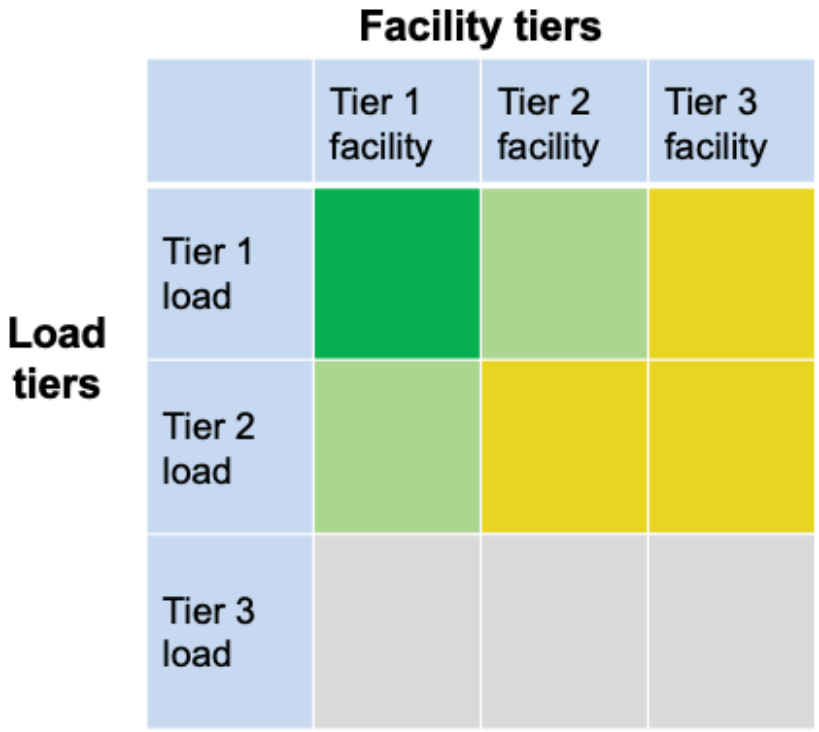
VOR123 depends on tiering electricity loads

- *The Clean Coalition's VOR123 approach standardizes resilience values for three tiers of loads,* regardless of facility type or location:
  - **Tier 1, usually about 10% of the total load, are mission-critical, life-sustaining loads** that warrant 100% resilience.
  - **Tier 2, or priority loads, usually about 15% of the total load**, should be maintained as long as doing so does not threaten the ability to maintain Tier 1 loads.
  - **Tier 3 are discretionary loads** that make up the remaining loads, usually about 75% of the total load. Maintained when doing so does not threaten Tier 1 & 2 resilience.



VOR123 for a Community Microgrid

- The VOR123 principles for an individual facility can also be applied to a larger grid area by tiering facilities, in addition to tiering loads:



= Critical for the entire community, such as Tier 1 loads at Tier 1 facilities like fire stations

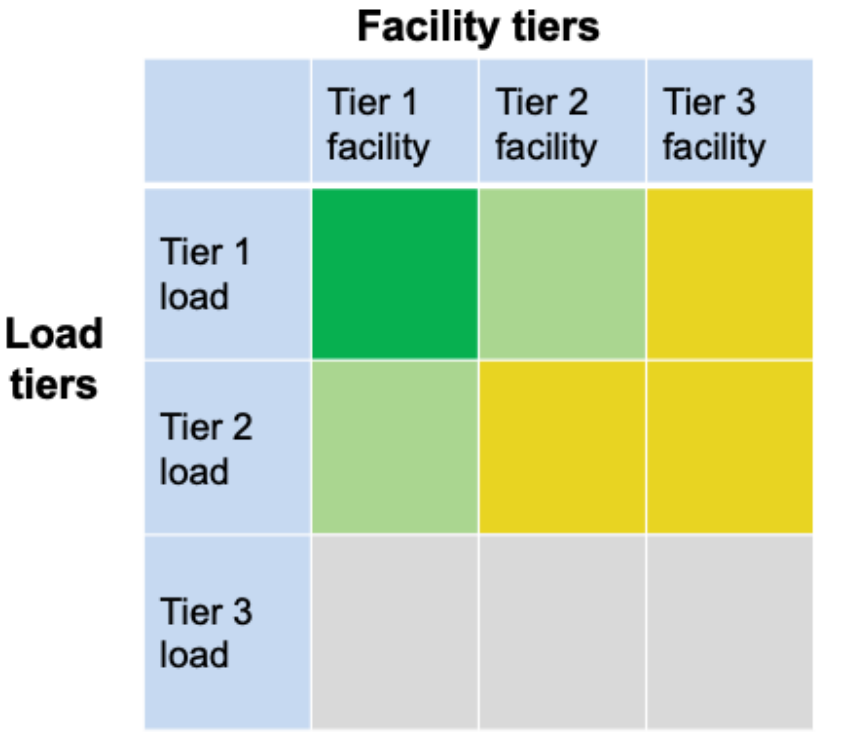
= Priority for the entire community, such as Tier 2 loads at Tier 1 facilities and Tier 1 loads at Tier 2 facilities like multi-unit housing facilities that can provide safe and easy sheltering in place

= Priority for individual facilities but not the entire community

= Discretionary loads that are not impactful to the community, whether on or off

VOR123 for a Community Microgrid

- The top emphasis is to provision 100% resilience for Tier 1 loads at Tier 1 facilities (the darker green square in the chart).
  - Tier 1 facilities include CCFs such as fire stations and emergency shelters — and can also include grocery stores, data centers, pharmacies, gas stations, EV charging stations, & apartment complexes that can provide sheltering-in-place during grid outages.
- The second emphasis is for Tier 1 loads at Tier 2 facilities and Tier 2 loads at Tier 1 facilities (the lighter green squares).



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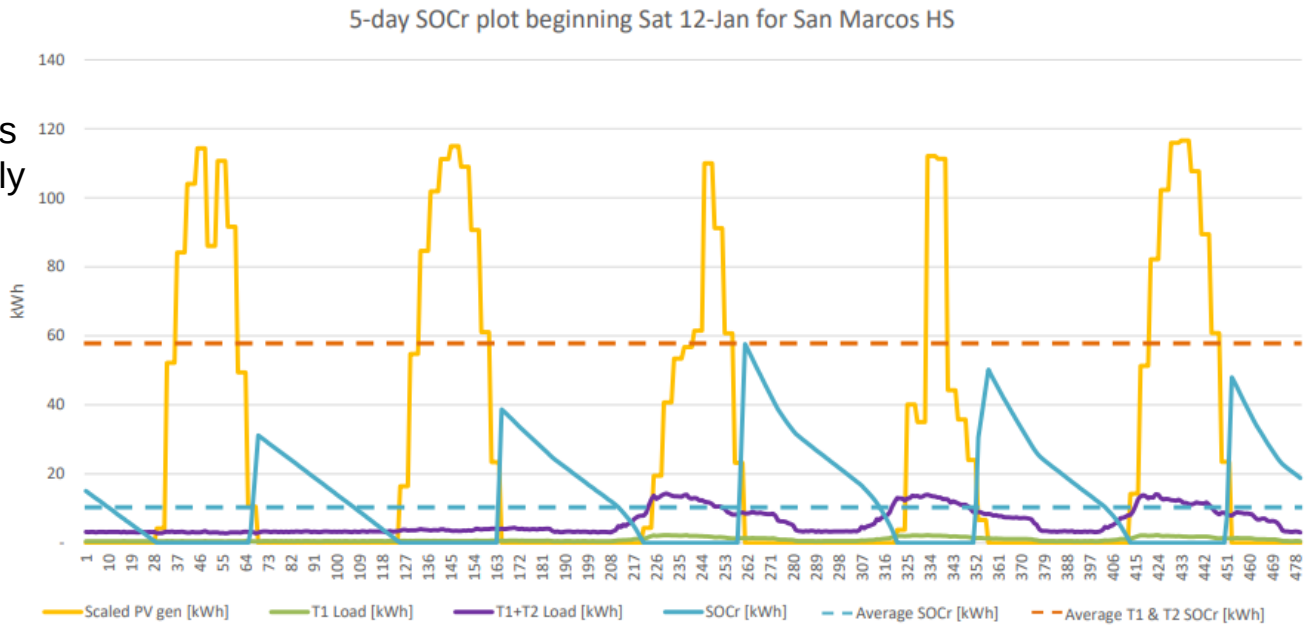
RES feasibility: Community Microgrid owner-operator perspective

- ROE for the Community Microgrid owner depends on the following factors:
  - Microgrid financial inflows:
    - RES fees*
    - Energy sold to the utility on an everyday basis
    - Solar and battery energy storage system (BESS) financial incentives
  - Microgrid financial outflows:
    - Microgrid capital expenditures (capex)
    - Microgrid operational expenditures (opex)

* Income from RES fees depends on the maximum guaranteed daily energy from the Community Microgrid. The Clean Coalition calculates this quantity using its state-of-charge for resilience (SOCr) methodology, which analyzes BESS capacity against actual solar generation and site load profiles.



Grand Orcas Community Microgrid plan for the entire OPALCO territory

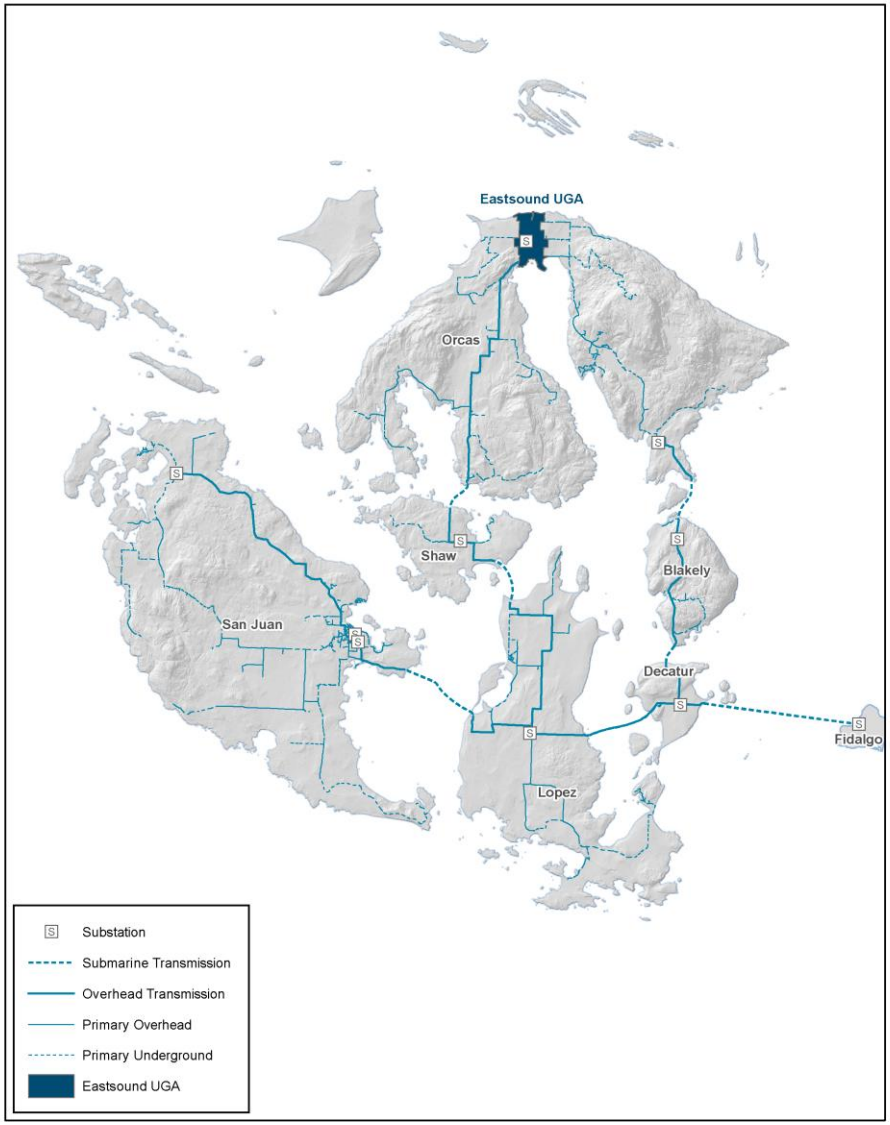


Figure 1: OPALCO's service territory covers San Juan County and includes 20 islands. Eastsound is shaded towards the top of Orcas Island and represents the initial Orcas Community Microgrid location. Over time, the Community Microgrid will expand to cover all of Orcas and then eventually the entire OPALCO service territory.

Eastsound Tier 1 & 2 facilities map

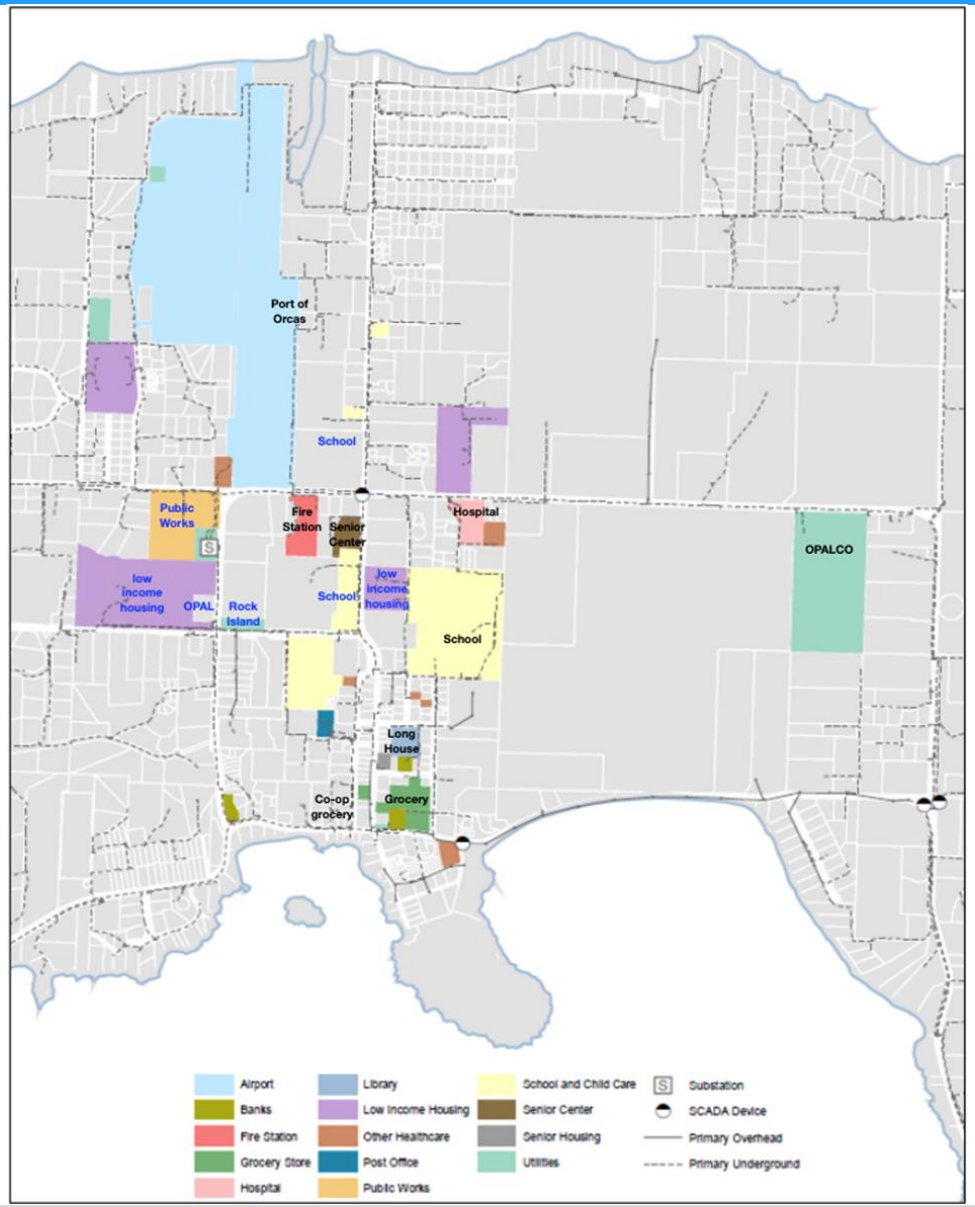


Figure 2: Eastsound facilities that are being provisioned with priority Community Microgrid resilience in the initial Orcas Community Microgrid design are shaded. Tier 1 Critical Community Facilities (CCFs) are shaded and labeled with black text, while Tier 2 CCFs are shaded in blue text. Figures 3 and 4 further depict the initial Orcas Community Microgrid in block diagram form.

Eastsound Tier 1 & 2 facilities block diagram

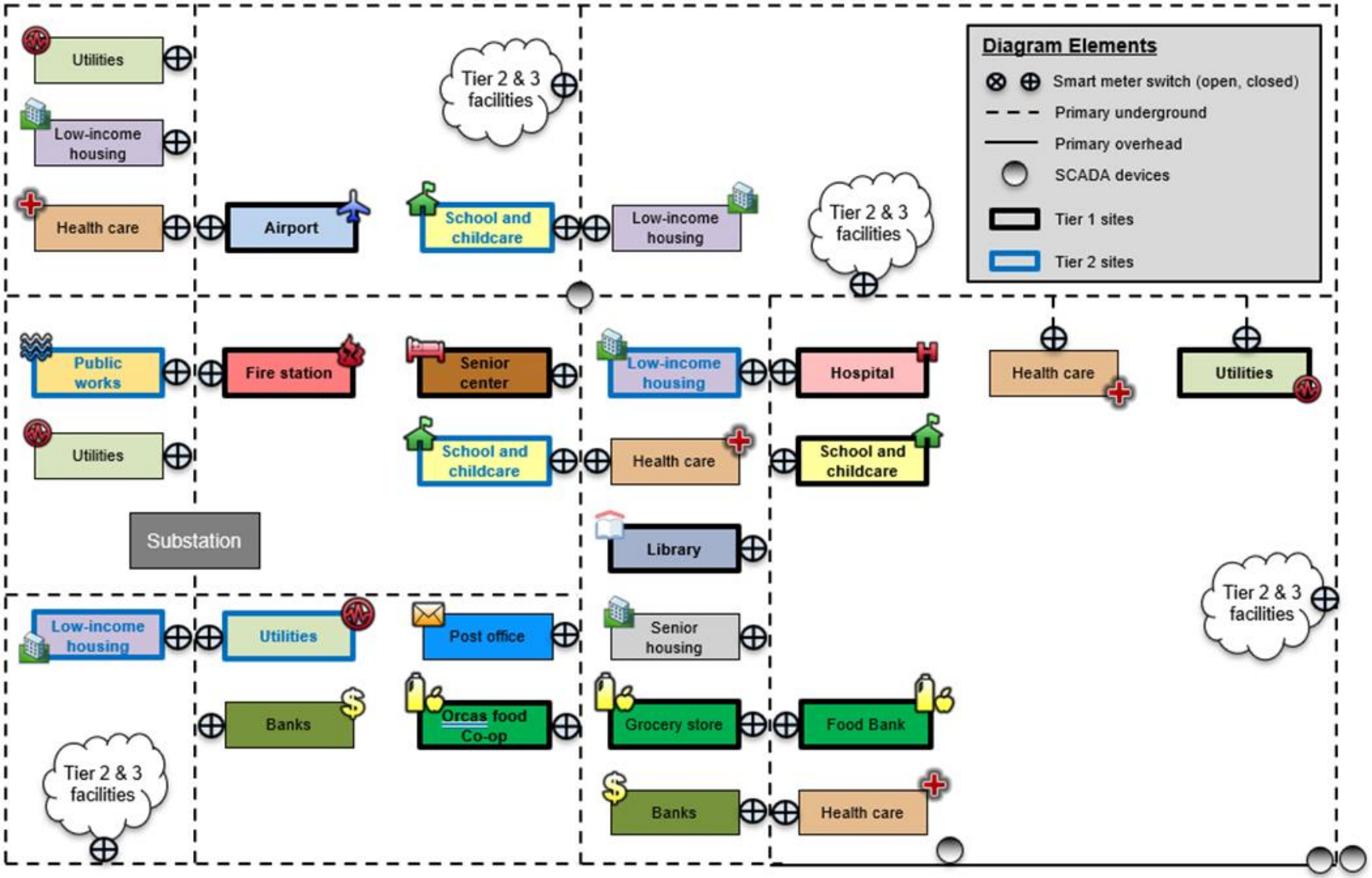
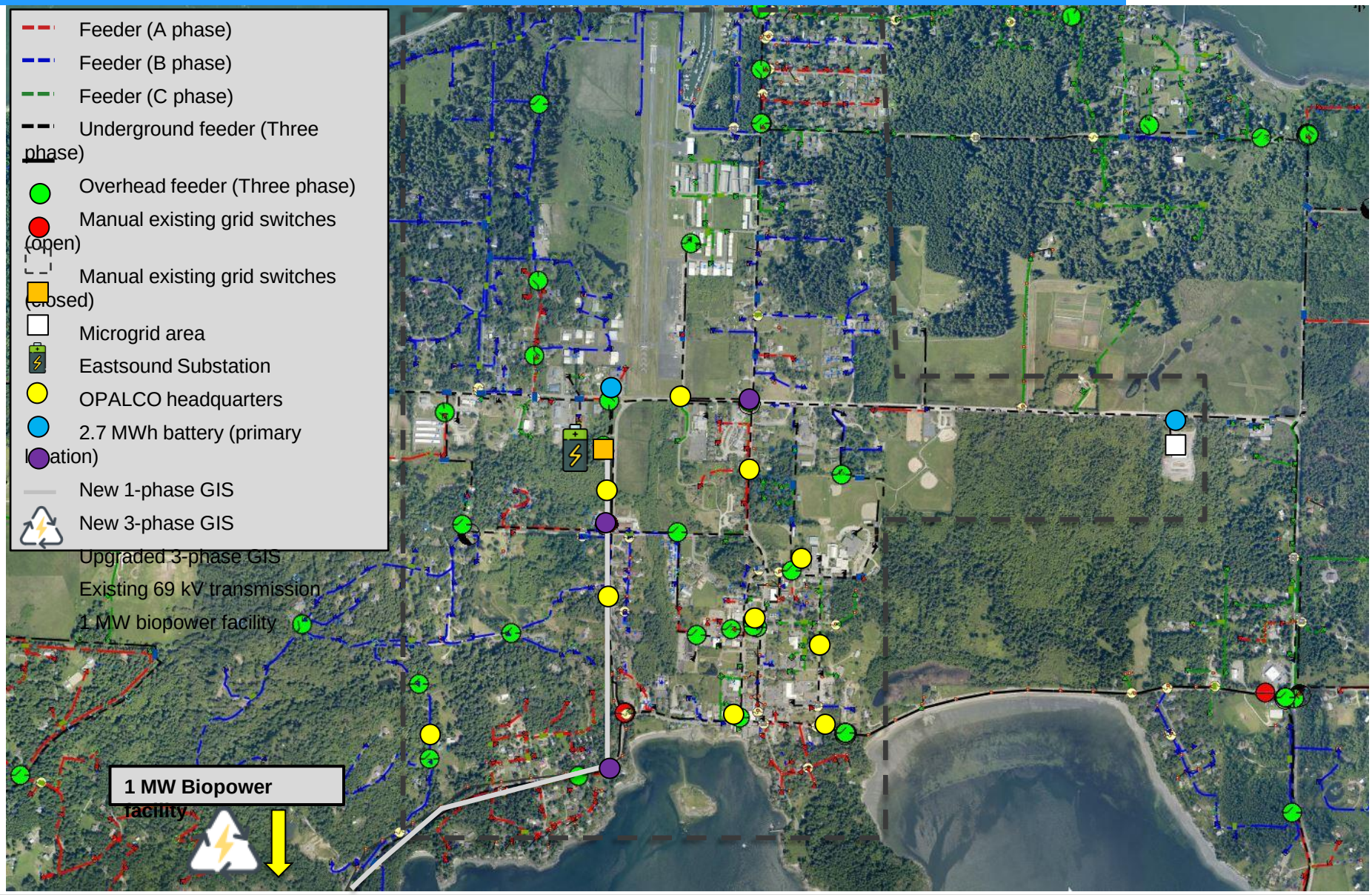


Figure 3: Noteworthy facilities in Eastsound and within the target grid area of the initial Orcas Community Microgrid. This figure reflects the block diagram version of the grid area shown in Figure 2.

OCM map for Orcas Island



RES feasibility: Community Microgrid owner-operator perspective

Analysis factors from a 2021 design for a Community Microgrid in Southern California:

Microgrid financial outflows:

	Year:	Capex	Opex
PV		$3,000,000	$7,000
BESS		$1,400,000	$5,000
Microgrid hardware + MC2		$500,000	$15,000
PV+BESS incentives		-$1,800,000	
Total annual expense:	1	$3,100,000	$27,000
	2	$-	$27,000
30-year analysis	3	$-	$27,000
	4	$-	$27,000

Microgrid financial Inflows:

	RES fees
RES fee ($/kWh)	$0.20
Guaranteed daily load (kWh)	2,300
Total annual income:	$165,000
	$165,000
	$165,000
	$165,000

	Sales to utility
Tariff to utility	$0.10
Annual PV sold (kWh)	2,400,000
	$236,000
	$236,000
	$236,000
	$236,000

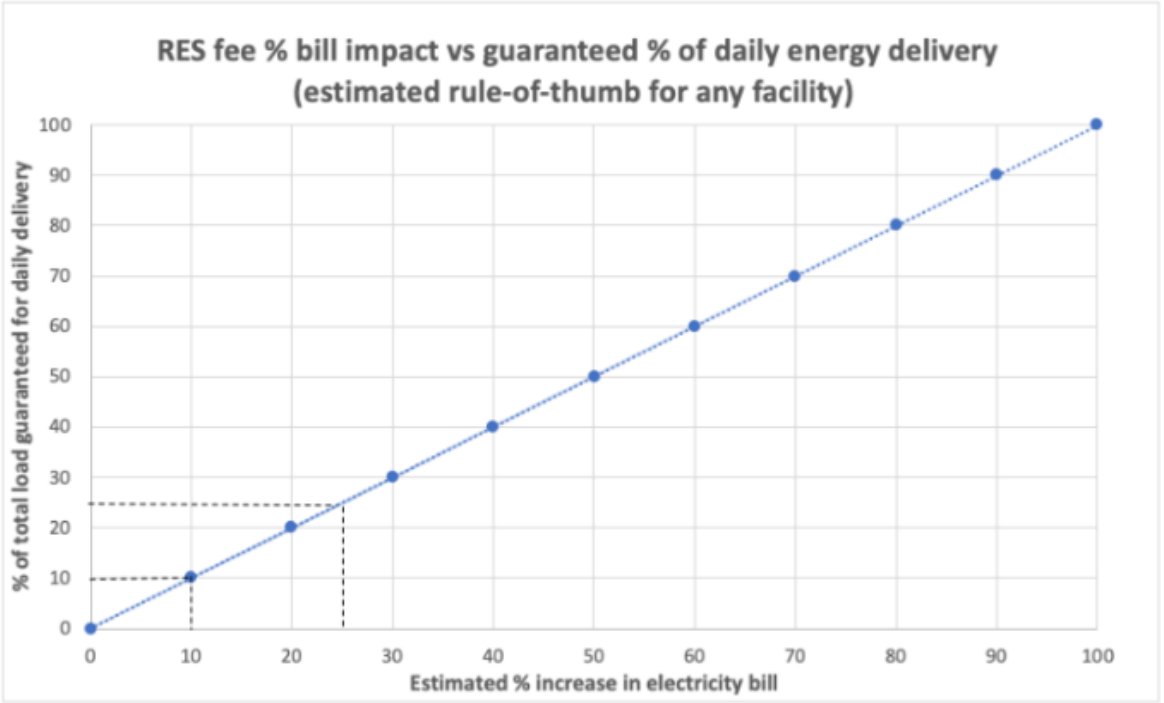
With these expenses and income, the Community Microgrid owner will see an internal rate of return (IRR) of at least **9%.**

RES feasibility analysis results

- *The Clean Coalition's analysis shows:*
  - A **value-appropriate** RES subscription ratio of 1.0 (1% bill increase per 1% guaranteed load coverage) for the subscriber is feasible.
  - A **positive IRR** of 9% for the Community Microgrid owner is feasible.
- *Therefore, the RES is financially feasible for all stakeholders.*

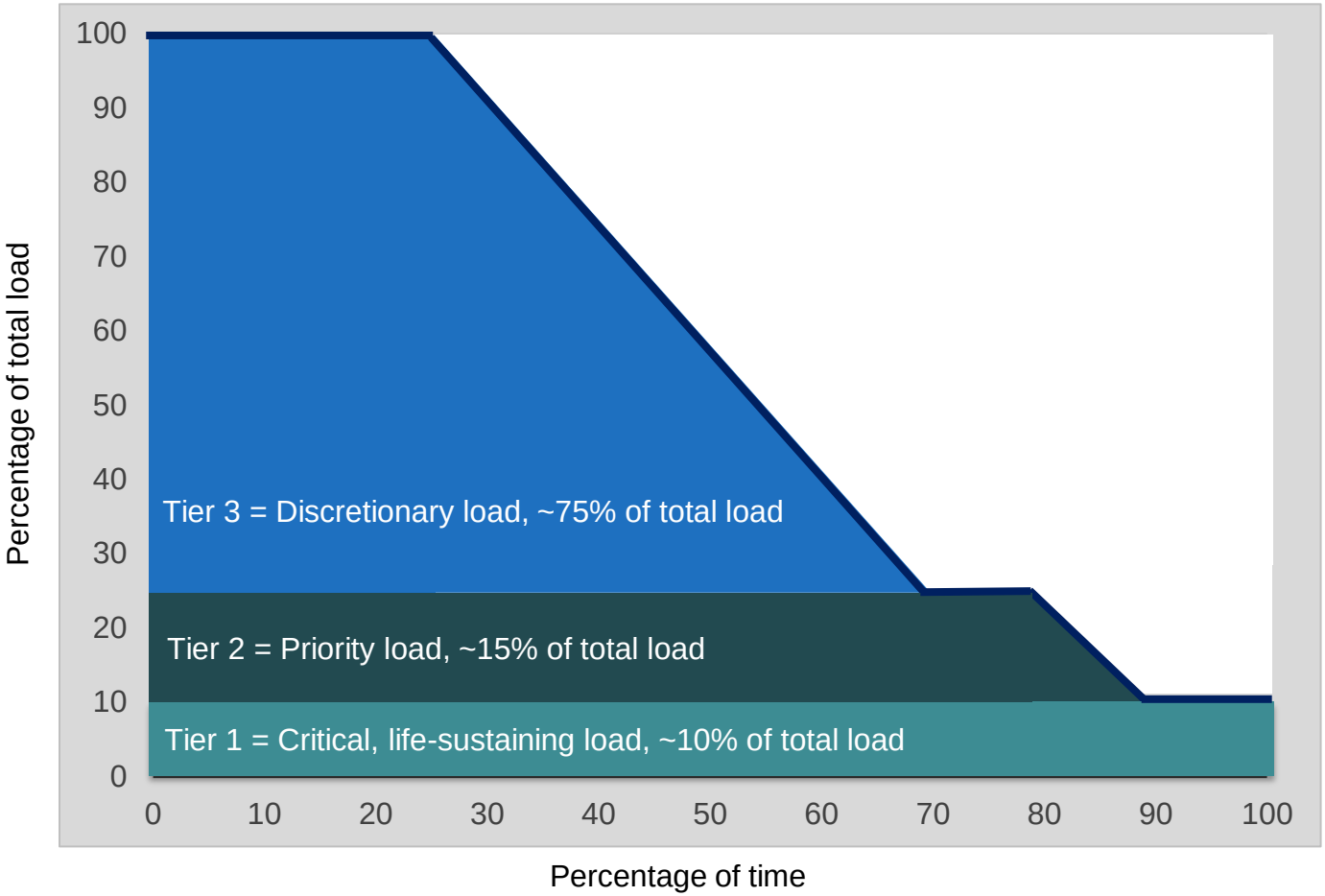
Key Takeaways:

- RES allows Community Microgrids to be deployed at scale and expanded, as more facilities desire resilient energy guarantees.
- RES provides a revolutionary and straightforward approach for financing Community Microgrids and delivering unparalleled resilience to communities.
- RES enables a greater harmonization between local energy needs and societal planning in a way that helps put the people first.



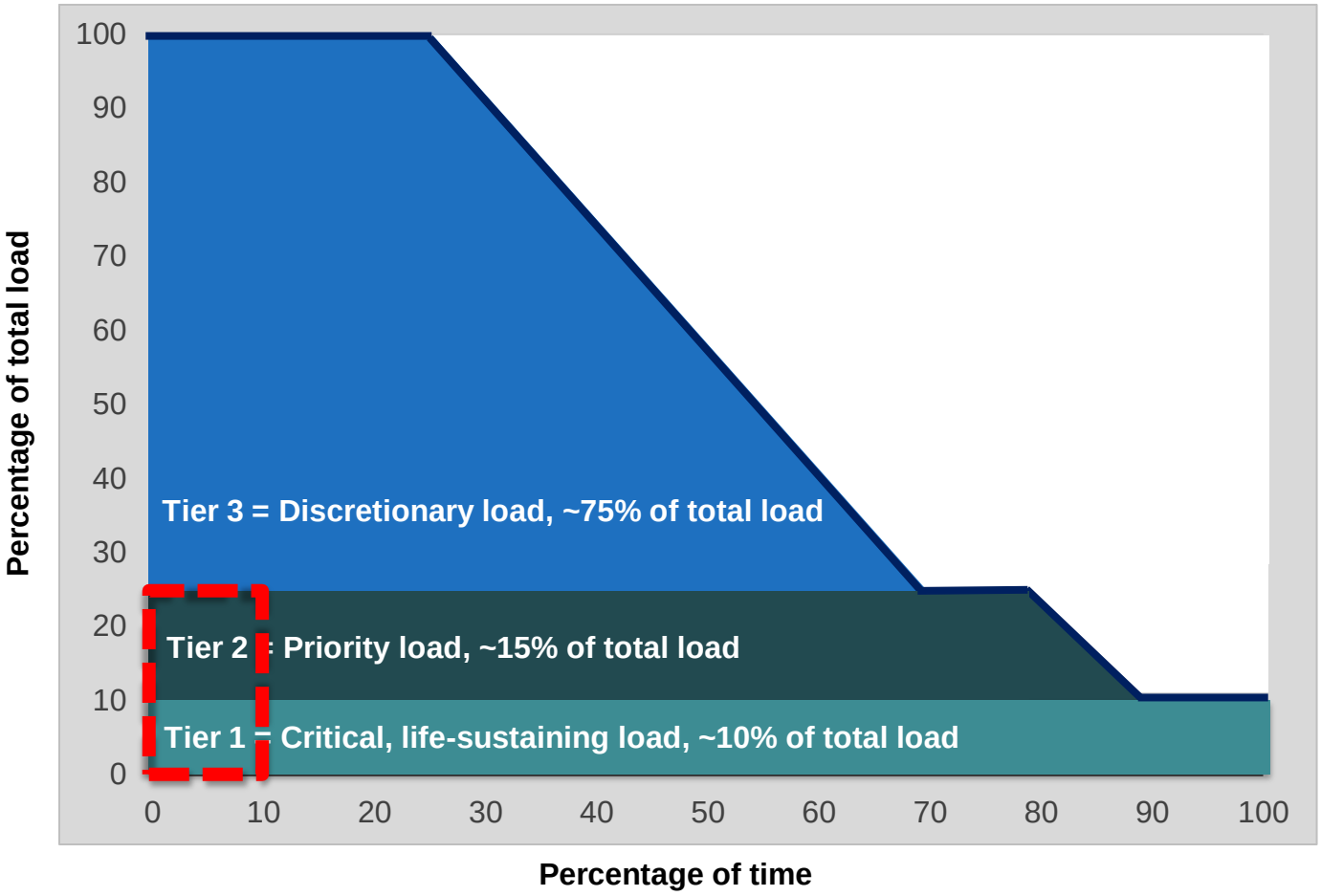
Backup Slides

Typical load tier resilience from a Solar Microgrid



Percentage of time online for Tier 1, 2, and 3 loads for a Solar Microgrid designed for the University of California Santa Barbara (UCSB) with enough solar to achieve net zero and 200 kWh of energy storage per 100 of kW solar.

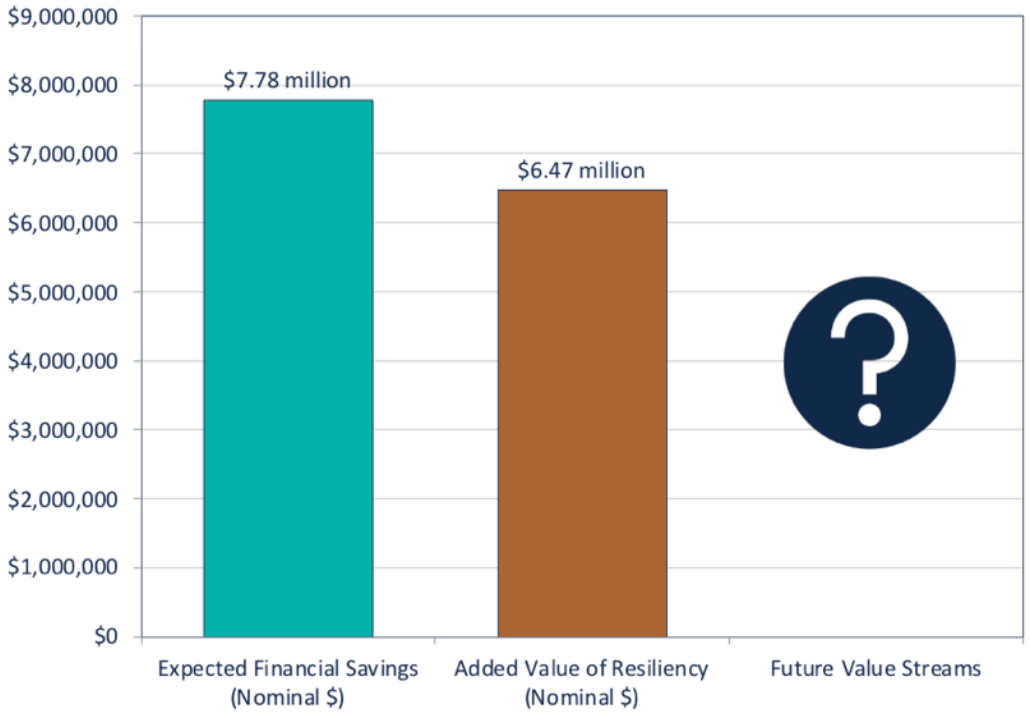
Diesel generators are designed for limited resilience



A typical diesel generator is configured to maintain 25% of the normal load for two days. If diesel fuel cannot be resupplied within two days, goodbye. This is hardly a solution for increasingly necessary long-term resilience. In California, Solar Microgrids provide a vastly superior trifecta of economic, environmental, and resilience benefits.

VOR123 yields a 25% typical adder

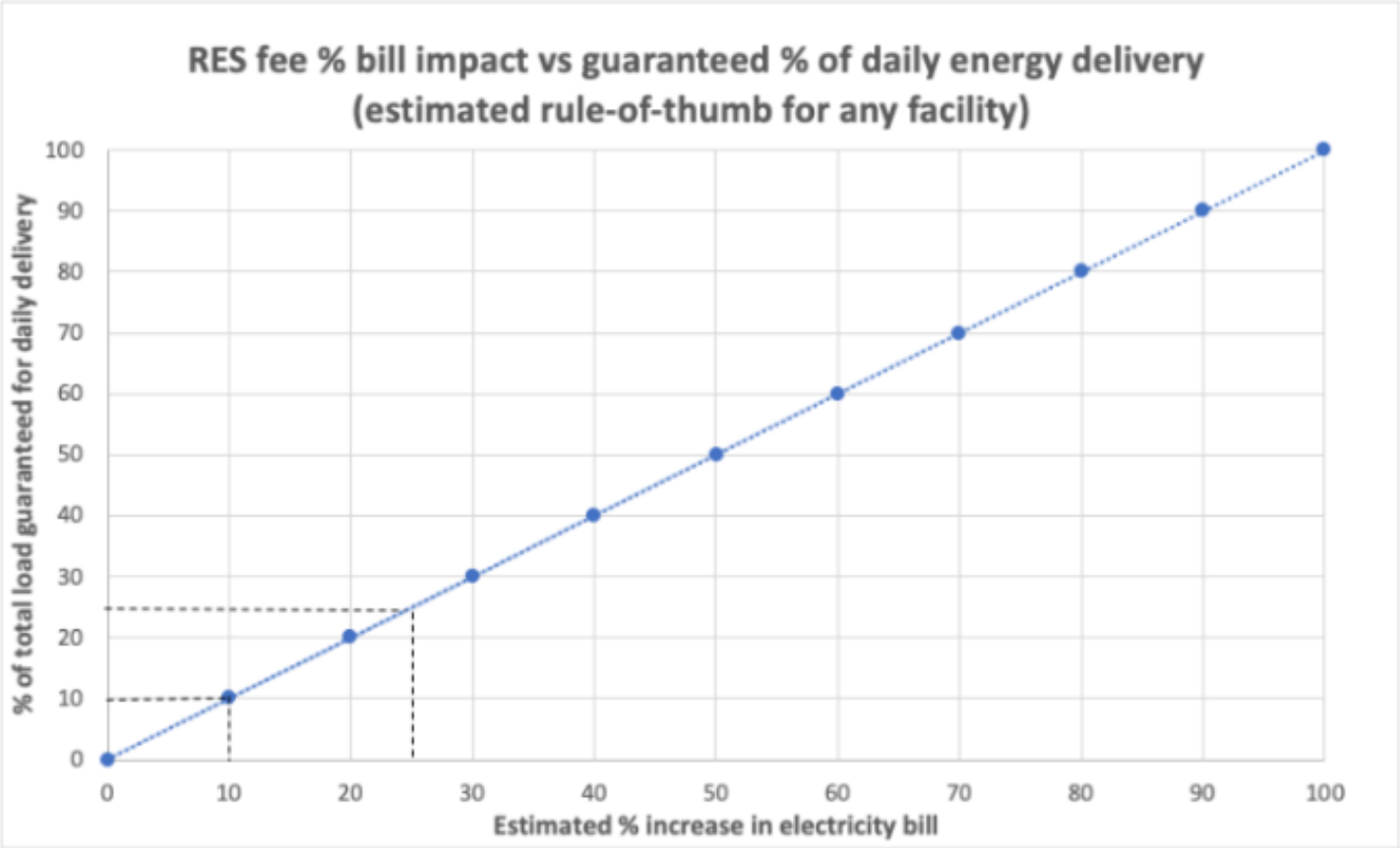
- Based on this tiering system, the Clean Coalition arrived at **25% as the typical VOR123 adder** that a site should be willing to pay for resilience.
- The Clean Coalition has validated the 25% adder using four approaches: Cost-of-service, Department of Energy multiplier, market-based, and avoided diesel generator cost (see https://clean-coalition.org/disaster-resilience/#adder).
- We also applied VOR123 to the Solar Microgrids for the Santa Barbara Unified School District (SBUSD), which is getting significant resilience benefits for free:



Bill savings and resilience value accruing to the SBUSD from six Solar Microgrid sites plus eight additional solar-only sites.

COS for expanding a Community Microgrid via RES

- Once an initial Community Microgrid is established for serving the CCFs, incremental COS will be low for expanding the Community Microgrid via the market-based RES.
- Each 1% of load that a facility secures via a RES will result in an approximately 1% electricity bill increase:



RES feasibility:
Community Microgrid owner perspective

Clean Coalition

Analysis factors from a real-world design for a Community Microgrid in Southern California:

Factor	Amount	Units
RES fee	0.20	$/kWh
Tariff for energy sold to utility	0.10	$/kWh
Daily site load guaranteed by RES	2,300	kWh
PV+BESS financial incentives	1,800,000	$
PV size	1,500	kW
PV capex	3,000,000	$
BESS size	2,000	kWh
BESS capex	1,400,000	$
Microgrid hardware + MC2*	500,000	$
PV annual opex	7,000	$/year
BESS annual opex	5,000	$/year
Microgrid MC2 annual opex	15,000	$/year

* MC2 = Monitoring, Communications, and Controls for a microgrid.

Heading

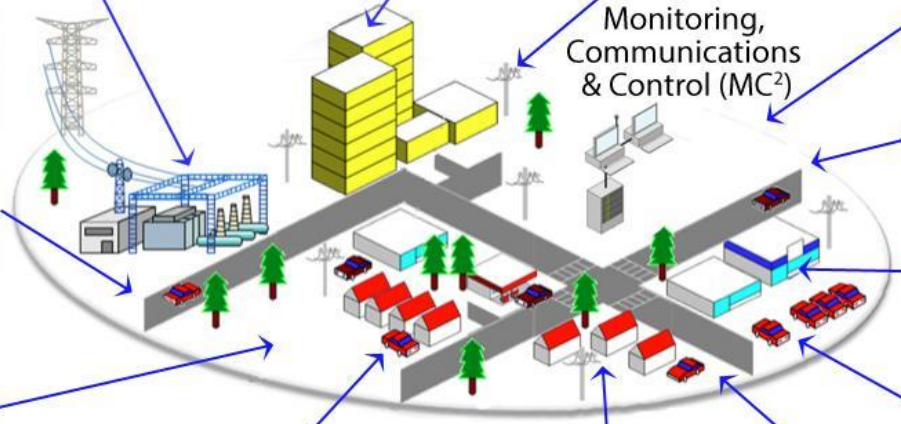
Grid Energy Storage

Distributed Generation

Switches &
Power Electronics

Distributed Generation

Biopower Generation



Monitoring,
Communications
& Control (MC^2)

Energy Storage

Microturbine

Distributed Generation

Electric Vehicles (EV)

Home Energy System

Fuel Cells

Distributed Generation