City of San Diego (“SD”) SEIN

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SD SEIN overarching objectives

- SD overarching goal is to achieve 100% renewable energy across the City by 2035 with a high penetration of local renewables.
- The SD SEIN goal is to achieve 25% of the renewables locally (from within City boundaries) in order to maximize the trifecta of economic, environmental, and resilience benefits to the City and its residents.
- Stage policy and programs that will accelerate achievement of the 25% local renewables goals deployment, along with Community Microgrid renewables-driven resilience across substation-level grid areas.
- Get started with behind-the-meter (BTM) solutions that are achievable without policy and program innovations; and without utility facilitation and/or without the establishment of a more proactive alternate Load Serving Entity (LSE).
- Over-weight benefits to communities of concern (COC).

SD constraints & assumptions

- Solar siting opportunities in SD will predominantly be on built-environments like rooftops, parking lots, and parking structures.
  - Planning will be greatly informed by surveying associated solar siting potential. Hence, a Solar Siting Survey (SSS) was performed.
- Achieving 25% local renewables will require unleashing Wholesale Distributed Generation (WDG).
  - Only proven approach is a Feed-In Tariff (FIT). Hence, a FIT was designed.
- Achieving renewables-driven resilience will require high penetrations of local renewables that are dispatchable and over-weighting COC.
  - Hence, the FIT includes a mechanism for ensuring that energy storage is deployed in a manner that makes renewable energy available whenever needed, not just when the sun is shining or wind is blowing etc.
- BTM sourcing via RFP & PPA is the only currently available approach due to lack of SDG&E proaction and due to the multi-year process for establishing an alternate LSE that ensures success.
  - Hence, existing solar projects on City-owned properties were evaluated via ReOpt as were new solar and solar+storage showcases for comparing optimized economics and optimized resilience scenarios.

WDG provides the gradient path to success

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Wholesale Distributed Generation (WDG) is the market segment that will realize the Clean Coalition's mission, vision, and over-arching goal.

FITs address the WDG market segment

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Project Size

50+ MW

500 kW

5 kW

Wholesale DG

Serves Local Loads

Central Generation

Serves Remote Loads

Retail DG

Serves Onsite Loads

Behind the Meter

Distribution Grid

Transmission Grid

FITs proliferated WDG solar in Germany

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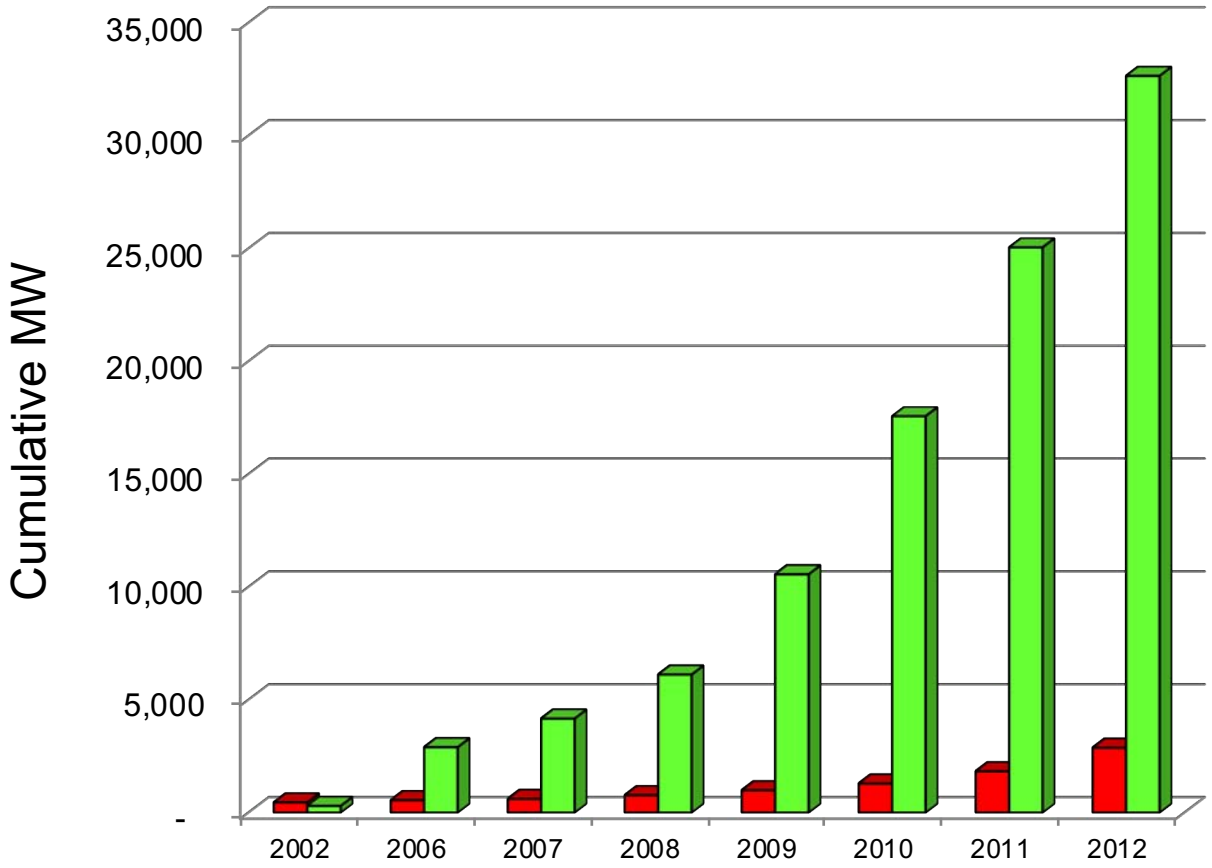
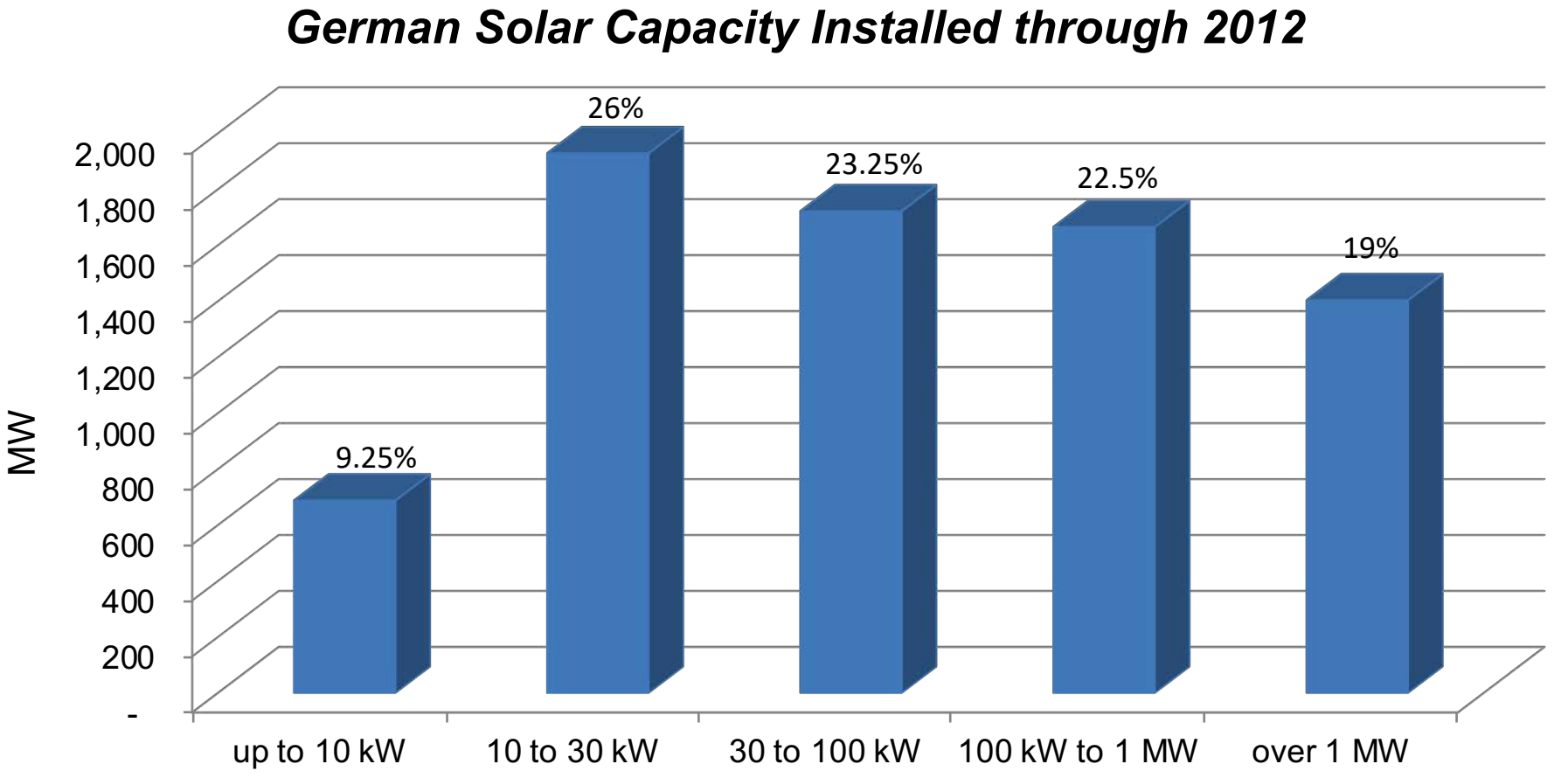
Solar Markets: Germany vs California (2002-2012)



Sources: CPUC, CEC, SEIA and German equivalents.

Germany deployed over 10 times more solar than California in the decade from 2002 — despite California having 70% better solar resource.

The majority of German solar is local solar



Source: Paul Gipe, March 2012

Germany's solar deployments are almost entirely sub-2 MW projects on built-environments and interconnected to the distribution grid (not behind-the-meter).

German rooftop solar is 4 to 6 cents/kWh today

Clean Coalition

Project Size	Euros/kWh	USD/kWh	California Effective Rate $/kWh
Under 10 kW	0.1270	0.1359	0.0628
10 kW to 40 kW	0.1236	0.1323	0.0611
40.1 kW to 750 kW	0.1109	0.1187	0.0548
Other projects up to 750 kW*	0.0891	0.0953	0.0440

- Conversion rate for Euros to Dollars is €1:$1.07.
- California's effective rate is reduced 40% due to tax incentives and then an additional 33% due to the superior solar resource.

Replicating German scale and efficiencies would yield rooftop solar today at only between 4 and 6 cents/kWh to California ratepayers.

* For projects that are not sited on residential structures or sound barriers.

Why FITs are the world-class solution

FITs are unparalleled in unleashing cost-effective, commercial-scale renewables

FITs keep things simple

- Standardized and guaranteed contract with a long-term, predefined rate paid for energy produced

FIT project

Utility customer

100% of the renewable energy generation is purchased by SDGE at FIT rate

100% of customer energy usage is purchased based on a normal retail rate

SDGE

FIT benefits

- **Maintains relationship with customers:** A buy-all, sell-all structure; Load Serving Entity (LSE) customers continue to pay for all energy they consume, so load is not reduced from FIT projects.

- **Creates visible, manageable assets:** A FIT uses wholesale interconnection, so the LSE and Independent System Operator (ISO) have visibility and control of power produced by DG systems.

- **Guides the market to build desired projects**: Through adders, a FIT can be tailored to drive deployment of projects that have certain characteristics, such as location, size, and ability to dispatch power on-call using energy storage.

Net metering does not work for many properties

- **Maximizes applicable properties**: A FIT simplifies the process for all commercial properties to participate in energy generation, including non-owner occupied and split-metered properties. Also, a FIT removes on-site load limitations to allow for optimal project sizing.

Source: City of Palo Alto

FITs efficiently open the WDG market segment

- FITs offer clear guidance to the market through predefined terms and prices, thereby allowing project developers to qualify their planned projects before undertaking significant investment in siting, interconnection, etc.

- A clear, predictable purchase offer — and a simple, standardized contract for use between a LSE and energy generators — streamline the development of clean local energy. Not only does this approach nearly eliminate speculative projects, but it also drives down renewable energy development costs.

- FITs secure projects that will be built immediately and proven to deliver power within 12 to 18 months.

Auctions create inefficient markets, FITs do not

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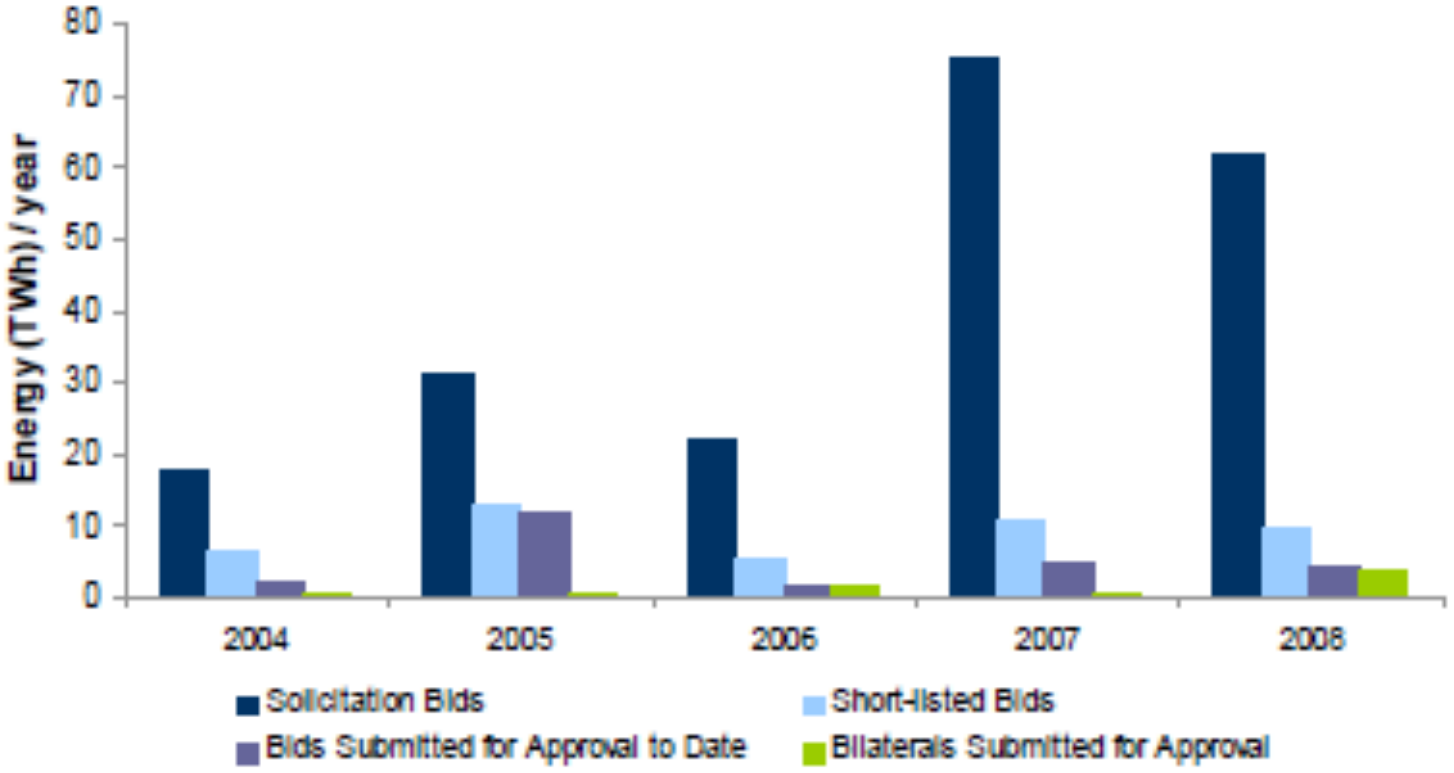
- Auctions and similar competitive solicitations result in a highly inefficient market due to exorbitant bidding costs and extreme failure rates.
  - Average minimum cost of producing an auction bid is over $150k, which overwhelms commercial-scale projects that generally have total turnkey installed costs of less than $500k.
  - 97% failure rates, combined with exorbitant bidding costs, are a recipe for bankruptcy.
  - Yes, it is insane to think that auctions could possibly attract commercial-scale renewables and other DER, and yet, California utilities and policymakers chronically prove Einstein's definition of insanity by continuing to pursue local renewables and other DER via auctions!
- Competitive solicitations for project developers raise the costs of doing business for all developers — and result in higher prices for consumers.
- Losing bids tie up prime siting options and flood interconnection queues. Winning bids include unrealistically low offers based on speculative future pricing rather than firm current pricing, resulting in projects that may never be built.

Auctions/solicitations have massive failure rates

- Across California RPS solicitations, fewer than 1 in 10 project bids were actually developed, which resulted in high administrative costs for the program and exorbitant risk/cost for renewable energy project development.



Source: California Public Utilities Commission, 2nd Quarter 2009

Solar Siting Survey

for

City of San Diego

SSS methodology

SSS is performed manually through a multi-step process:

- **Set** a minimum project size for the SSS.
- **Scan** the target region via Google Earth Pro for prospective solar sites on built-environments (rooftops, parking lots, and parking structures) that meet the minimum project size.
- **Measure** the usable surface area and eliminate obvious portions that are not viable due to setbacks, obstructions, and/or shading.
- **Assess** the probable solar generation density against the minimum project size threshold (1 MWac for this SSS).
- Where sensible, **aggregate** campus-type structures that are likely to have common ownership into a single site (examples being parking lots and rooftops in a shopping center, industrial park, or school campus).
- **Capture** the details, including the interconnection hosting capacity.
- **Map** the results.

SSS deliverables

- Searchable spreadsheet including detailed results.
- Interactive maps in the form of Google Earth .kml files with icons marking structures and aggregations with details available in pop-up windows:
  - Google Map versions are also made available.
  - Maps linked to the spreadsheet details.
- Summary report of key findings and methodology.

Summary of SD SSS findings (all figures in AC)

- Over 490 MW of technical solar siting potential was found on built environments that can support projects sized at least 1 MW.
- 75% of the potential is in parking lots and parking structures.
- Extrapolations to lower minimum project sizes:
  - Total potential doubles to 1 GW if project limit set at 500 kW.
  - Total potential doubles again to 2 GW if project limit set at 100 kW.

Overview of SD SSS sites

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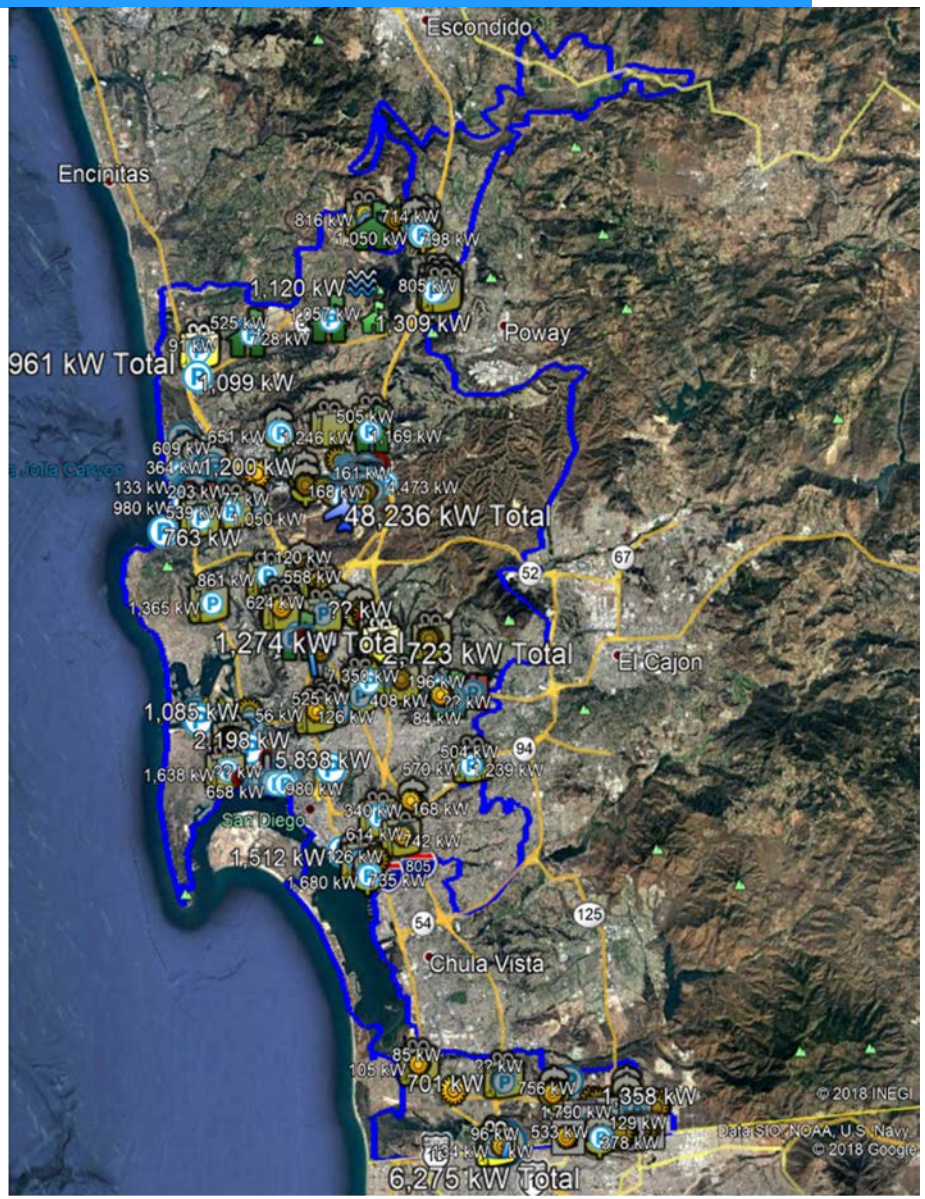
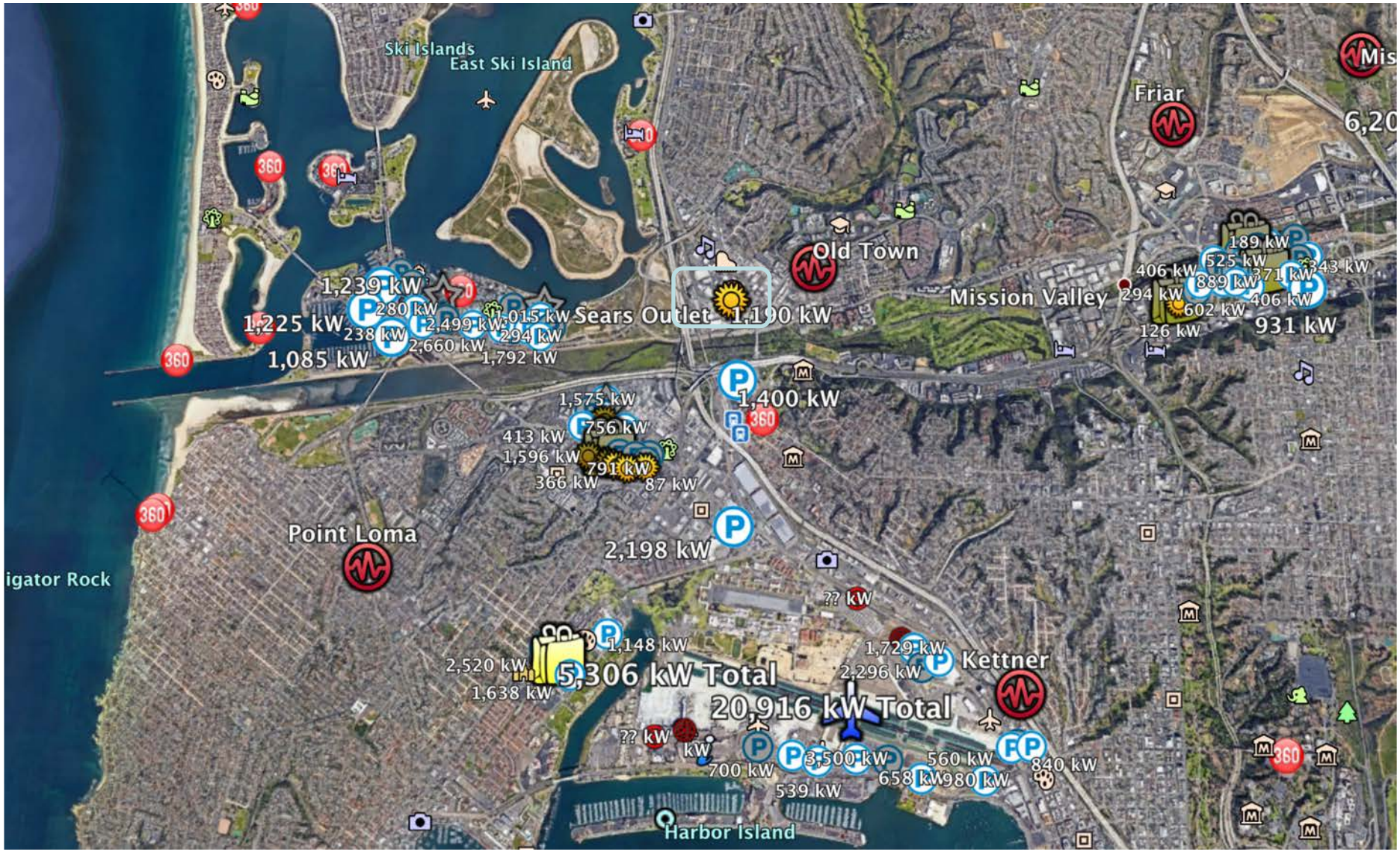
Over 490 MW of
Solar Siting Potential identified

- Sites >1 MW
- On built-environments



Sears Outlet



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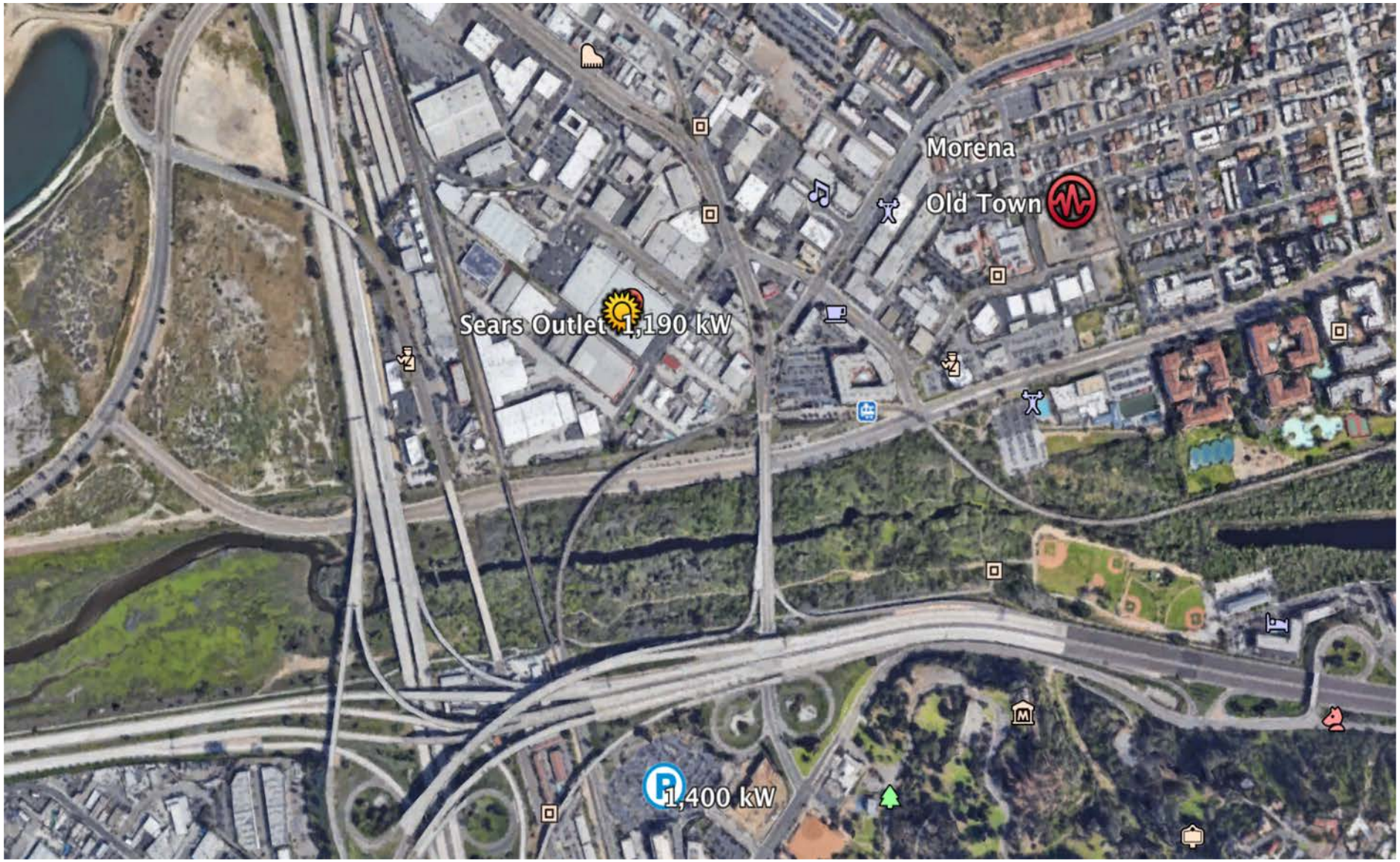

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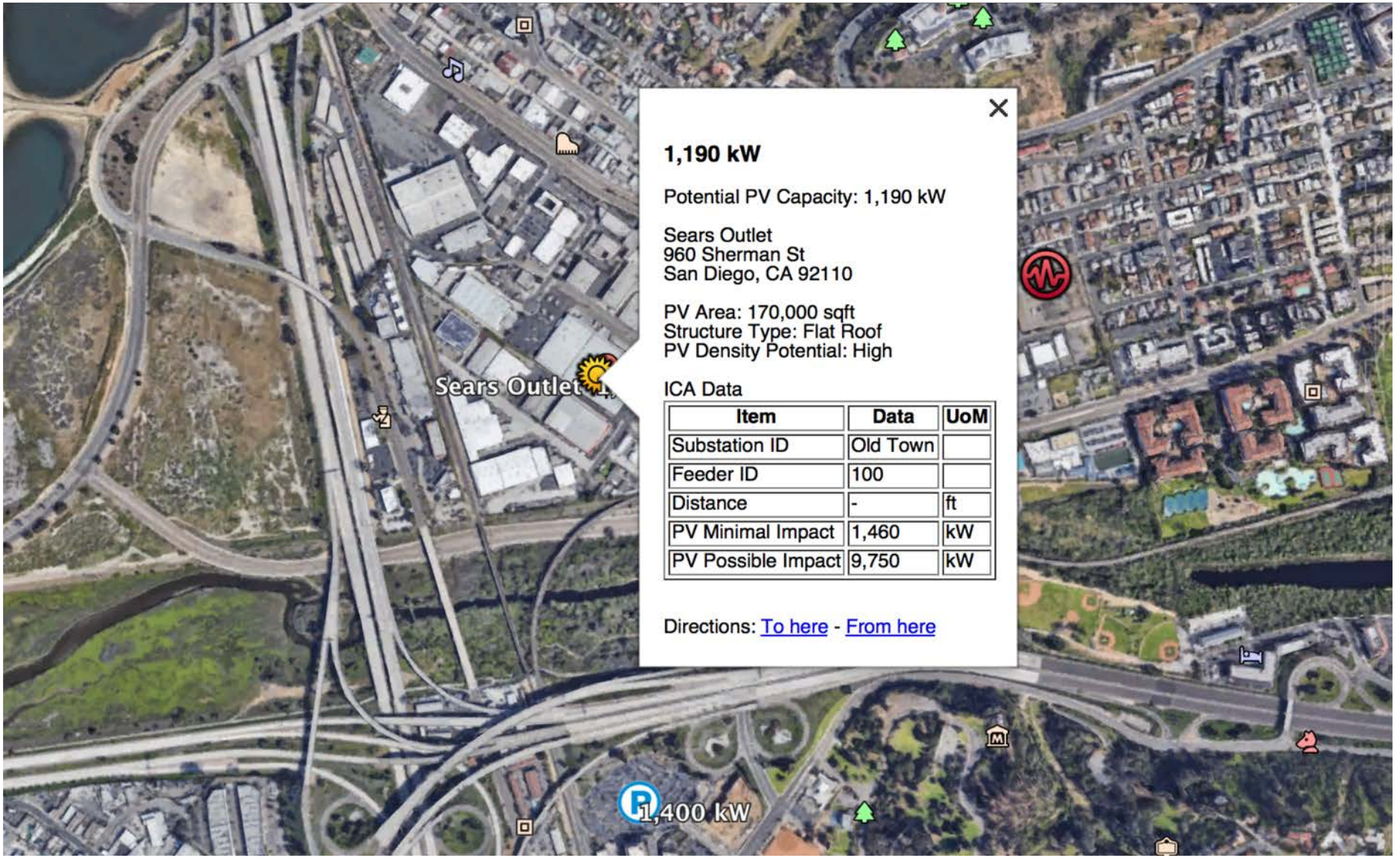
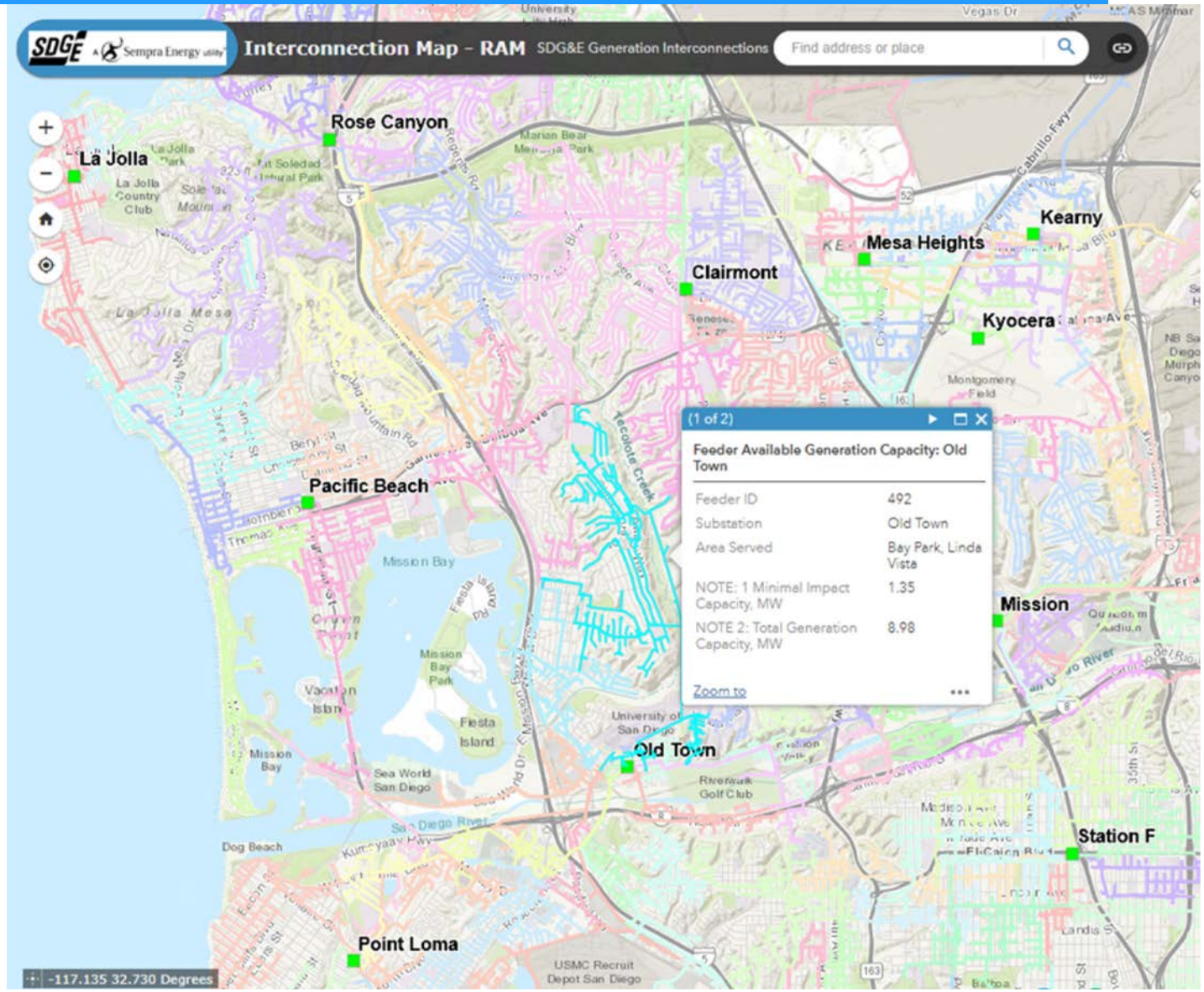


SD feeder map



SD substation & feeder hosting capacities

PV Sites		ICA	
Substation Name	Substation Survey Siting Potential [MW]	Substation Minimal Impact [MW]	Substation Possible Impact [MW]
Feeder ID	Feeder Survey Siting Potential [MW]	PV Feeder Minimal Impact [MW]	PV Feeder Possible Impact [MW]
Artesian	6.52	1.23	8.18
1104	3.36	0.88	5.27
1100	1.39	1.23	8.18
1102	1.76	1.23	8.17
Bernardo	22.98	1.75	11.65
534	2.95	1.75	11.65
537	4.33	1.46	9.75
292	1.79	1.27	8.47
543	7.48	1.49	9.90
540	0.00	1.44	9.60
577	3.86	1.48	9.90
575	2.58	1.50	10.00
Border	52.59	1.46	9.76
533	30.61	1.35	8.99
534	5.63	1.03	6.87
535	5.01	1.41	9.40
1160	11.34	1.46	9.76
Chicarita	3.51	1.08	7.19
500	2.43	1.04	6.91
910	1.09	1.08	7.19
Chollas West	6.14	1.23	8.19
164	6.14	1.23	8.19
Clairmont	8.55	1.32	8.77
274	6.92	1.17	7.78
277	0.74	1.27	8.47
279	0.89	1.32	8.77
Division	3.67	1.50	10.00
48	3.67	1.50	10.00

Feed-In Tariff

for

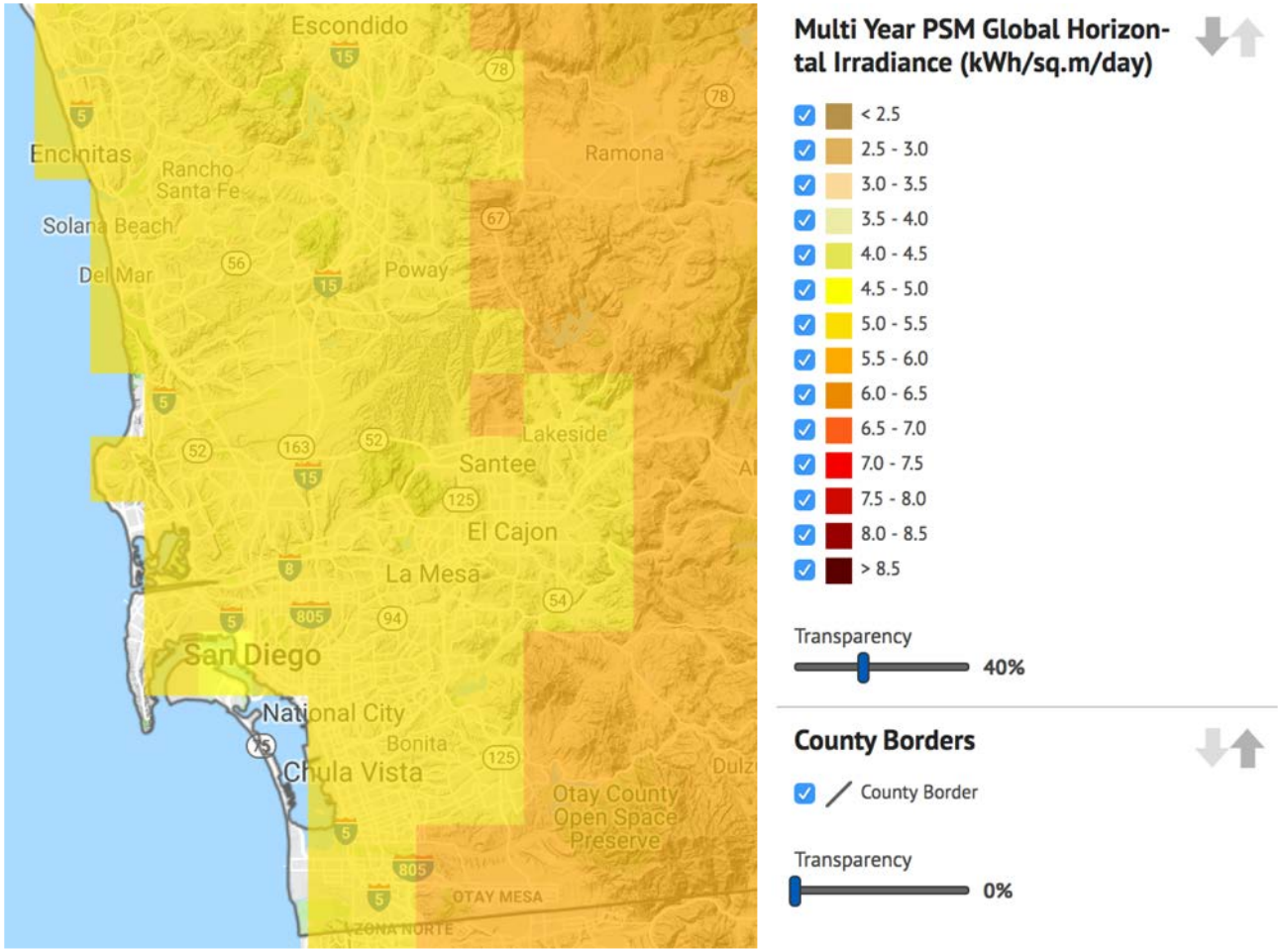
City of San Diego

SD FIT project eligibility

- Open to all renewable energy technologies that meet California's Renewables Portfolio Standard (RPS) eligibility requirements
- Projects must be sited within the City of San Diego
- Projects can sized up to 3 MW *

*All project size capacity references in this presentation are rated in Alternating Current (AC), unless noted otherwise.

City of San Diego solar resource quality



City of San Diego has a Solar Resource quality of 5.0-5.5 kWh/m^2/day according to NREL's solar resource database.

City of San Diego FIT program size

- A 50 MW FIT will provide roughly 1.1% of the City of San Diego's annual electric load

FIT capacity	Annual energy production from each kW of FIT capacity	Annual energy deliveries through FIT	Annual LSE energy sales	Percent of total LSE retail sales
50 MW	1,900 kWh	95,000,000 kWh	8,500,000 MWh	1.1%

- Annual production of 1,900 kWh/kWac of FIT capacity is based on solar resource analysis for the City of San Diego, as we expect PV to be the dominant FIT technology

Location	Solar resource quality (kWh/m²/day)	System type	Annual energy production (kWh/kWac/year)
San Diego	5.00-5.50	Fixed rooftop installation	1900
San Diego	5.00-5.50	Single-axis tracking installation	2371

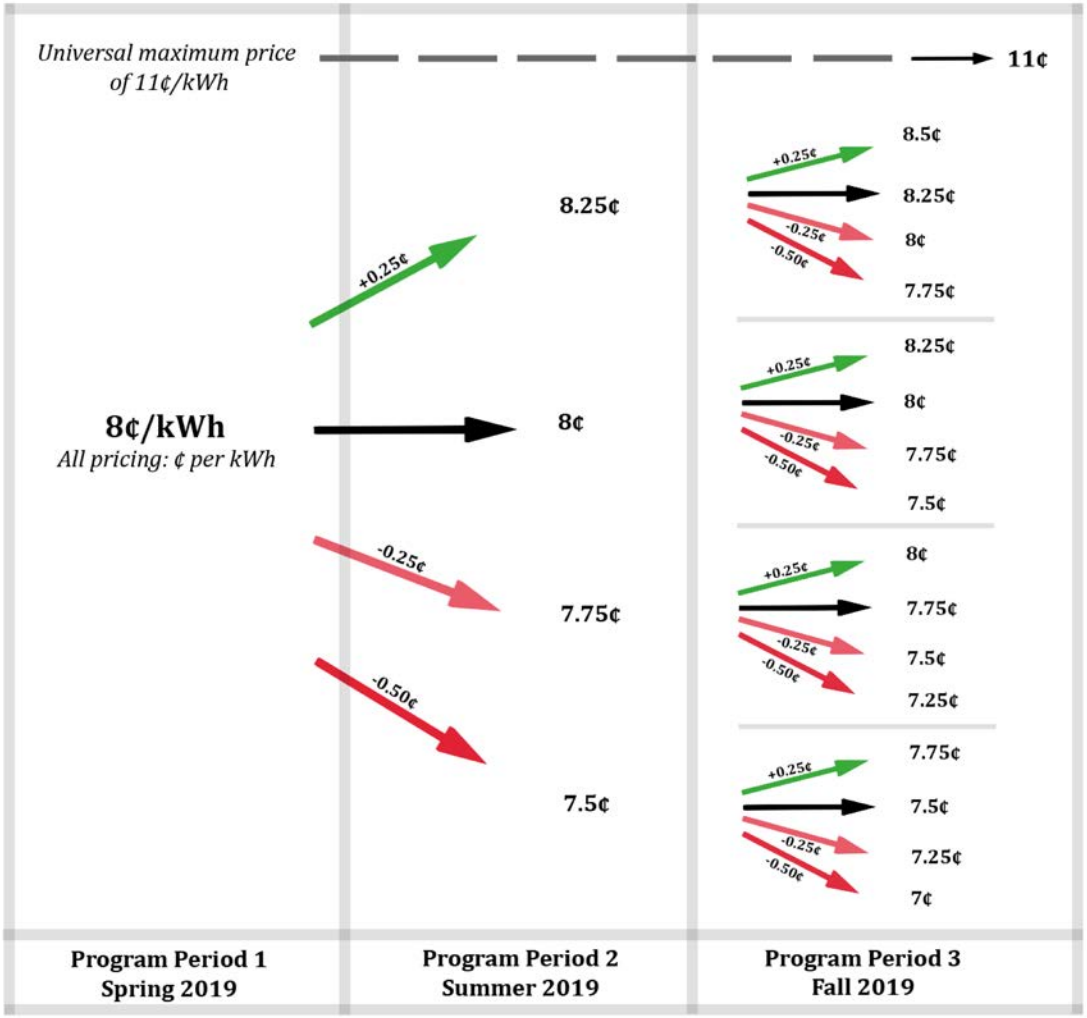
City of San Diego FIT initial pricing

- Initial baseline FIT pricing of 8¢/kWh fixed for 20 years.
  - Modeling was done using NREL's System Advisor Model (SAM).

Type of system	Size of solar PV system (W_{AC})	Installed cost ($/$W_{DC}$)	20-year fixed PPA price (¢/kWh) No sales tax
Built environment	100 kW roof	$2.19	13.9¢
Built environment	350 kW roof	$2.02	12.9¢
Built environment	500 kW roof	$1.96	12.7¢
Built environment	1 MW roof	$1.81	12.0¢
Ground-mount	1 MW tracking	$1.76	9.6¢
Ground-mount	3 MW tracking	$1.70	9.3¢

SD FIT Market Responsive Pricing (MRP)

Once baseline pricing is set for the initial FIT tranche, MRP governs baseline pricing, which can never exceed a universal maximum of 11¢/kWh.



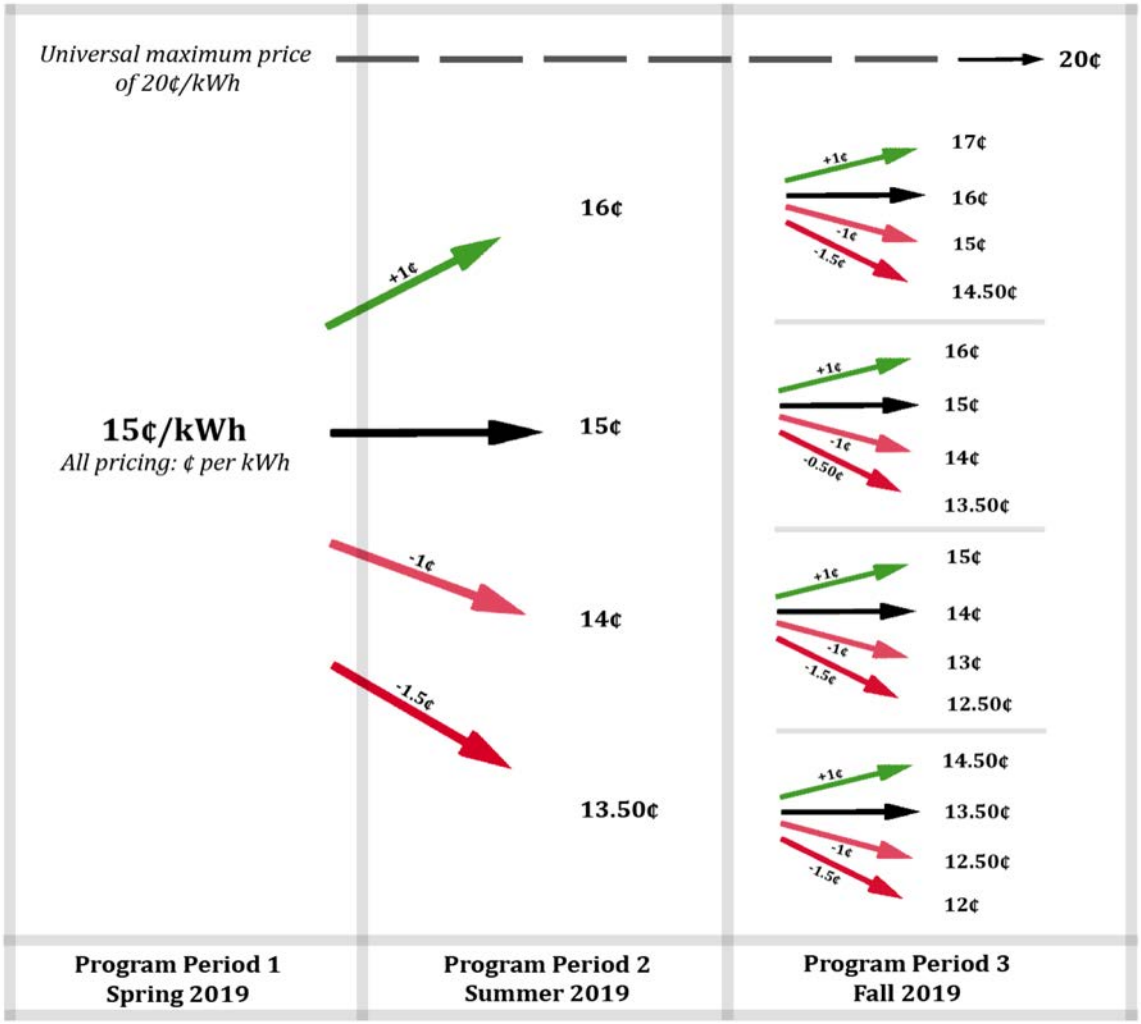
City of San Diego FIT pricing adders

- The concept of pricing adders is simple
  - A Load Serving Entity (LSE) identifies the characteristics it would like to see in its FIT projects and then creates adders to its baseline FIT price to incentivize projects with these characteristics.
- The Clean Coalition recommends the LSE implement four pricing adders:
  - Built-environment adder at 20%
    - Rooftops, parking lots, parking structures, etc.
  - Small project adder at either 10% or 20%
    - 10% for projects larger than 100 kW and less than or equal to 350 kW.
    - 20% for projects less than or equal to 100 kW.
  - Community benefit adder at 5%
    - Tax-exempt and/or within Communities of Concern.
  - Dispatchability adder at 15¢/kWh
    - Eligible for guaranteed daily dispatchable renewable energy at 2-4 hours of nameplate renewable energy FIT project.

City of San Diego Dispatchability adder with MRP

Clean Coalition

Dispatchability adder with MRP governs baseline pricing, which can never exceed a universal maximum of 20¢/kWh.



SD FIT program timing

- 7.5 MW quarterly allocations — from Spring 2019 thru Fall 2020, with a final 5 MW allocation in Fall 2020
- The FIT will bring all 50 MW of capacity online by Spring 2022 as the ITC steps down from 22% to 10% that year.

Allocation date	Capacity allocation	Total FIT program size	Estimated commercial online date (COD)[8]	Approximate annual energy deliveries through FIT[9]	FIT as a percentage of total LSE estimated retail sales[10]
Spring 2019	7.5 MW	7.5 MW	Fall 2020	14,250,000 kWh	0.17%
Summer 2019	7.5 MW	15 MW	Winter 2020	28,500,000 kWh	0.34%
Fall 2019	7.5 MW	22.5 MW	Spring 2021	42,750,000 kWh	0.50%
Winter 2019	7.5 MW	30 MW	Summer 2021	57,000,000 kWh	0.67%
Spring 2020	7.5 MW	37.5 MW	Fall 2021	71,250,000 kWh	0.84%
Summer 2020	7.5 MW	45 MW	Winter 2021	85,500,000 kWh	1.0%
Fall 2020	5 MW	50 MW	Spring 2022	95,000,000 kWh	1.1%

SD FIT program capacity management

- If any capacity remains unclaimed within 30 days of the next upcoming allocation, then that excess capacity is rolled into the next allocation.
  - For example, if a 7.5 MW allocation in Spring 2019 receives only 5 MW worth of applications, then the Summer 2019 capacity allocation will total 10 MW — the originally planned 7.5 MW plus the 2.5 MW of unclaimed capacity from Spring 2019.

- This will ensure that the program delivers the desired capacity within the program timeline.

Optimizing near-term BTM projects using ReOpt

Clean Coalition

Analyzing economics of 19 existing solar projects on City-owned properties along with 10 prospective solar and solar+storage projects, as shown below, which were compared for economics-optimized and resilience-optimized scenarios.