

Exploring the Feasibility of Floating Solar at Lauro Reservoir

Executive Summary

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Faculty Advisors

Dr. Roland Geyer
Dr. Ranjit Deshmukh

Project Members

Colin Schimmelfing
Joe Walderman
Andrea Gracia Duran
Trent Buchanan
Carlos Simms



Significance

In 2017, the City of Santa Barbara adopted an ambitious goal of 100% renewable electricity by 2030 to combat climate change and to improve local grid resilience in the face of a changing energy and climate landscape. The City established Santa Barbara Clean Energy (SBCE) in 2021 as a step towards reaching these goals. The creation of this entity allows the City to procure its own renewable energy supply, and allows flexibility crucial to enable innovative projects. This report assesses the feasibility of adopting floating solar technology on Lauro Reservoir as a unique opportunity to achieve the City's goals.

Located in the hills of Santa Barbara, Lauro Reservoir is an artificial body of water that maintains a stable surface water level throughout the year. The reservoir acts as a holding tank for the nearby Cater Water Treatment Plant – a critical City facility susceptible to public safety power shutoffs and outage events.

Floating solar consists of conventional solar panels installed on floats that are anchored on top of a body of water. Such a system at Lauro Reservoir would provide many benefits, including:

- Generation of local, renewable energy
- Resilience to grid outages
- Evaporation and algae growth reduction
- Conservation of land
- Improved solar module performance

There are several possible configurations of such a system, including choices regarding system size, how the system connects to the grid, and whether the system includes a battery for energy storage. For instance, a “behind-the-meter” (BTM) system would be

directly connected to the Cater Water Treatment Plant, while a “front-of-meter” (FOM) system would be directly connected to the grid. While BTM systems are more costly, these types of systems can take advantage of avoided energy costs while providing resilience to critical City facilities.

Findings

Several stakeholder and permitting issues are explored and are determined to be unlikely to block this project. For instance, agencies managing the reservoir are not opposed to floating solar at the site, and the US Bureau of Reclamation (USBR) may even be interested in the site as a pilot project for this technology on federal land. NEPA and CEQA regulations apply to this reservoir, however it is likely that the project could qualify for a “categorical exemption” under CEQA to avoid further regulation and the project would likely have no “significant effect” on the surrounding environment, avoiding further NEPA concerns. Finally, based on a preliminary investigation with the local utility, the distribution grid near the site can likely accommodate the power generated by the larger system configurations.

For each system configuration, the report explores specific permitting concerns, quantifies evaporation reductions, and presents an economic analysis to calculate the effective Levelized Cost of Energy. Effective LCOE consists of the initial cost of the system combined with other available value streams which effectively lower the cost of the system. This report includes evaporation savings, avoided energy costs, “Resource Adequacy”, and “time-shifting” value. The report also provides estimates for estimated electricity contract prices inclusive of an expected range of required 3rd-party solar developer profits.

Two feasible systems are identified as optimal: Both systems are 5.7 megawatt (MW) systems that incorporate both floating and ground-mounted arrays. One system consists of a BTM system, and the other consists of a FOM system that includes 6-8 MWh of energy storage at a power factor of 4-6 MW. Shown in **Figure 1**, the Effective LCOE for the BTM and FOM systems are 4.37¢ and 3.15¢ per kilowatt-hour (kWh) respectively.

The decision between proceeding with either the optimal BTM system or the optimal FOM system is complex and a recommendation cannot be objectively made. The full report includes information for decision-makers to fully consider such a decision.

Implications and Future Work

A floating solar system on Lauro Reservoir would be cost-effective, beneficial for wildlife habitats, not negatively affect drinking water quality, and would achieve the City’s goal. By using SBCE’s flexibility and by applying the findings of this report, the City may be able to implement floating solar at Lauro Reservoir. Proving the feasibility of the technology could serve as a test case for other City sites and other municipalities, and further catalyze the development of such technology nationwide.

Although not extensively explored, adding battery storage to the BTM system may reduce effective costs while adding resilience benefits, and should be considered. If such a battery is large enough, the Cater Water Treatment Plant could operate continuously from system power even if detached from the wider grid. Further quantification of resilience benefits could clarify such value. In relevance, this performance could also be achieved with a FOM system, provided that a “community microgrid” is investigated and implemented.

Lastly, a BTM system may also encounter other costs or barriers compared to a FOM system. For example, a proposed “net billing” policy – a possible amendment to the current net metering policy – would significantly reduce the value of exported electricity from BTM systems to the grid. The authorization to directly connect a system to the Cater Water Treatment Plant is also uncertain. Thus, future work should include additional analysis of BTM system feasibility.

While there are many steps to consider before a project of this specific nature can be realized, this report highlights several paths forward. This report helps clarify the issues and opportunities for floating solar on behalf of decision-makers in the City of Santa Barbara.

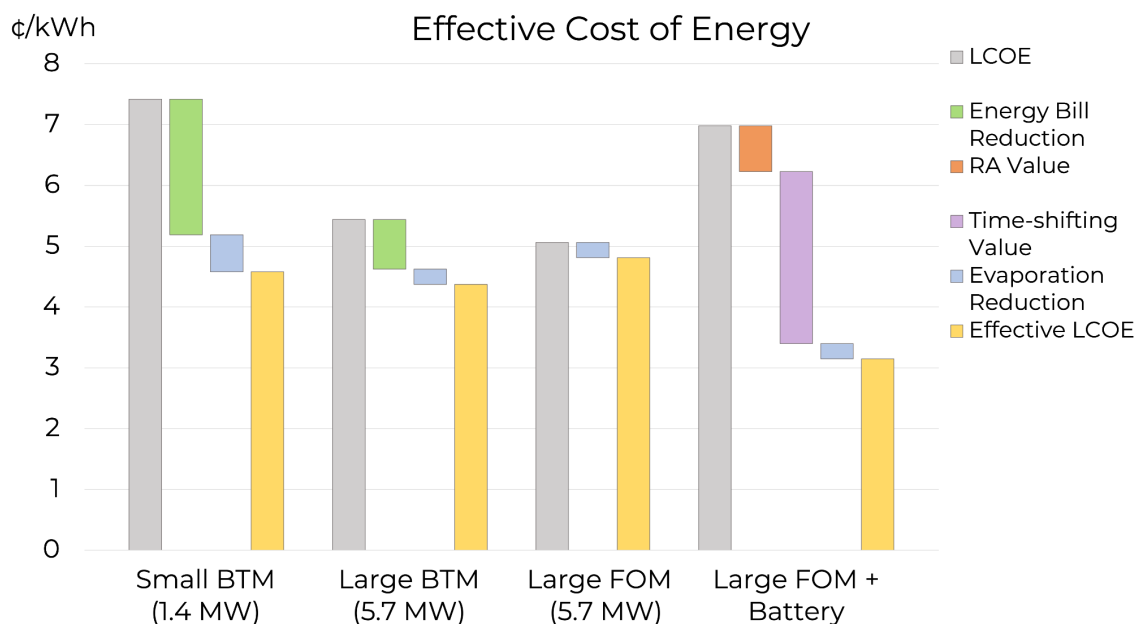


Figure 1. Comparison of the “Effective LCOE” (yellow, ¢/kWh) for possible system configurations. This metric consists of the initial LCOE (“Levelized Cost of Energy”) adjusted by various value streams.