

## DOCKETED

<b>Docket Number:</b>	15-BSTD-03
<b>Project Title:</b>	Local Ordinace Applications
<b>TN #:</b>	207723
<b>Document Title:</b>	Ron Takiguchi Comments: Santa Monica Cost Effectiveness Analysis
<b>Description:</b>	N/A
<b>Filer:</b>	System
<b>Organization:</b>	Ron Takiguchi
<b>Submitter Role:</b>	Applicant
<b>Submission Date:</b>	1/19/2016 4:34:14 PM
<b>Docketed Date:</b>	1/19/2016

*Comment Received From: Ron Takiguchi*

*Submitted On: 1/19/2016*

*Docket Number: 15-BSTD-03*

## **Santa Monica Cost Effectiveness Analysis**

*Additional submitted attachment is included below.*



### Analysis on the cost-effectiveness of the “Implementation of Solar Energy Systems”

In 2015, the City of Santa Monica investigated opportunities to help meet long-range goals related to renewable energy, energy efficiency and carbon reductions through its municipal green building ordinance. The City of Santa Monica has a history of adopting local requirements to advance energy efficiency in the built environment that exceed state minimum requirements. This is necessitated by local climatic conditions and a community that expects sustainability leadership in city policy making. Prior to the State implementing the 2013 California Energy Code in July 2014, Santa Monica required all new buildings be designed to use 15% less energy than required by the California Energy Code. With the update to the State Energy Code, the City had to reassess if adopting local standards exceeding the 2013 Building Energy Efficiency Standards was appropriate. It was determined trends related to photovoltaic solar energy were strong enough to consider a local ordinance.

At the time of this assessment, two other cities in California were requiring the installation of photovoltaic (PV) solar energy systems, the cities of Lancaster and Sebastopol. The City of Lancaster requires 1kW of solar PV-generated energy per single-family home and their code was analyzed by referencing a report prepared by Energy and Environmental Economics, Inc. (“E3”) for the California Energy Commission, titled “Cost-Effectiveness of Rooftop Photovoltaic Systems for Consideration in California’s Building Energy Efficiency Standards,” dated May 2013. The authors measure photovoltaic’s cost-effectiveness using two approaches: an average consumer savings analysis and a market-segmented savings analysis. An average consumer savings analysis evaluates whether PV is cost-effective to residential and commercial buildings owners on average. A market-segmented savings analysis evaluates whether PV is cost-effective to building owners based on their specific retail rate and annual electricity consumption.

E3’s average consumer savings analysis determines cost-effectiveness using a benefit-cost ratio. The ratio is calculated by dividing the benefits (levelized bill savings) by the cost (levelized cost of solar electricity). A benefit-cost ratio greater than one is determined to be cost-effective. Figure 11 on Page 29 of E3’s report shows that residential PV solar is cost-effective for year 2014, including the area of Climate Zone 6, where Santa Monica is located. PV is expected to be more cost-effective in the future as the installed capital costs of solar decreases, given advancements in technology development, and despite anticipated reductions in federal tax credits. This trend towards lower capital costs for solar installation is further reinforced by the City of Santa Monica’s Solar Santa Monica program. Solar Santa Monica is a city-funded service administered by consultant, EcoMotion, and designed to provide free, unbiased technical advice to residents and businesses looking to install solar systems. EcoMotion assisted City Staff with the review of E3’s 2013 report to provide context related to current trends in 2015 and confirm applicability of conditions in and around Climate Zone 6. According to the California Solar Initiative (CSI), the cost of residential solar installation was just below \$6/Watt in Q4 2013. This was down from \$11/Watt in 2007. The Solar Energy Industries Association (SEIA) recently published the average price of residential PV installation in Q2 2015 was \$3.50/Watt. This data confirms the



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predictions made by E3 in 2013 that the capital cost of installing solar systems would continue to decrease.

E3's market-segmented analysis evaluates benefits by including the avoided cost of retail electricity prices based on a customer's existing retail rate. Assumptions for this analysis vary, from the lifetime and cost of installation of solar PV systems, to the tiered retail rates that Santa Monica residents and businesses pay for electricity, as well as compensation parameters for an electricity company's Net Energy Metering program. Figure 14 on Page 33 of E3's report show that residential PV solar is cost-effective for year 2014 in the area of Climate Zone 6. The cost-effectiveness increases with the size of the customer's annual electricity usage. Although the report predicts residential PV solar is less cost-effective in 2017 due to the expiration of the federal Investment Tax Credit (ITC), it is still cost-effective for most electricity usage tiers and is expected to be more cost-effective by 2020 due to continued reductions in the capital cost of solar, which counteract the reduction in the federal ITC. Figure 17 on Page 36 of E3's report show that commercial PV solar is cost-effective for year 2014 in the area of Climate Zone 6 for small commercial buildings (10-15MWh). The statistical range for large commercial buildings (100-500MWh) straddles the cost-effectiveness threshold for year 2014. By 2020 (Figure 19 on Page 38) PV solar is cost-effective in the area of Climate Zone 6, including large commercial. In Santa Monica, most commercial buildings anticipated in the near future will be mid-sized so likely on the lower end of the Southern California Edison (SCE) GS-2 rate. Therefore, although the cost-effectiveness of large commercial buildings from 2014-2017 is close to the cost-effective threshold, the City is confident most new buildings will benefit from PV solar.

After review of the E3 study and reconciliation with local trends since the report was published in 2013, City staff determined an ordinance requiring PV solar systems for all new construction is appropriate in the City of Santa Monica. The minimum requirements for single-family homes and multi-story commercial/multi-family/institutional were evaluated separately. For single-family homes a requirement to install a PV solar system with a minimum total wattage of 1.5 times the square footage of the dwelling was established. The wattage amount was determined by considering average new home sizes in California and Santa Monica, average capacity of recently installed PV solar systems in Santa Monica, percentage of roof space PV solar system would encompass, installation cost compared to total construction cost of the new home, and cost-effectiveness based on the methodology presented by E3. After analyzing these indicators, 1.5 Watts/square foot was determined the optimal amount for the requirement.

For multi-story commercial/multi-family/institutional (commercial), it was determined a wattage/square foot would be best to maintain consistency but it had to be modified. New commercial construction in Santa Monica is expected to be mainly mid-rise, mixed-use, multi-family, which are typically built with a moderate footprint so roof space dedicated to PV solar is competitive. More importantly, the City is keenly aware of the split-incentive issue, where project developers would not be able to recoup the energy savings return on their PV solar installation when the system's capacity exceeds the common-



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area load. So the wattage amount was determined by considering expected commercial development size pursuant to the zoning ordinance, percentage of roof space PV solar system would encompass, installation cost compared to total construction cost of the new development, average common-area load electricity demands in existing Santa Monica commercial buildings, and cost-effectiveness based on the methodology presented by E3. After analyzing these indicators, it was determined the requirement would be installation of PV solar system with a minimum total wattage 2.0 times the square footage of the building footprint (2 watts/footprint square feet).

Page 41 of E3's report summarizes the results of their cost-effectiveness analysis for rooftop PV solar. The average consumer and market-segmented savings results show that solar PV systems are largely cost-effective, especially for less expensive systems. More so, given Santa Monica's location and ample sunshine, solar PV systems are cost-effective now and into the future as installation costs decline.