



Solar PV Battery Installations in Honolulu: 2019 Update

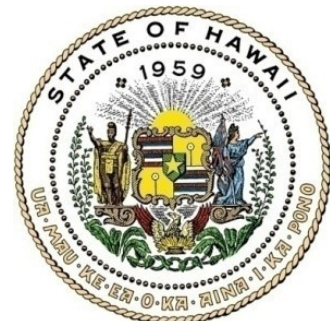


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Department of Business, Economic Development and Tourism

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This report is an update of the previous reports published in 2018 and 2019. Since October 2015 when the State Public Utilities Commission limited the number of new solar photovoltaic (PV) customers to send excess power to the electric grid for credit, battery-connected PV systems have become a more attractive option. As a result, 2017 saw an exponential growth of battery storage installed together with solar PV systems; and this number doubled in 2018. The strong growth continued into 2019, with PV plus battery installations exceeding all previous years combined. Based on building permit data from the City and County of Honolulu, this report provides detailed information on solar PV battery installations in 2019, in the hope of increasing our understanding of solar battery installation activities in Honolulu County.

Table 1: Summary of building permits related to residential¹ PV plus battery installation: 2008-2019

| Year | Number of permits | Average permit value* (\$) | Median permit value* (\$) |
|------|-------------------|----------------------------|---------------------------|
| 2008 | 7 | 32,065 | 27,581 |
| 2009 | 5 | 32,203 | 34,000 |
| 2010 | 4 | 29,000 | 28,000 |
| 2011 | 1 | 34,000 | 34,000 |
| 2012 | 1 | 10,000 | 10,000 |
| 2013 | 10 | 23,961 | 24,000 |
| 2014 | 5 | 31,904 | 15,000 |
| 2015 | 5 | 54,480 | 45,000 |
| 2016 | 40 | 25,086 | 21,000 |
| 2017 | 731 | 29,475 | 27,552 |
| 2018 | 1,659 | 34,995 | 32,000 |
| 2019 | 3,003 | 35,491 | 31,000 |

Source: Department of Planning and Permitting, City and County of Honolulu. Calculation by DBEDT.

*PV plus battery installation projects were excluded from calculating the average or median permit values if they were combined with other types of building work which were not related to PV or battery storage installation.

The first building permit for residential PV battery installation was issued in February 2008. Annual numbers of PV plus battery building permits did not go beyond ten until 2016.

¹ Our analysis focuses on residential PV battery installations, as less than five percent of PV battery installations were for commercial use. A summary table of commercial PV battery installations is provided in the Appendix.

Since then, installing battery storage together with the PV system became an increasingly popular choice. In 2017, a total of 731 permits were issued by Honolulu DPP for PV plus battery installation, accounting for 26.5 percent of the total PV related or PV battery related projects². This percentage jumped significantly to 62.3 percent in 2018³ and continued to climb to 74.1 percent in 2019, with a total of 3,003 permits for PV plus battery installations. While the PV plus battery installation became more attractive, installation cost stabilized over time. In 2019, the average installation cost, measured by permit values, was \$35,491, a slight increase from \$34,995 in 2018. The median installation cost was \$31,000, compared with \$32,000 in 2018.

Table 2: Summary of building permits related to residential PV and battery installation in 2019

| Month | PV plus battery | | Battery Only | | PV Only | |
|---|-------------------|--------------------------------|-------------------|--------------------------------|-------------------|--------------------------------|
| | Number of permits | % completed as of Dec 31, 2019 | Number of permits | % completed as of Dec 31, 2019 | Number of permits | % completed as of Dec 31, 2019 |
| 1 | 125 | 90% | 0 | - | 28 | 93% |
| 2 | 110 | 88% | 1 | 100% | 30 | 97% |
| 3 | 144 | 94% | 0 | - | 46 | 96% |
| 4 | 171 | 90% | 1 | 100% | 49 | 96% |
| 5 | 180 | 83% | 1 | 100% | 53 | 94% |
| 6 | 163 | 84% | 0 | - | 56 | 89% |
| 7 | 251 | 66% | 0 | - | 81 | 71% |
| 8 | 265 | 45% | 1 | 100% | 106 | 71% |
| 9 | 331 | 22% | 3 | 33% | 106 | 47% |
| 10 | 381 | 4% | 1 | 0% | 143 | 21% |
| 11 | 572 | 1% | 1 | 0% | 193 | 1% |
| 12 | 310 | 5% | 2 | 0% | 155 | 5% |
| Total | 3,003 | 39% | 11 | 45% | 1,046 | 45% |
| Annual average permit value (\$) | | 35,491 | | 7,773 | | 18,744 |
| Annual median permit value (\$) | | 31,000 | | 7,000 | | 15,633 |

Source: Department of Planning and Permitting, City and County of Honolulu. Calculation by DBEDT.

Table 2 summarizes the building permits issued monthly to install residential PV battery and PV alone projects in 2019. Installations of PV plus battery steadily grew over the 12-month period, with an average of 250 permits issued each month. Although the majority of cases were solar battery installed together with PV, 11 projects added batteries to the existing PV systems, and 1,046 building permits were issued for installing PV alone. The average cost that households in Honolulu paid to install a solar PV system together with battery in 2019 was \$35,491. By

² Solar PV Battery Installations in Honolulu: 2017, Jan 2018, DBEDT, State of Hawaii.

³ Solar PV Battery Installations in Honolulu: 2018 Update, August 2019, DBEDT, State of Hawaii.

contrast, the average costs of installing battery alone and PV alone were \$7,773 and \$18,744 respectively.

The median project cost of PV plus battery was \$31,000, about \$4,500 less than the average cost, suggesting that the cost distribution was slightly skewed to the right, as we can see from the cost distribution below (Table 3). 78 percent of permits issued for PV installation with battery were above \$20,000 and over a half were above \$30,000. All the battery only permits were below \$20,000. As for the PV only installations, about two thirds had permit values between \$10,000 and \$30,000. Only 4.2 percent of the permits were issued to install PV alone with permit values above \$40,000; by contrast, this ratio is almost 30 percent for the PV plus battery installations.

Table 3: Cost distribution of residential PV and battery installation: 2019

| Price range | PV plus battery | | Battery only | | PV only | |
|---------------------|-------------------|---------------|-------------------|---------------|-------------------|---------------|
| | Number of permits | percent | Number of permits | percent | Number of permits | percent |
| < \$5,000 | 14 | 0.5% | 2 | 18.2% | 40 | 3.9% |
| \$5000 - \$10,000 | 141 | 4.7% | 6 | 54.5% | 152 | 14.7% |
| \$10,000 - \$20,000 | 504 | 16.8% | 3 | 27.3% | 478 | 46.3% |
| \$20,000 - \$30,000 | 785 | 26.2% | 0 | 0.0% | 222 | 21.5% |
| \$30,000 - \$40,000 | 685 | 22.8% | 0 | 0.0% | 97 | 9.4% |
| > \$40,000 | 871 | 29.0% | 0 | 0.0% | 43 | 4.2% |
| Total | 3,000 | 100.0% | 11 | 100.0% | 1,032 | 100.0% |

Source: Department of Planning and Permitting, City and County of Honolulu. Calculation by DBEDT.

Note: The total permit numbers are slightly smaller than those in table 2, because some PV installation projects were combined with other types of building work which were not related to PV or battery installation, so these were excluded from the cost distribution table.

Table 4 shows the number of building permits issued for PV battery installation by city neighborhood areas in 2019. Like in the previous year, Ewa hosted the most PV plus battery installations, with 441 permits issued by the end of 2019; it also had the highest battery only and PV only installations, 2 and 90 respectively. The next is Waipahu, with 228 PV plus battery and 67 PV only installations. Closely followed by Kailua, with 217 PV plus battery, one battery only, and 68 PV only installations. Other areas where the installation of PV together with battery was popular were: Kapolei (163), Mililani (161), Hawaii Kai (142), Kaneohe (142), and Aiea (134).

Table 4: Residential PV and battery installation by neighborhood area: 2019

| Neighborhood Name | Number of building permits related to PV and battery installation | | |
|-----------------------------------|---|--------------|---------|
| | PV plus battery | Battery Only | PV only |
| Aiea | 134 | 0 | 63 |
| Airport | 0 | 0 | 1 |
| Ala Moana/Kakaako | 1 | 0 | 1 |
| Aliamanu/Salt Lake/Foster Village | 53 | 0 | 27 |
| Diamond Head/Kapahulu/St. Louis | 57 | 0 | 32 |
| Downtown | 1 | 0 | 0 |
| Ewa | 441 | 2 | 90 |
| Hawaii Kai | 142 | 1 | 63 |
| Kahaluu | 37 | 0 | 15 |
| Kailua | 217 | 1 | 68 |
| Kaimuki | 99 | 0 | 50 |
| Kalihi Valley | 25 | 0 | 10 |
| Kalihi-Palama | 14 | 0 | 7 |
| Kaneohe | 142 | 1 | 37 |
| Koolauloa | 26 | 0 | 5 |
| Kuliouou-Kalani Iki | 119 | 2 | 47 |
| Liliha/Kapalama | 59 | 1 | 31 |
| Makakilo/Kapolei/Honokai Hale | 163 | 1 | 45 |
| Makiki/Lower Punchbowl/Tantalus | 15 | 0 | 9 |
| Manoa | 71 | 0 | 31 |
| Mililani Mauka-Launani Valley | 74 | 0 | 40 |
| Mililani/Waipio/Melemanu | 161 | 0 | 74 |
| Moanalua | 26 | 0 | 18 |
| Mccully/Moiliili | 11 | 0 | 4 |
| Nanakuli/Maili | 109 | 0 | 22 |
| North Shore | 38 | 0 | 19 |
| Nuuanu/Punchbowl | 58 | 0 | 27 |
| Palolo | 42 | 0 | 17 |
| Pearl City | 108 | 0 | 47 |
| Wahiawa | 41 | 0 | 12 |
| Waialae-Kahala | 54 | 1 | 28 |
| Waianae | 66 | 1 | 15 |
| Waimanalo | 18 | 0 | 5 |
| Waipahu | 228 | 0 | 67 |

Source: Department of Planning and Permitting, City and County of Honolulu. Calculation by DBEDT.

Appendix: Commercial PV Battery Installations in 2019

In this appendix, the commercial building permits related to PV battery installations are summarized. In 2019, there were 69 commercial PV plus battery installed, with an average permit value of \$39,753 and median permit value of \$37,029. It should be noted that the permit values of commercial PV battery projects were highly underestimated, due to the fact that several large PV plus battery projects were excluded from the calculation of average or median permit values. These large projects were combined with other types of work, such as the installation of an air conditioning system, so the cost of installing a PV battery could not be separated from the total project cost.

There was only one commercial battery only project, with the permit value of \$20,000. The majority of commercial PV-related permits did not include battery installations. In 2019, there were 109 commercial PV only installations, with average permit values over \$ 1.1 million. The fact that the average permit value was much higher than the median value reveals that there were some exceptionally large commercial PV only projects in 2019.

Table A1: Summary of building permits related to commercial PV and battery installation in 2019

| Month | PV plus battery | | Battery Only | | PV Only | |
|--------------|-------------------|--------------------------------|-------------------|--------------------------------|-------------------|--------------------------------|
| | Number of permits | % completed as of Dec 31, 2019 | Number of permits | % completed as of Dec 31, 2019 | Number of permits | % completed as of Dec 31, 2019 |
| 1 | 6 | 100% | 0 | - | 9 | 89% |
| 2 | 1 | 100% | 0 | - | 12 | 89% |
| 3 | 4 | 100% | 0 | - | 8 | 100% |
| 4 | 1 | 0% | 0 | - | 3 | 100% |
| 5 | 1 | 100% | 0 | - | 6 | 83% |
| 6 | 13 | 75% | 0 | - | 9 | 75% |
| 7 | 22 | 29% | 0 | - | 7 | 80% |
| 8 | 6 | 33% | 1 | 0% | 18 | 15% |
| 9 | 4 | 33% | 0 | - | 12 | 0% |
| 10 | 6 | 0% | 0 | - | 9 | 13% |
| 11 | 3 | 0% | 0 | - | 5 | 0% |
| 12 | 2 | 0% | 0 | - | 11 | 0% |
| Total | 69 | 41% | 1 | 0% | 109 | 47% |

Annual average permit value* (\$) 39,753 20,000 1,139,891

Annual median permit value* (\$) 37,029 20,000 75,000

Source: Department of Planning and Permitting, City and County of Honolulu. Calculation by DBEDT.

*: The PV plus battery installation projects were excluded from calculating the average or median permit values if they were combined with other types of building work which were not related to the PV or battery installation.

