Solar PV Battery Installations in Honolulu 2023 Update

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STATE OF HAWAI'I • DEPARTMENT OF BUSINESS, ECONOMIC DEVELOPMENT & TOURISM

RESEARCH AND ECONOMIC ANALYSIS DIVISION

DEPARTMENT OF BUSINESS, ECONOMIC DEVELOPMENT & TOURISM

STATE OF HAWAII

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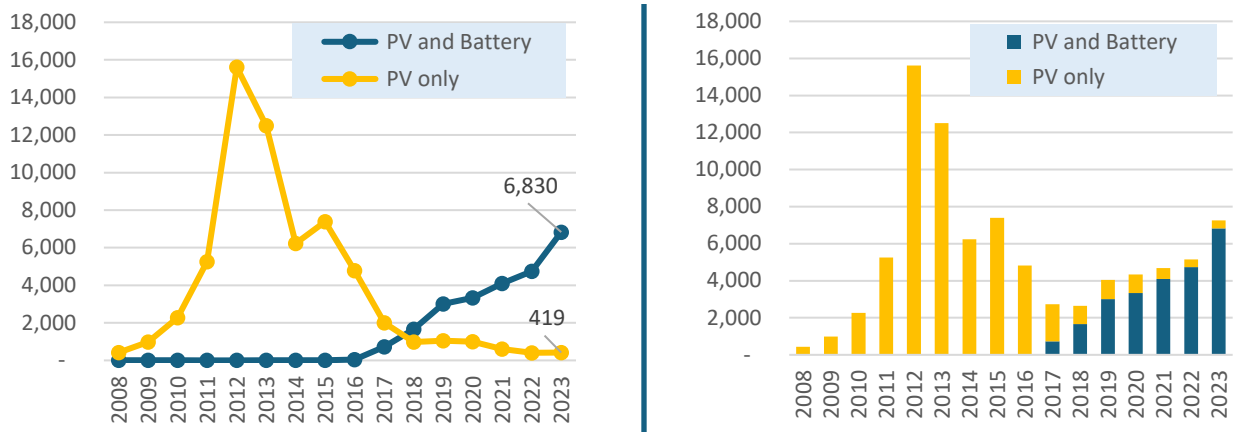
This report provides an update of the status of solar photovoltaic (PV) battery installations in Honolulu County. The report was first published in 2018 to enhance our understanding of battery installation activities on Oahu and has been updated annually. Statistics in this report were calculated based on building permit data from the Department of Planning and Permitting (DPP), City and County of Honolulu. Building permits for solar PV and battery installation were identified based on the type of work reported in the permit applications.[1]

Residential PV and battery installation, historical trend

Solar PV installation on Oahu started to increase gradually since 2008 and boomed in 2012 and 2013 with about 28,000 PV systems installed in this two-year period alone. However, installing battery storage together with PV system was very rare until 2017. Although the first building permit for residential PV battery installation was issued in February 2008, the number of cases installing battery storage with PV was no more than ten per year until 2015.

A battery-connected PV system has become a more attractive option since October 2015 when the State Public Utilities Commission closed the net-metering program and reduced compensation for the excess power sent to the grid by solar PV owners. As a result, 2017 had seen a significant growth of battery storage installation with a total of 731 permits issued for PV installation with battery storage ("PV plus battery" henceforth) in that year. The number of permits issued for PV plus battery doubled in 2018 and in 2019, then the growth slowed down. Encouraged by the battery bonus program, that was introduced to provide incentives for battery installation and was effective July 2021-December 2023, battery installation increased rapidly again from 2021 to reach 6,830 permits issued in 2023 for PV installation with battery storage.

Figure 1. Number of building permits issued for residential solar PV installation



[1] Battery installation was not explicitly indicated in permit application until 2017, so it had to be identified based on job description. Since 2017, the building permit application offers two types of PV related projects to choose: "Solar PV Installation Only (no battery)" and "Solar PV Installation w/ Battery Storage", making it easier to tell if the PV project included battery storage or not.

As shown in Figure 1, combining battery storage with PV system has become an increasingly popular choice since 2017. In 2017, PV plus battery permits accounted for 26.8 percent of the total residential PV permits issued in that year. This percentage jumped significantly to 62.7 percent in 2018 and continued to climb to reach 94.2 percent in 2023.

Although not many, there were permits issued for battery installation not associated with a solar PV system ("battery only" henceforth), presumably additions of a battery to the existing solar PV system. During the seven-year period from 2017 to 2023, a total of 315 building permits were issued for battery only installation.

Table 1 summarizes the total numbers of building permits issued for residential PV and/or battery installation, and their average and median permit values for the period of 2017 to 2023. Including the 315 permits issued for battery only installations, a total of 24,709 building permits were issued for installation of battery storage on Oahu from 2017 to 2023.

Table 1. Building permits issued for residential PV and battery installation during 2017-2023

Year	PV plus battery			Battery only			PV only		
	Number of permits	Average permit value ($)	Median permit value ($)	Number of permits	Average permit value ($)	Median permit value	Number of permits	Average permit value ($)	Median permit value ($)
2017	731	29,475	27,552	33	12,799	12,400	1,996	24,407	23,000
2018	1,659	34,995	32,000	21	7,971	8,000	985	23,045	22,000
2019	3,003	35,491	31,000	11	7,773	7,000	1,046	18,744	15,633
2020	3,336	30,987	28,000	39	6,788	4,000	1,003	18,737	15,000
2021	4,092	31,708	29,000	120	15,506	14,000	599	19,045	15,000
2022	4,743	34,351	30,000	4	9,750	11,500	406	19,220	16,250
2023	6,830	31,996	28,000	87	11,084	10,500	419	16,897	13,000

* Permits that were cancelled or revoked after being issued were excluded.
** Values are based on "accepted value" indicated in the building permit. PV/battery permits that were combined with other types of building work were excluded from calculating the average or median permit values because the PV related cost could not be separated from other costs.

Residential PV and battery installation in 2023

In 2023, a total of 6,830 permits, on average 569 permits per month, were issued for PV plus battery installation, which was 2,087 permits more or 44 percent increase from the previous year. Among those, 79 percent were completed by the end of March 2024. In addition, there were 87 permits issued to add batteries to the existing PV systems, and 419 permits issued for installation of a PV system alone. Their completion rates by the end of March 2024 were 75 percent and 80 percent respectively.

Table 2. Building permits issued for residential PV and battery installation in 2023

Month	PV plus battery		Battery only		PV only	
	Number of permits	% completed as of Mar 31, 2024	Number of permits	% completed as of Mar 31, 2024	Number of permits	% completed as of Mar 31, 2024
1	452	86%	4	75%	20	95%
2	579	90%	2	100%	30	97%
3	471	91%	3	100%	36	92%
4	479	89%	1	100%	40	88%
5	527	88%	4	75%	38	89%
6	499	88%	3	100%	32	84%
7	535	84%	4	50%	40	80%
8	792	81%	14	79%	50	76%
9	668	74%	19	68%	38	74%
10	618	73%	4	75%	31	68%
11	562	62%	14	43%	27	67%
12	648	40%	15	40%	37	49%
Total	6,830	79%	87	75%	419	80%

The average installation cost of PV plus battery systems, as measured by permit values, was $31,996 in 2023, a decline of 6.8 percent from $34,351 in 2022. About half of the PV plus battery projects started in 2023 cost between $10,000 and $30,000 while about a quarter of them cost more than $40,000. The median project cost of PV plus battery installation was $28,000, about $4,000 less than the average cost.

On the other hand, the average permit value of installing battery alone and PV alone in 2023 was $11,084 and $16,897 respectively, less than half of the average value of PV plus battery projects.

Table 3. Cost of residential PV and battery installation in 2023

Value	PV plus battery		Battery only		PV only	
	Number of permits	Percent	Number of permits	Percent	Number of permits	Percent
< $5,000	15	0%	8	9%	49	12%
$5000 - $10,000	142	2%	25	29%	90	21%
$10,000 - $20,000	1,445	21%	45	52%	152	36%
$20,000 - $30,000	2,174	32%	7	8%	74	18%
$30,000 - $40,000	1,199	18%	1	1%	25	6%
> $40,000	1,855	27%	1	1%	29	7%
Total	6,830	100%	87	100%	419	100%
Average value ($)	31,996		11,084		16,897	
Median value ($)	28,000		10,500		13,000	

Residential PV and battery installation by neighborhood

Table 4 shows the number of building permits issued for PV battery installation in 2023 by city's neighborhood area. Ewa hosted the most PV plus battery installation with 979 permits issued for it. Other areas where the PV and battery installation was active in 2023 include Kailua (507), Waipahu (476), Makakilo-Kapolei-Honokai Hale (475), Kaneohe (347), Hawaii Kai (326), and Mililani-Waipio-Melemanu (302).

Table 4. Residential PV and battery installation by neighborhood area in 2023

Neighborhood name	Number of permits issued for installation of		
	PV plus battery	Battery only	PV only
Aiea	280	4	16
Ala Moana-Kakaako	2	0	0
Aliamanu-Salt Lake-Foster Village-Airport	126	1	4
Diamond Head-Kapahulu-St Louis Ht.	122	1	6
Downtown-Chinatown	2	0	0
Ewa	979	12	42
Hawaii Kai	326	8	28
Kahaluu	100	1	5
Kailua	507	7	48
Kaimuki	176	4	16
Kalihi Valley	70	1	9
Kalihi-Palama	46	0	0
Kaneohe	347	2	27
Koolauloa	106	1	9
Kuliouou-Kalani Iki	260	5	20
Liliha-Kapalama	128	2	10
Makakilo-Kapolei-Honokai Hale	475	7	19
Makiki-Lwr Punchbowl-Tantalus	53	1	4
Manoa	198	1	9
Mccully-Moiliili	18	0	1
Mililani Mauka-Launani Valley	188	0	7
Mililani-Waipio-Melemanu	302	3	21
Moanalua	68	1	5
Nanakuli-Maili	202	0	9
North Shore	135	2	9
Nuuanu-Punchbowl	117	2	9
Palolo	90	0	7
Pearl City	243	4	21
Wahiawa	120	2	4
Waialae-Kahala	127	3	9
Waianae	169	4	9
Waimanalo	45	1	4
Waipahu	476	5	21
Unidentified [1]	227	2	11

1. It represents the permits of which project location could not be identified

Table 5. Residential PV and battery installation by neighborhood area during 2017-2023

Neighborhood name	Number of building permits issued for installation of		
	PV plus battery	Battery only	PV only
Aiea	1,038	10	312
Ala Moana-Kakaako	10	0	8
Aliamanu-Salt Lake-Foster Village-Airport	501	8	137
Diamond Head-Kapahulu-St Louis Ht.	487	4	154
Downtown-Chinatown	3	0	1
Ewa	3,314	33	619
Hawaii Kai	1,173	17	349
Kahaluu	346	6	73
Kailua	1,800	29	578
Kaimuki	698	15	262
Kalihi Valley	249	1	60
Kalihi-Palama	179	0	52
Kaneohe	1,253	13	319
Koolauloa	351	5	84
Kuliouou-Kalani Iki	968	22	259
Liliha-Kapalama	439	11	179
Makakilo-Kapolei-Honokai Hale	1,572	17	371
Makiki-Lwr Punchbowl-Tantalus	183	4	57
Manoa	614	14	207
Mccully-Moiliili	52	0	22
Mililani Mauka-Launani Valley	612	6	177
Mililani-Waipio-Melemanu	1,135	13	328
Moanalua	240	4	71
Mokapu	4	0	0
Nanakuli-Maili	829	7	172
North Shore	371	6	131
Nuuanu-Punchbowl	403	6	97
Palolo	312	0	108
Pearl City	920	15	276
Wahiawa	390	7	89
Waialae-Kahala	484	11	151
Waianae	652	8	126
Waimanalo	167	2	61
Waipahu	1,827	15	378
Unidentified [1]	818	8	186

[1] It represents the permits of which project location could not be identified

Commercial PV and battery installation

A total of 35 PV plus battery permits were issued for commercial use in 2023 with an average permit value of $413,368 and a median permit value of $50,816. Due to some large commercial PV plus battery projects, the average permit value was much higher than the median value. There was also one permit issued for a commercial battery-only project in 2023, valued at $442,999.

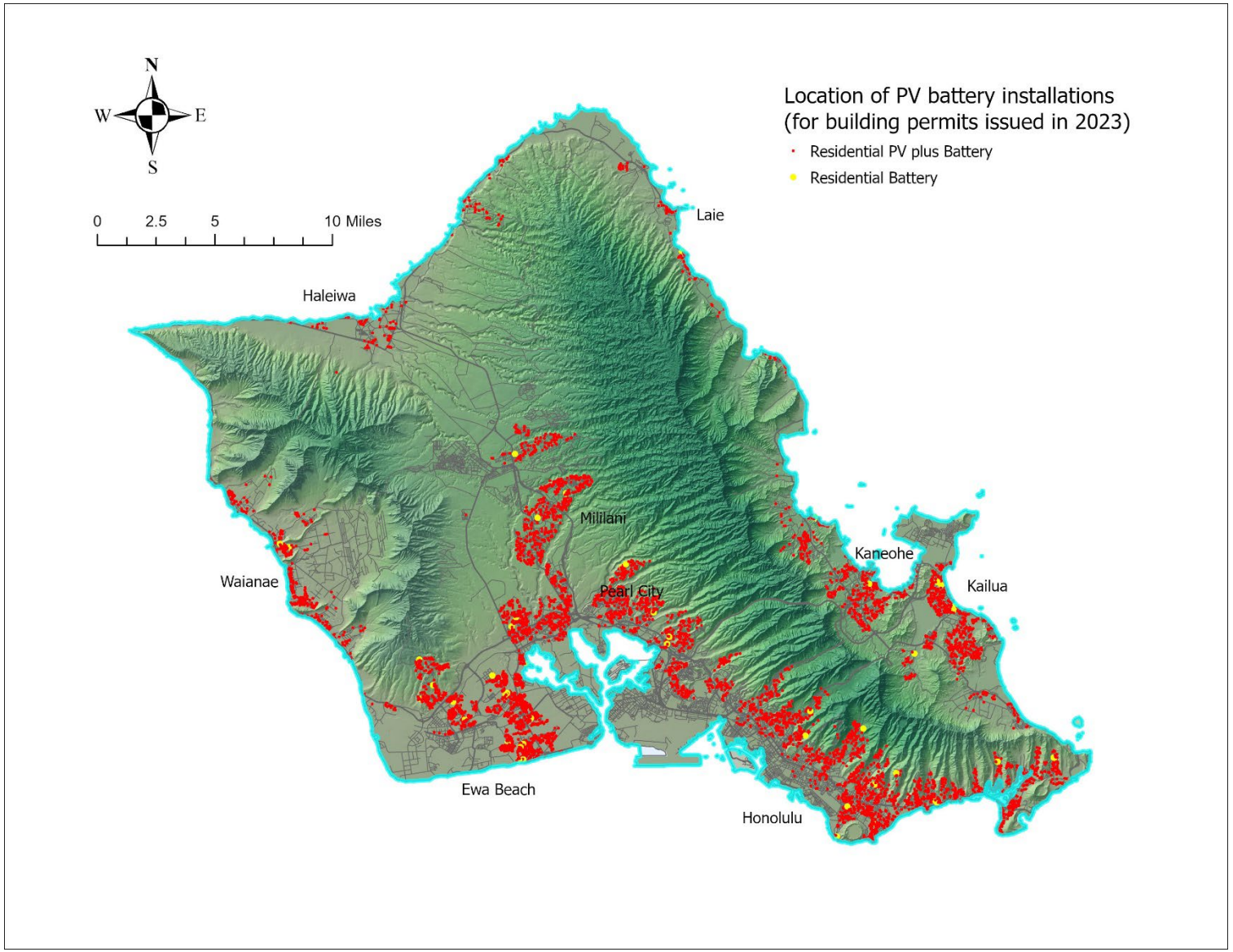
Table 6. Building permits issued for commercial PV and battery installation in 2023

Month	PV plus battery		Battery only		PV only	
	Number of permits	% completed as of Mar 31, 2024	Number of permits	% completed as of Mar 31, 2024	Number of permits	% completed as of Mar 31, 2024
1	0		0		3	67%
2	2	100%	0		7	71%
3	0		0		5	80%
4	3	100%	0		12	92%
5	5	100%	0		8	63%
6	3	67%	0		9	56%
7	7	100%	0		12	75%
8	3	100%	0		15	53%
9	1	0%	1	0%	6	100%
10	3	100%	0		21	29%
11	2	0%	0		5	60%
12	6	83%	0		8	63%
Total	35	75%	**1**	0%	111	67%

Table 7. Building permits issued for commercial PV and battery installation during 2017-2023

Year	PV plus battery			Battery only			PV only		
	Number of permits	Average permit value ($)	Median permit value ($)	Number of permits	Average permit value ($)	Median permit value ($)	Number of permits	Average permit value ($)	Median permit value ($)
2017	7	44,443	26,000	2	4,750	4,750	199	174,537	53,550
2018	49	89,360	42,500	1	12,400	12,400	113	486,727	85,675
2019	69	39,753	37,029	1	20,000	20,000	109	1,139,891	75,000
2020	56	230,613	35,000	3	4,000	4,000	94	424,723	188,824
2021	40	2,256,862	38,480	2	8,000	8,000	49	152,296	45,000
2022	30	97,382	42,460	42	656,250	656,250	47	164,068	80,384
2023	35	413,368	50,816	1	442,999	442,999	111	4,291,066	154,000

Map 1. Location of permits for residential battery storage issued in 2023



Map 2. Location of permits for commercial battery storage issued in 2023