research & economic analysis division

Solar PV Battery Installations in Honolulu: 2017

Since October 2015, the State Public Utilities Commission has limited the number of new solar photovoltaic (PV) customers to send excess power to the electric grid for credit, making battery-connected PV system a more attractive option. As a result, the year of 2017 has seen an exponential growth of battery installed together with solar PV systems. Based on the building permit data from the City and County of Honolulu, this report provides detailed information on solar PV battery installations in 2017, in the hope of increasing our understanding of the solar battery installation activities in the Honolulu County.

Table 1: Summary of building permits related to residential PV plus battery installation: 2008-2017

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

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

The first building permit for residential[1] PV battery installation was issued in February 2008. Since then, the annual number of PV plus battery building permits was no more than 10 until 2015. From 2016, the number began to pick up. In 2017, a total of 731 permits were issued by Honolulu DPP for PV plus battery installation, accounted for 26.5 percent of the total PV and battery related projects.

[1] Our analysis focuses on residential PV battery installations, as only one percent of PV battery installations were for commercial use. A summary table of commercial PV battery installation is provided in the Appendix.

Table 2 summarizes the building permits related to residential PV plus battery installations in each month of 2017. For the first four months, total number of issued permits was only 41. Starting from May, when the city streamlined the approval process, 53 PV plus battery building permits were issued merely in May. By the end of 2017, the cumulated number reached 731, with 61 percent of projects still ongoing. Although the majority cases were solar battery installed together with PV, 33 solar batteries were or will be installed to the existing PV systems, two thirds of which were completely installed by the end of the year. As a comparison, Table 2 also shows that about 2,000 building permits were issued for installing PV alone.

Table 2: Summary of building permits related to residential PV and battery installation in 2017

Month	PV plus battery		Battery Only		PV Only	
	Number of permits	% completed as of Dec 31, 2017	Number of permits	% completed as of Dec 31, 2017	Number of permits	% completed as of Dec 31, 2017
1	5	100%	1	100%	166	96%
2	4	100%	0	-	130	94%
3	16	88%	4	25%	152	93%
4	16	81%	5	80%	157	93%
5	53	66%	2	50%	134	94%
6	49	59%	4	100%	124	96%
7	98	52%	11	73%	163	91%
8	64	77%	1	100%	181	94%
9	77	51%	1	100%	166	86%
10	77	39%	2	50%	213	69%
11	124	13%	0	-	223	43%
12	148	0%	2	0%	187	7%
Total	**731**	**39%**	**33**	**67%**	**1,996**	**77%**
Annual average permit value ($)	29,475		12,799		24,407	
Annual median permit value ($)	27,552		12,400		23,000	

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

The average cost that households in Honolulu have paid to install a solar PV system together with battery was $29,475. By contrast, the average costs of installing battery alone and PV alone were $12,799 and $24,407 respectively. So, installing PV together with battery on average was about $7,700 cheaper than installing PV and battery separately, indicating clear evidence of economies of scope of installing PV and battery together.

The median project cost of PV plus battery was $27,552, about $2,000 less than the average cost, suggesting the cost distribution was slightly skewed to the right, as we can see from the cost distribution table below. Among the 731 permits issued for PV installation with battery,

93.2 percent were above $10,000 and over a half were in the $20,000-$40,000 price range. About 85 percent of battery only permits were below $20,000.

Table 3: Cost distribution of residential PV and battery installation: 2017

Price range	PV plus battery		Battery only		PV only	
	Number of permits	percent	Number of permits	percent	Number of permits	percent
< $5,000	0	0.0%	1	3.0%	66	3.3%
$5000 - $10,000	50	6.8%	9	27.3%	134	6.7%
$10,000 - $20,000	161	22.0%	18	54.5%	617	30.9%
$20,000 - $30,000	214	29.3%	5	15.2%	661	33.1%
$30,000 - $40,000	176	24.1%	0	0.0%	360	18.0%
> $40,000	130	17.8%	0	0.0%	158	7.9%
Total	**731**	**100.0%**	**33**	**100%**	**1,996**	**100%**

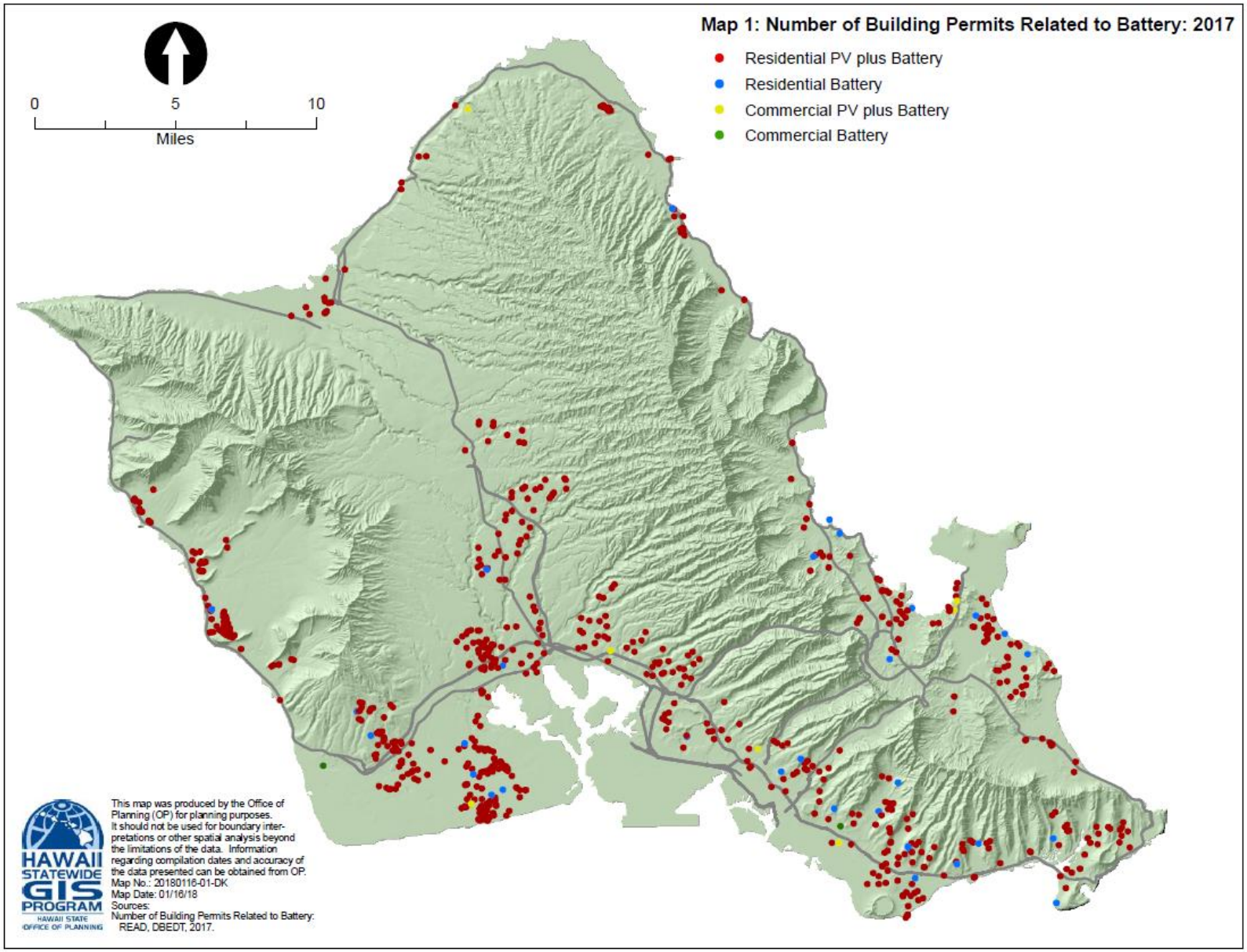
Source: Department of Planning and Permitting, City and County of Honolulu. Calculation by DBEDT.

Table 4 shows the number of building permits issued for PV battery installation by city's neighborhood areas in 2017. Ewa area hosted the most PV plus battery installations, with 132 permits issued by the end of 2017; it also had the second highest PV only installations, next to Kailua where 193 PV were or are to be installed alone. Other areas where the installation of PV together with battery was popular were Waipahu (61) and Makakilo/Kapolei/Honokai Hale (59).

Table 4: Residential PV and battery installation by neighborhood area: 2017

Neighborhood Name	Number of building permits related to PV and battery installation		
	PV plus battery	Battery Only	PV only
Aiea	26	0	89
Ala Moana/Kakaako	0	0	1
Aliamanu/Salt Lake/Foster Vill	14	1	41
Diamond Head/Kapahulu/St. Loui	6	0	33
Ewa	132	4	188
Hawaii Kai	28	2	109
Kahaluu	11	3	22
Kailua	39	3	193
Kaimuki	18	2	98
Kalihi Valley	5	0	17
Kalihi-Palama	4	0	13
Kaneohe	36	2	117
Koolauloa	28	1	28
Kuliouou-Kalani Iki	15	2	78
Liliha/Kapalama	9	2	63
Makakilo/Kapolei/Honokai Hale	59	2	123
Makiki/Lower Punchbowl/Tantalu	2	1	18
Manoa	12	2	75
Mililani Mauka-Launani Valley	16	0	36
Mililani/Waipio/Melemanu	22	1	85
Moanalua	4	0	19
Mccully/Moiliili	2	0	5
Nanakuli/Maili	45	2	64
North Shore	18	0	55
Nuuanu/Punchbowl	6	0	22
Palolo	7	0	34
Pearl City	18	0	93
Wahiawa	10	1	30
Waialae-Kahala	15	1	42
Waianae	25	0	39
Waimanalo	8	0	31
Waipahu	61	1	89

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


Map 1: Number of Building Permits Related to Battery: 2017
Residential PV plus Battery
Residential Battery
Commercial PV plus Battery
Commercial Battery
0
5
10
Miles
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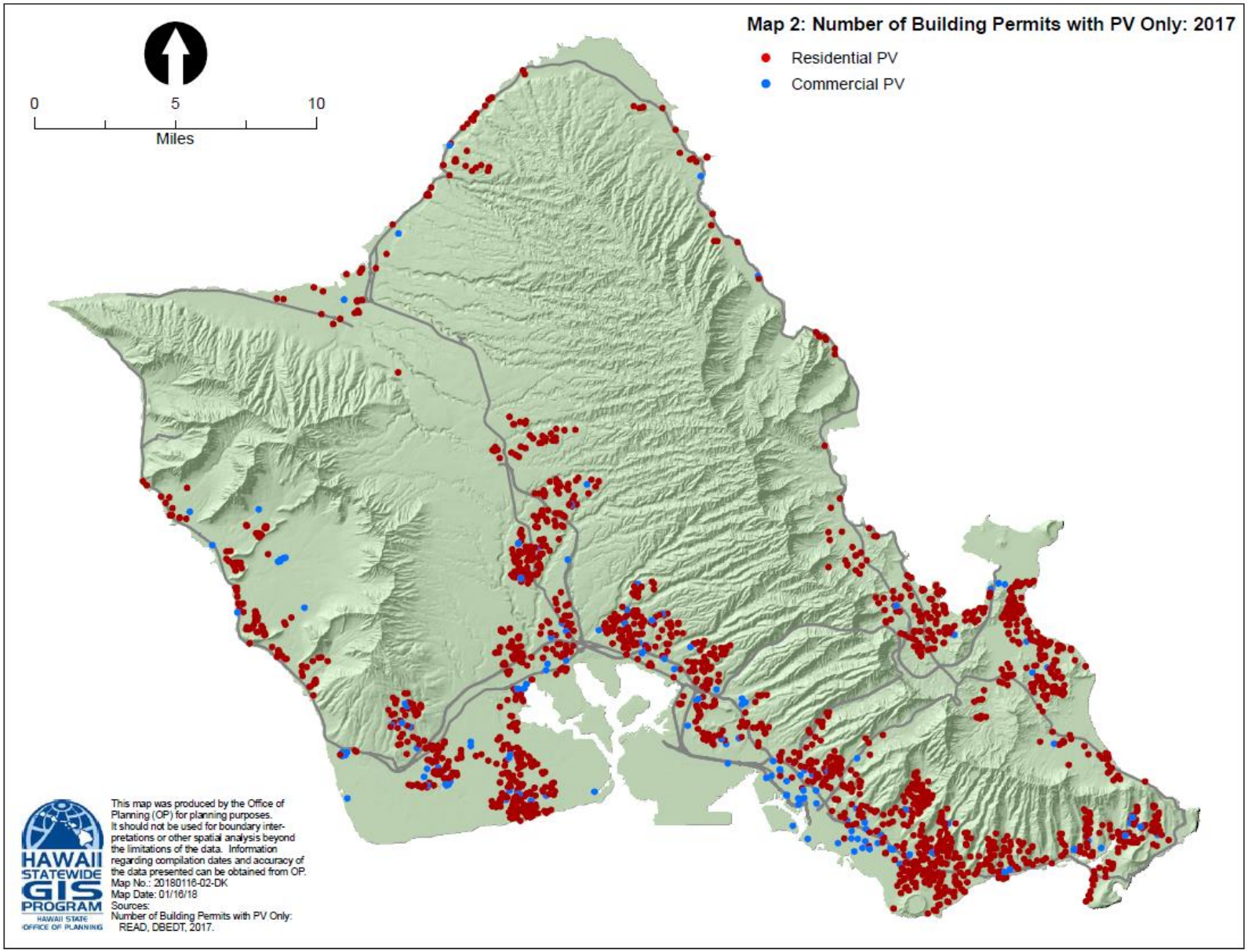
Map No.: 20180116-01-DK
Map Date: 01/16/18
Sources:
Number of Building Permits Related to Battery: READ, DBEDT, 2017.


Map 2: Number of Building Permits with PV Only: 2017
Residential PV
Commercial PV
0
5
10
Miles
HAWAII STATEWIDE GIS PROGRAM
HAWAII STATE OFFICE OF PLANNING
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Map No.: 20180116-02-DK
Map Date: 01/16/18
Sources:
Number of Building Permits with PV Only: READ, DBEDT, 2017.

Table A1: Summary of building permits related to commercial PV and battery installation in 2017

Month	PV plus battery		Battery Only		PV Only	
	Number of permits	% completed as of Dec 31, 2017	Number of permits	% completed as of Dec 31, 2017	Number of permits	% completed as of Dec 31, 2017
1	0	-	0	-	16	81%
2	0	-	0	-	15	93%
3	0	-	0	-	14	93%
4	0	-	2	100%	13	92%
5	1	100%	0	-	18	94%
6	1	100%	0	-	28	82%
7	0	-	0	-	15	60%
8	2	0%	0	-	21	52%
9	1	0%	0	-	9	78%
10	1	0%	0	-	13	62%
11	1	100%	0	-	23	35%
12	0	-	0	-	14	0%
Total	**7**	**43%**	**2**	**100%**	**199**	**69%**
Annual average permit value ($)	44,443		4,750		174,537	
Annual median permit value ($)	26,000		4,750		53,550	