

# Sterling Municipal Light Dept.



## Department of Energy Resources Community Clean Energy Resiliency Initiative

Sean Hamilton - General Manager

September 22, 2016

# Value of Energy Storage

- **Grid Resiliency-Police and Dispatch Center**
- **Smoothing Intermittent Resources**
- **Regional Network Service (RNS) -Monthly Peak**
- **Capacity Load Obligation Payments –Annual Peak**
- **Energy Arbitrage**

# Grant Timeline

- First Application \$2.8 million April 2014
- December 2014, awarded \$1.465 million
- Grant awarded to Town of Sterling
- Contract Signed October 2015
- October-April, Hired OPM, Design Engineers
- Collaborated with CESA, Sandia National Laboratories and DOE creating RFP.
- 32 RFPs packages requested, 7 returned
- 4 finalist, Interviews held, NEC Finalist

# Types of Energy Storage Technology

- **Pumped Hydro** - Using large reservoirs to create energy with water that pump during off peak hours and release during peak hours.
- **Thermal** - Using heat and cold to create energy on demand for on or off peak purposes.
- **Flywheel** - Using mechanical devices that harness rotational energy to deliver instantaneous energy.
- **Flow Batteries** - Batteries where energy is stored in the electrolyte solution for longer cycle and quick response times.
- **Solid State Batteries** - A range of electrochemical storage solutions, including advanced chemistry batteries including Lead Acid and Lithium Ion.



# Micro Grid Capable

© 2014 Google

Google

Imagery Date: 9/20/2010 42°27'00.86" N 71°44'14.78" W elev 434 ft

# SEPA Solar Watts Per Customer Comparision

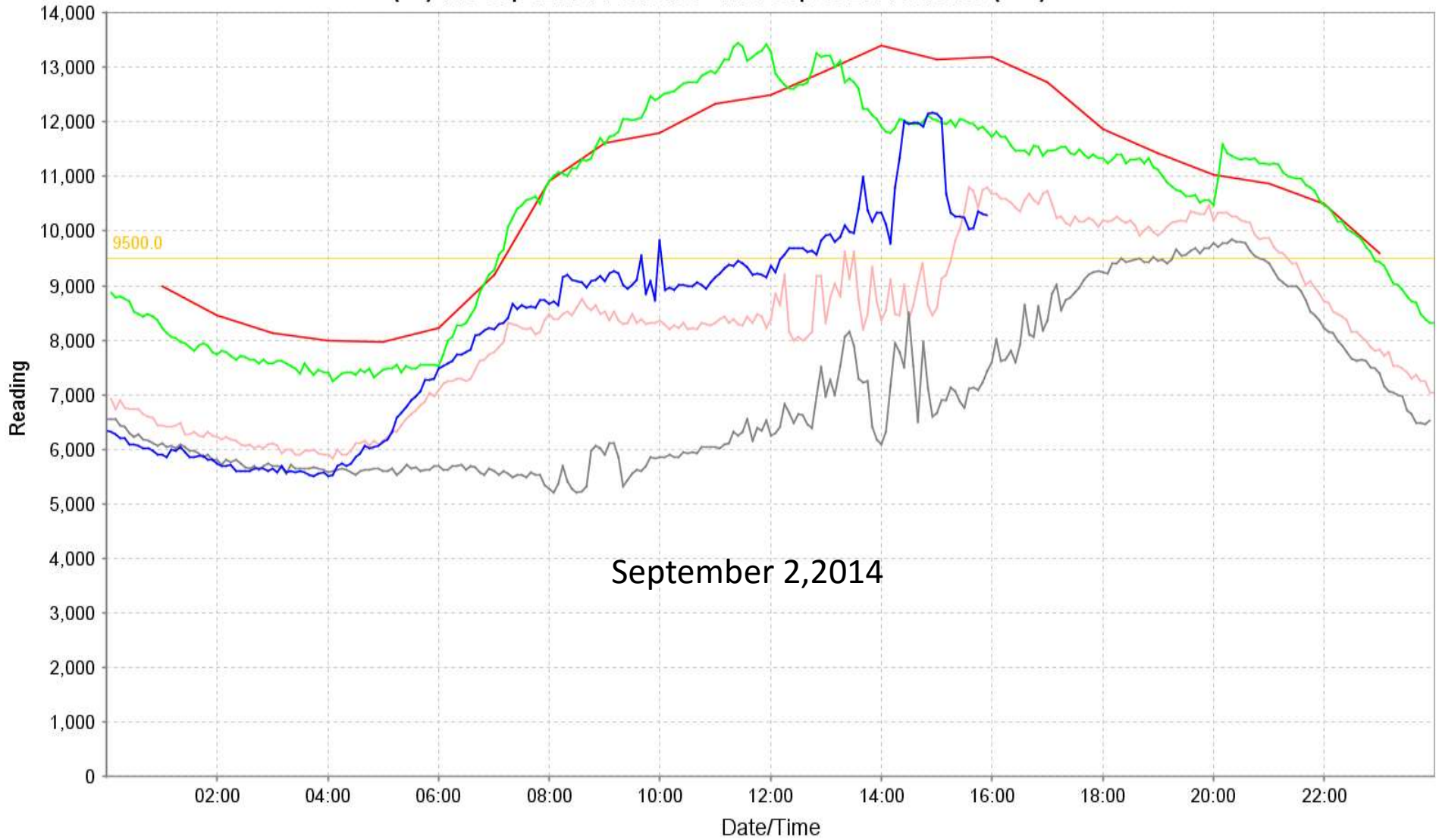
## SEPA 2013

Rank	Utility	W/C
1	Sterling Municipal Light Dept (MA).	831
2	San Diego Gas & Electric Company (CA)	461
3	Silicon Valley Power/City of Santa Clara (CA)	427
4	Arizona Public Service (AZ)	368
5	Hawaiian Electric Company, Inc. (HI)	329
6	Pacific Gas and Electric Company (CA)	281
7	Hawaii Electric Light Company (HI)	182
8	Maui Electric Company Ltd (HI)	178
9	Kauai Island Utility Cooperative (HI)	167
10	Imperial Irrigation District (CA)	159

## SEPA 2015

	Village of Minster (OH)	2,104
2	City of Palo Alto Utilities (CA)	1,846
3	Roseville Electric Utility (CA)	1,416
4	Carey Municipal Electric Utility (OH)	1,351
5	Vineland Municipal Electric Utility (NJ)	1,318
6	Ashburnham Municipal Light Plant (MA)	1,079
7	Sterling Municipal Light Department (MA)	848
8	Imperial Irrigation District (CA)	750
9	Guam Power Authority (GU)	710
10	Silicon Valley Power (CA)	613

**System Demand**  
( > ) Tue Sep 02 2014 00:00:00 - Wed Sep 03 2014 00:00:00 ( <= )



- Today System Total KW L
- 2011 Coincident Peak 1.975MW SHD [Fri Jul 22 2011] L
- Yesterday System Total KW [Mon Sep 01 2014] L
- August 2013 Peak [Wed Aug 28 2013] L
- System Peak KW [Wed Aug 02 2006] L
- Threshold L

## Final Real-Time Locational Marginal Prices (\$/MWh) 9/2/2014

Hour	HUB	WCMA	NEMA	SEMA	CT	RI	NH	VT	ME
1	44.23	44.35	44.48	44.03	44.40	44.39	43.85	43.75	41.88
2	38.15	38.31	38.22	37.84	38.36	38.17	37.74	37.75	36.11
3	32.98	33.11	33.01	32.68	33.09	32.96	32.67	32.54	31.54
4	28.23	28.34	28.26	28.01	28.26	28.19	28.02	27.90	27.13
5	28.06	28.19	28.07	27.83	28.17	27.97	27.89	27.81	26.98
6	32.97	33.10	32.98	32.67	33.11	33.09	32.86	32.82	31.77
7	37.33	37.46	37.49	37.03	37.51	37.24	37.44	37.29	36.38
8	40.87	40.99	41.07	40.62	41.05	40.90	41.01	40.86	39.96
9	35.01	35.09	35.25	36.10	35.06	41.63	35.25	34.96	34.33
10	45.85	45.99	46.13	46.51	46.09	50.20	46.07	45.92	44.34
11	73.81	74.12	74.15	73.39	74.69	73.55	74.11	74.15	71.31
12	89.80	90.11	90.35	89.45	93.48	89.51	90.14	89.86	86.67
13	185.70	186.25	187.11	185.44	190.47	185.53	186.15	184.95	178.01
14	554.71	555.62	560.77	555.12	558.00	555.55	555.69	551.95	530.00
15	206.54	206.72	209.37	207.47	308.93	207.60	206.72	205.66	196.51
16	70.45	70.57	71.51	70.86	158.68	70.91	70.15	70.67	65.38
17	86.23	86.34	87.48	86.72	168.94	86.71	85.96	86.14	80.60
18	133.90	134.22	135.05	134.18	174.45	134.14	133.38	133.73	126.21
19	72.92	73.14	73.35	72.90	107.74	72.81	72.65	73.38	68.10
20	75.16	75.35	75.60	75.14	82.61	75.08	75.14	75.41	71.28
21	74.36	74.62	74.61	74.20	75.75	73.96	74.14	74.76	70.18
22	55.07	55.27	55.32	54.86	55.76	54.56	54.81	54.91	52.16
23	38.60	38.75	38.82	38.36	39.02	38.21	38.48	38.42	36.99
24	54.55	54.76	54.98	54.15	55.00	54.01	54.41	54.12	52.48
AVG	88.98	89.20	89.73	88.98	104.53	89.45	88.95	88.74	84.85
On Peak AVG	114.94	115.20	116.00	115.08	138.17	115.68	114.99	114.73	109.50
Off Peak AVG	37.06	37.20	37.19	36.78	37.24	37.00	36.86	36.75	35.53



# 2015 SOLAR MARKET SNAPSHOT

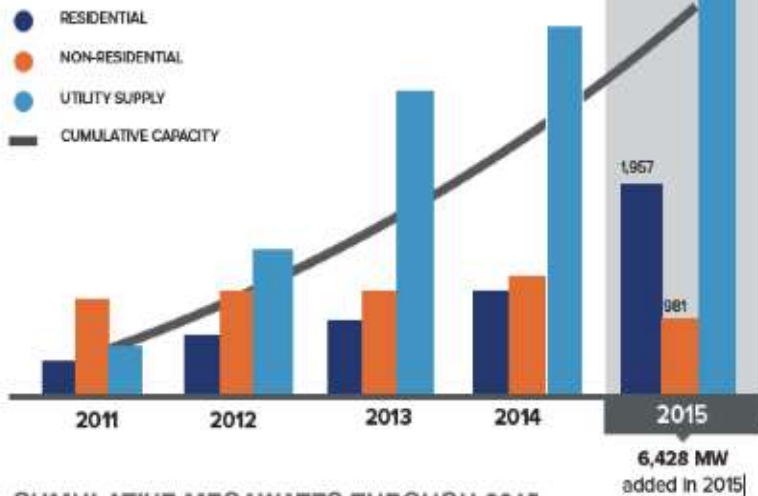


Made possible in part by:

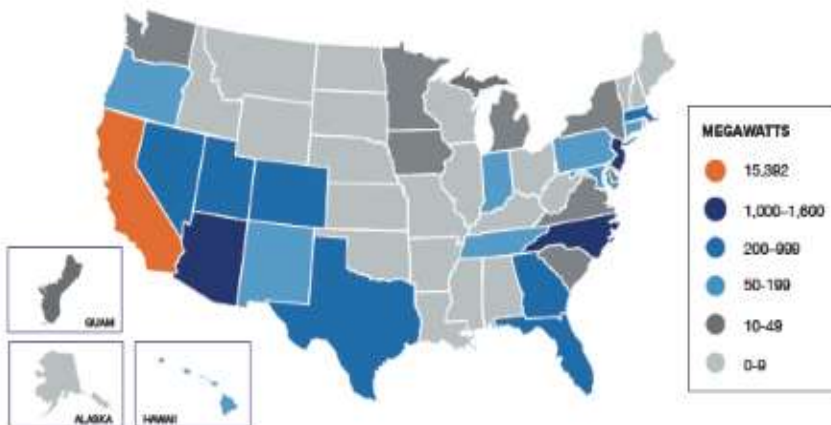


## U.S. SOLAR CAPACITY

MEGAWATTS BY YEAR, 2011-2015



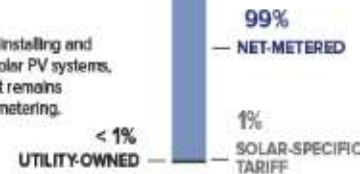
CUMULATIVE MEGAWATTS THROUGH 2015



## 1,957 MW (2015) RESIDENTIAL

321,758 TOTAL SYSTEMS  
5.8kW AVERAGE SYSTEM SIZE

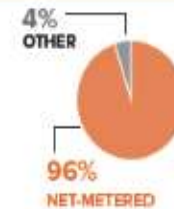
**SUMMARY**  
Utilities have begun installing and owning residential solar PV systems, but this arrangement remains nascent next to net metering.



## 981 MW (2015) NON-RESIDENTIAL

12,521 TOTAL SYSTEMS  
80.9 kW AVERAGE SYSTEM SIZE

**SUMMARY**  
There is somewhat more diversity in compensation for non-residential installations, but net metering remains the dominant mechanism.



## 3,490 MW (2015) UTILITY SUPPLY

1,494 TOTAL SYSTEMS

**SUMMARY**

Overall capacity for utility supply solar tracked similar to 2014, but there has been an emergence of merchant (wholesale) plants and utility-owned generation in contrast to the popular power purchase agreement.



## NET METERING REFORM



Respondents implementing, researching, or expressing interest in net metering reforms.

## COMMUNITY SOLAR

85

UTILITIES

currently have

ACTIVE

Community Solar Programs.



2 OUT OF 3

Respondents are currently

RESEARCHING OR PLANNING

their own community solar programs.

# Special Thanks to :

- SMLD Commissioners - For their support of this project.
- Town of Sterling - For their continued support
- Judith Judson-Ma. DOER Commissioner
- Dr. Imre Gyuk - U.S. Dept of Energy, Energy Storage Program Director.
- Sandia National Laboratories - Daniel Borneo PE., Dr. Raymond Byrne
- Todd Olinsky-Paul- Director of CEG and CESA.
- MMWEC - Market Analysis
- Jared Carpenter, Jim Frawley-Grant Technical Information