RESILIENTPOWER

A project of CleanEnergyGroup

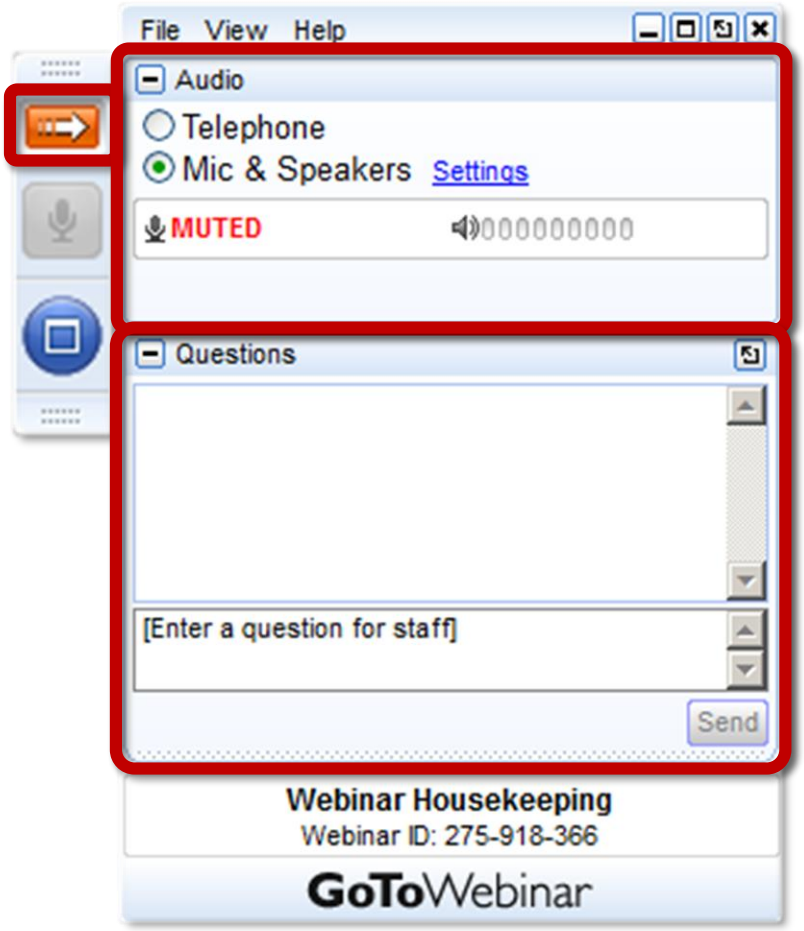
ESyst: Optimizing Energy Storage Savings with Geli's New Online Tool

May 24, 2017

CleanEnergyGroup

Innovation in Finance, Technology & Policy

Housekeeping



Use the red arrow to open and close your control panel

Join audio:

- Choose Mic & Speakers to use VoIP
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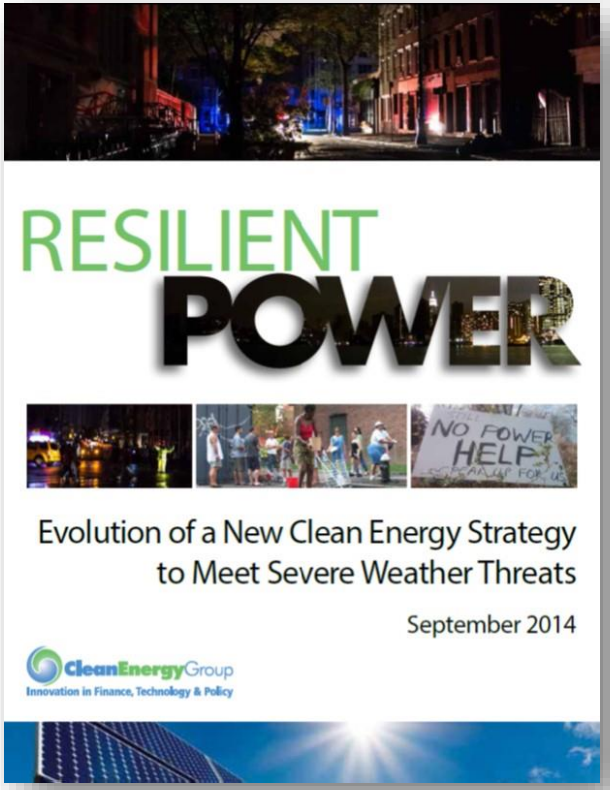
Submit questions and comments via the Questions panel

This webinar is being recorded. We will email you a webinar recording within 48 hours. Resilient Power Project webinars are archived online at: www.resilient-power.org

Who We Are



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Meridian Institute
Connecting People to Solve Problems

CleanEnergy States Alliance

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THE KRESGE FOUNDATION

www.cleanegroup.org

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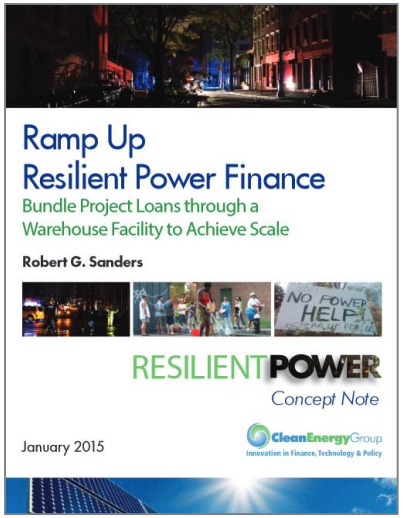
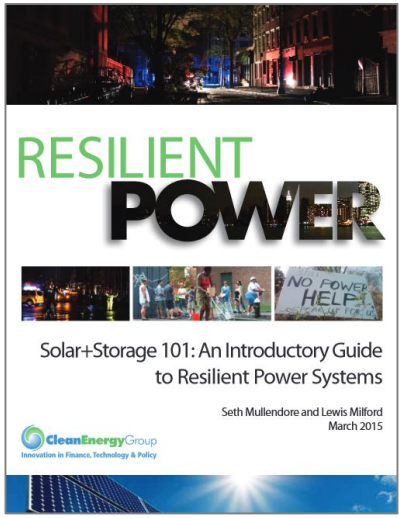
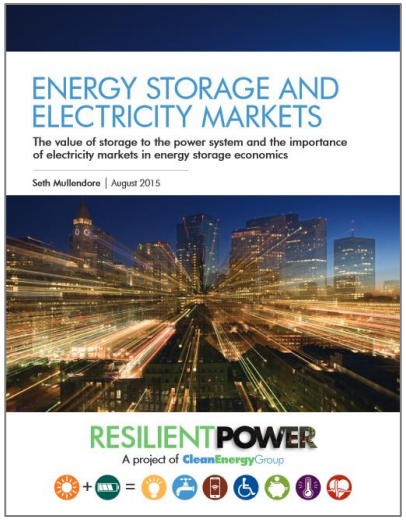
SURDNA FOUNDATION
Fostering sustainable communities in the United States

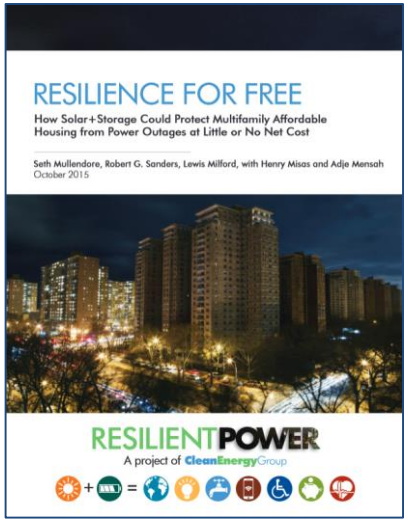
Resilient Power Project

- Increase public/private investment in clean, resilient power systems
- Engage city officials to develop resilient power policies/programs
- Protect low-income and vulnerable communities
- Focus on affordable housing and critical public facilities
- Advocate for state and federal supportive policies and programs
- Technical assistance for pre-development costs to help agencies/project developers get deals done
- See www.resilient-power.org for reports, newsletters, webinar recordings









www.resilient-power.org

Speakers

Andrew Krulewitz
Dir. Marketing & Strategy
Geli

Seth Mullendore
Project Director
Clean Energy Group

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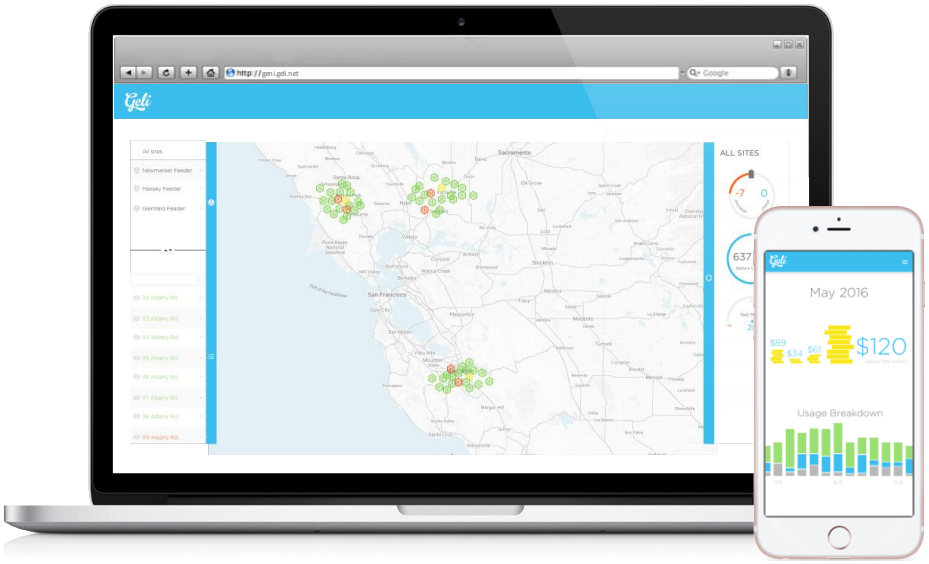
About Geli

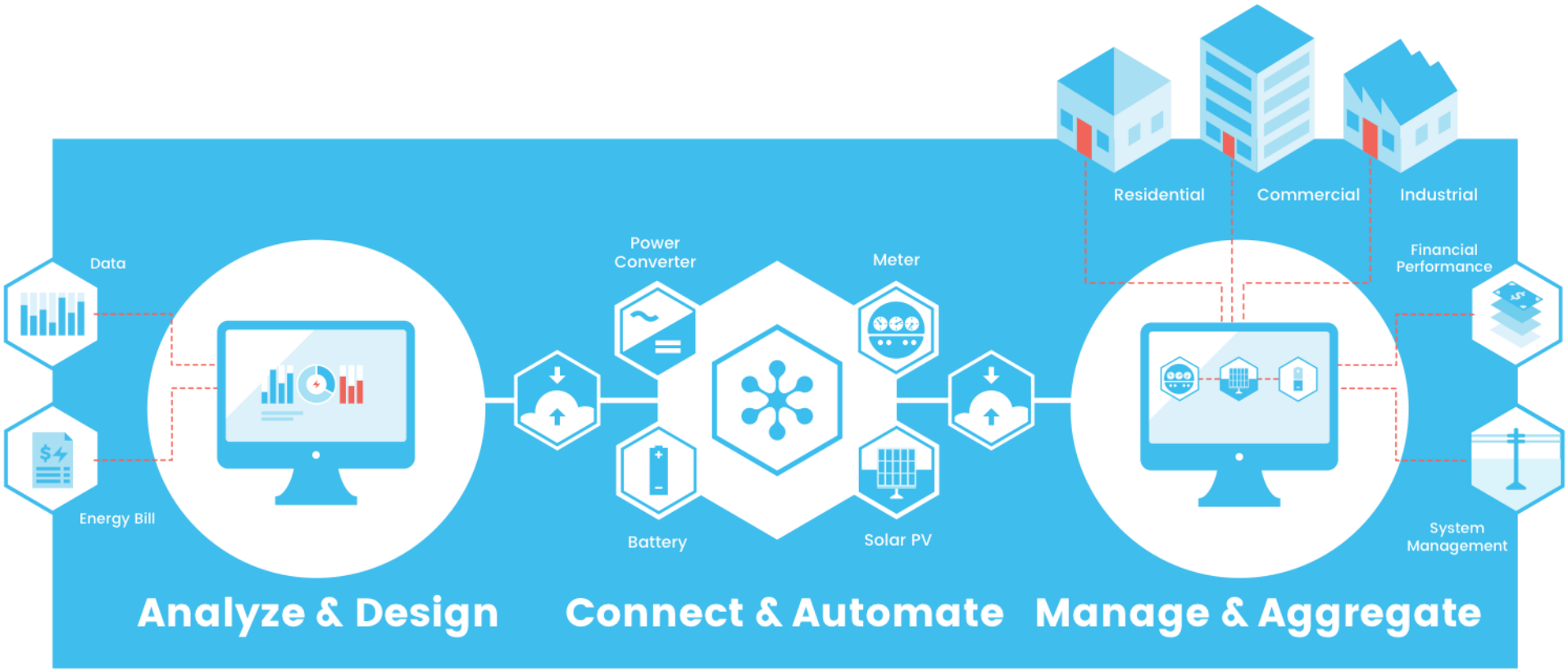
Software that maximizes the value of energy storage

Geli's solutions enable many types of service providers – from developers to utilities – to deliver intelligent energy storage systems.

Our products speed time-to-market and reduce costs for all industry participants.

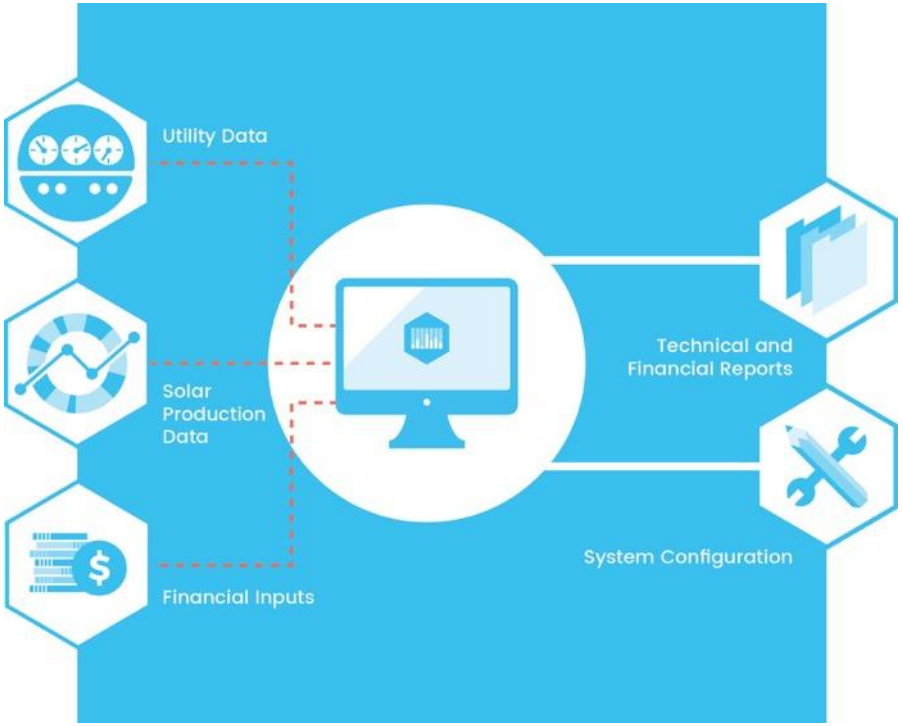


Geli Platform



Analyze & Design: Geli ESyst

Geli Esyst is a free web-based design tool to aid project developers in right-sizing and selecting energy storage and solar-plus-storage systems for commercial and industrial facilities.



Create your free account at esyst.geli.net

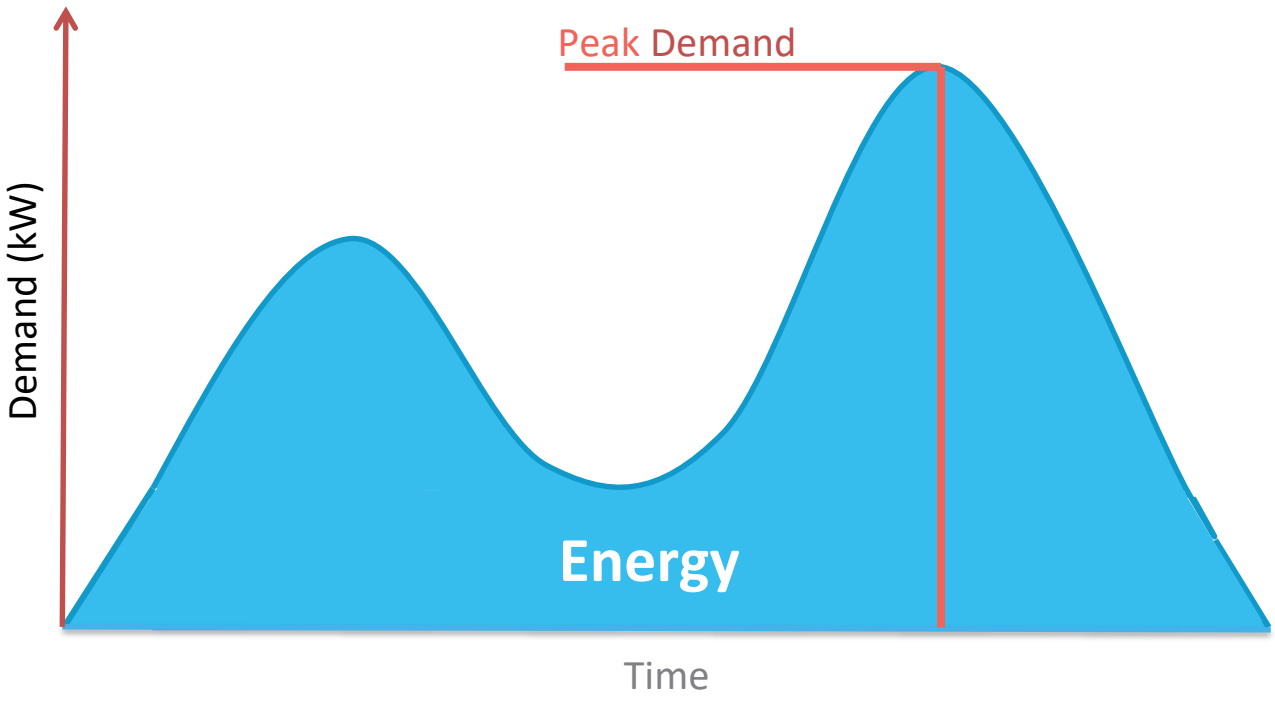
Energy & Demand

Energy (kWh)

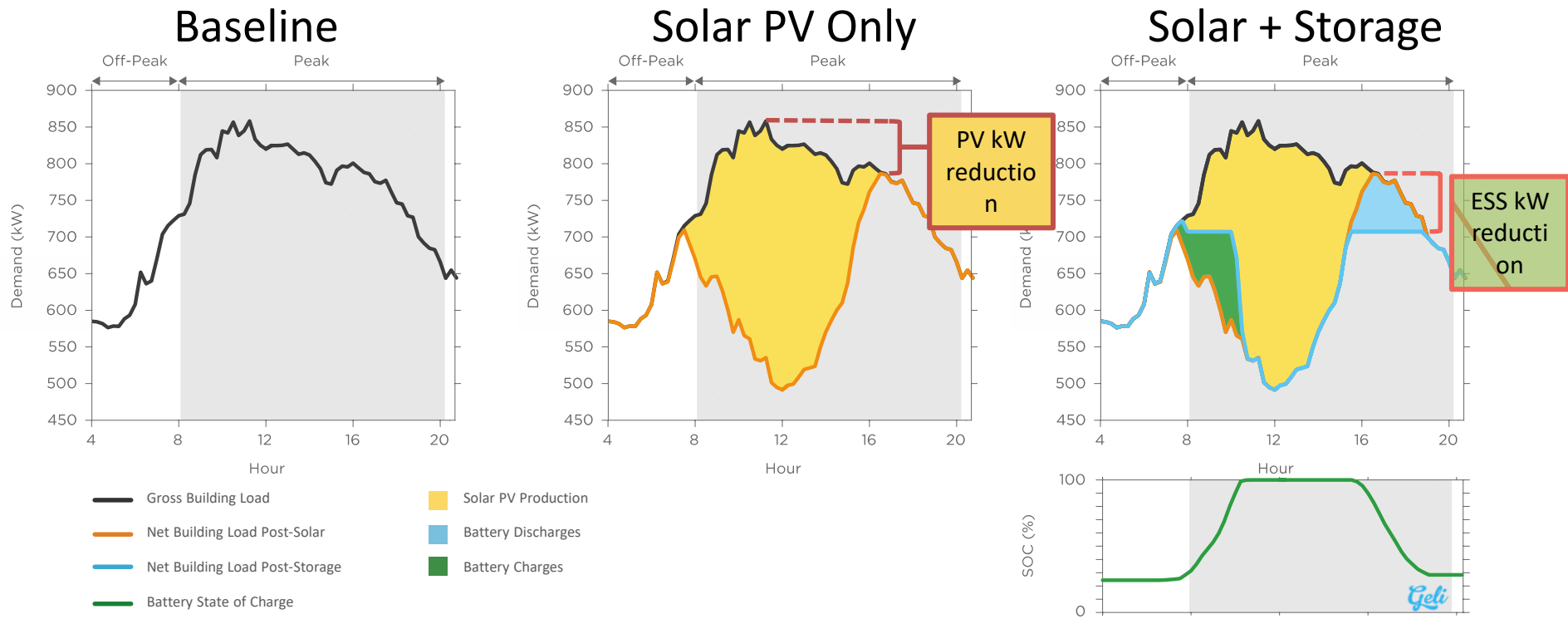
Energy is a measure of the amount of power (kW) consumed over a specific period of time (in this case, hours)

Demand (kW)

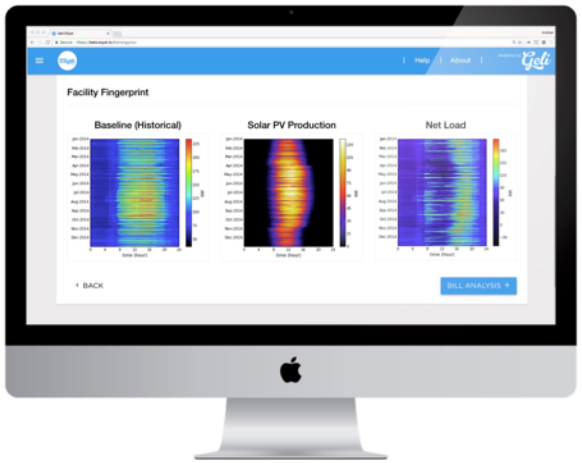
Demand corresponds to instantaneous power (kW) consumed and is typically measured as the average of a 15 minute period



Solar + Storage: Why 1 + 1 = 3



ESyst Demo



Key inputs:

Utility bill

Interval Data

Solar PV Data

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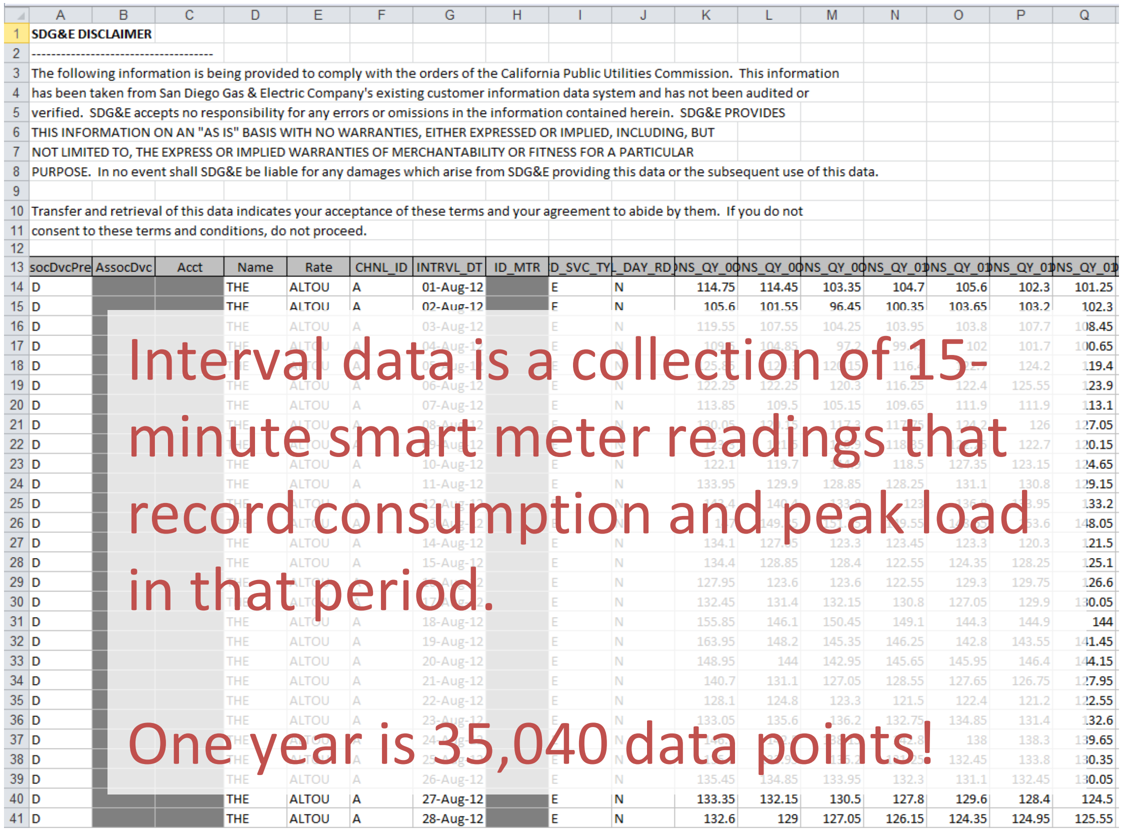
Interval Data

What is it?



Interval data is a collection of 15-minute smart meter readings that record consumption and peak load in that period.

One year is 35,040 data points!

Where to get it?

- Utility website
- Green Button
- UtilityAPI

Case Study: Property Details

50-Unit Affordable Housing Property

Location: **Whittier, California**
Utility: **Southern California Edison**

Solar: **49 kW DC**

Case Study: Utility Rate Tariff

TOU-GS-2-B

time-of-use rate with demand charges for commercial customers with peak demand between 20kW and 200kW

energy ($/kilowatt hours)

TOU Periods	Season	Cost
partial peak	summer	$0.08
	winter	$0.08
on peak	summer	$0.12
off peak	summer	$0.06
	winter	$0.07

demand ($/kilowatts)

TOU Periods	Season	Cost
monthly max	summer	$15.48
	winter	$15.48
on peak	summer	$17.32
partial peak	summer	$3.38

ESyst Site Analysis Report

Geli

SCE Multifamily Housing

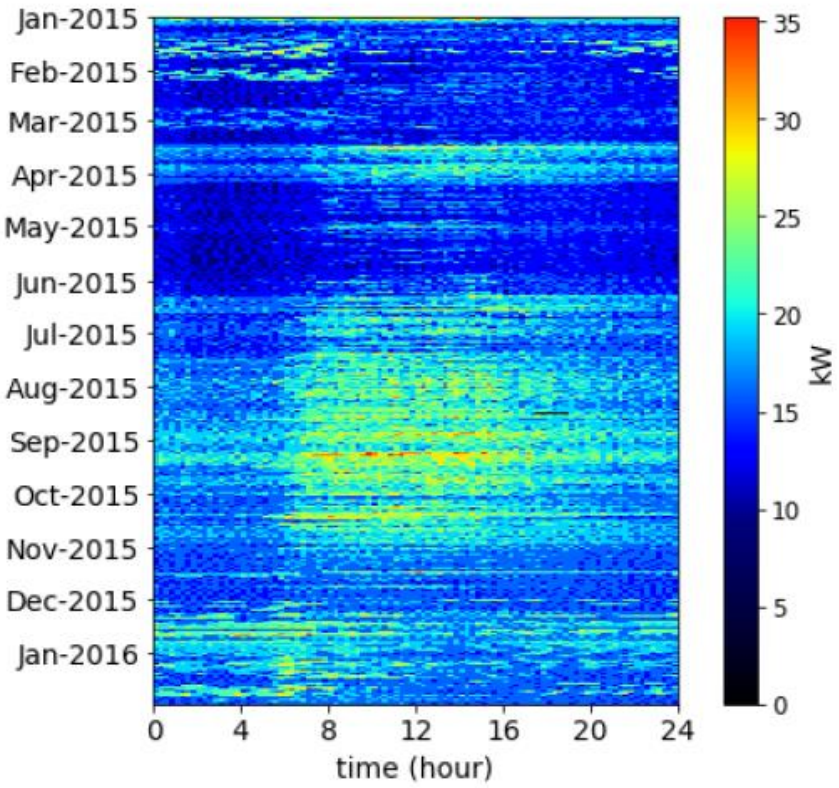
ESyst Site Analysis Report

Multifamily Affordable Housing

, CA, 90602

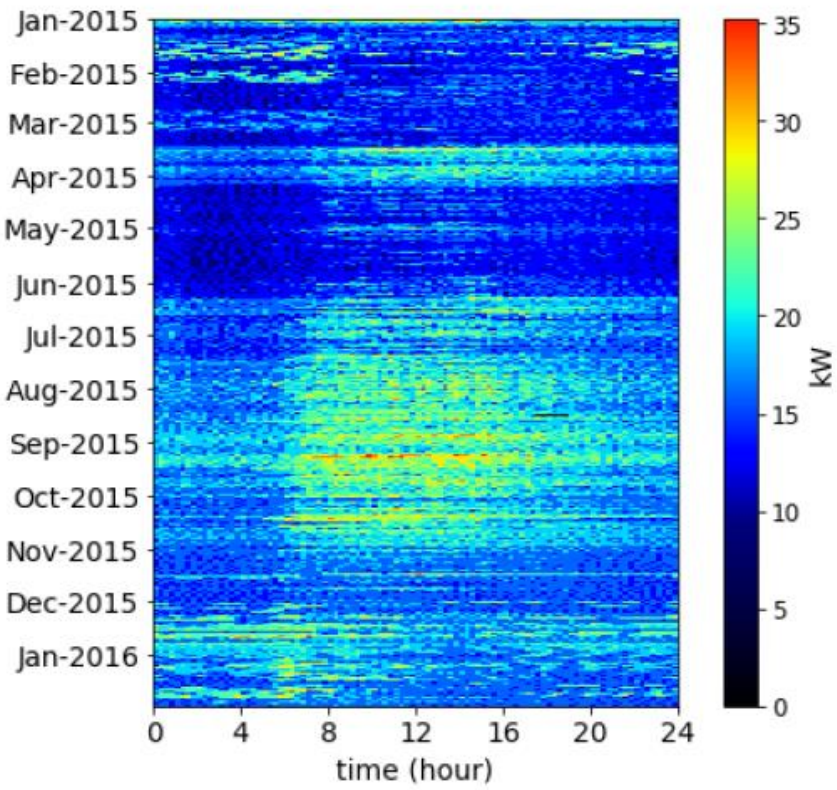
Load Analysis: Heat Maps

Baseline

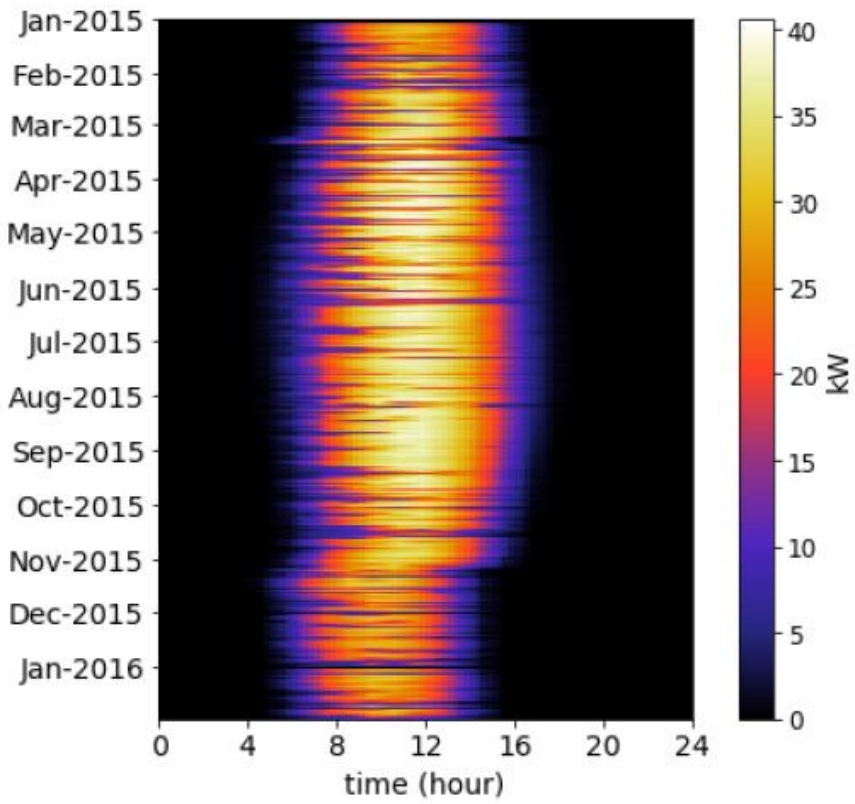


Load Analysis: Heat Maps

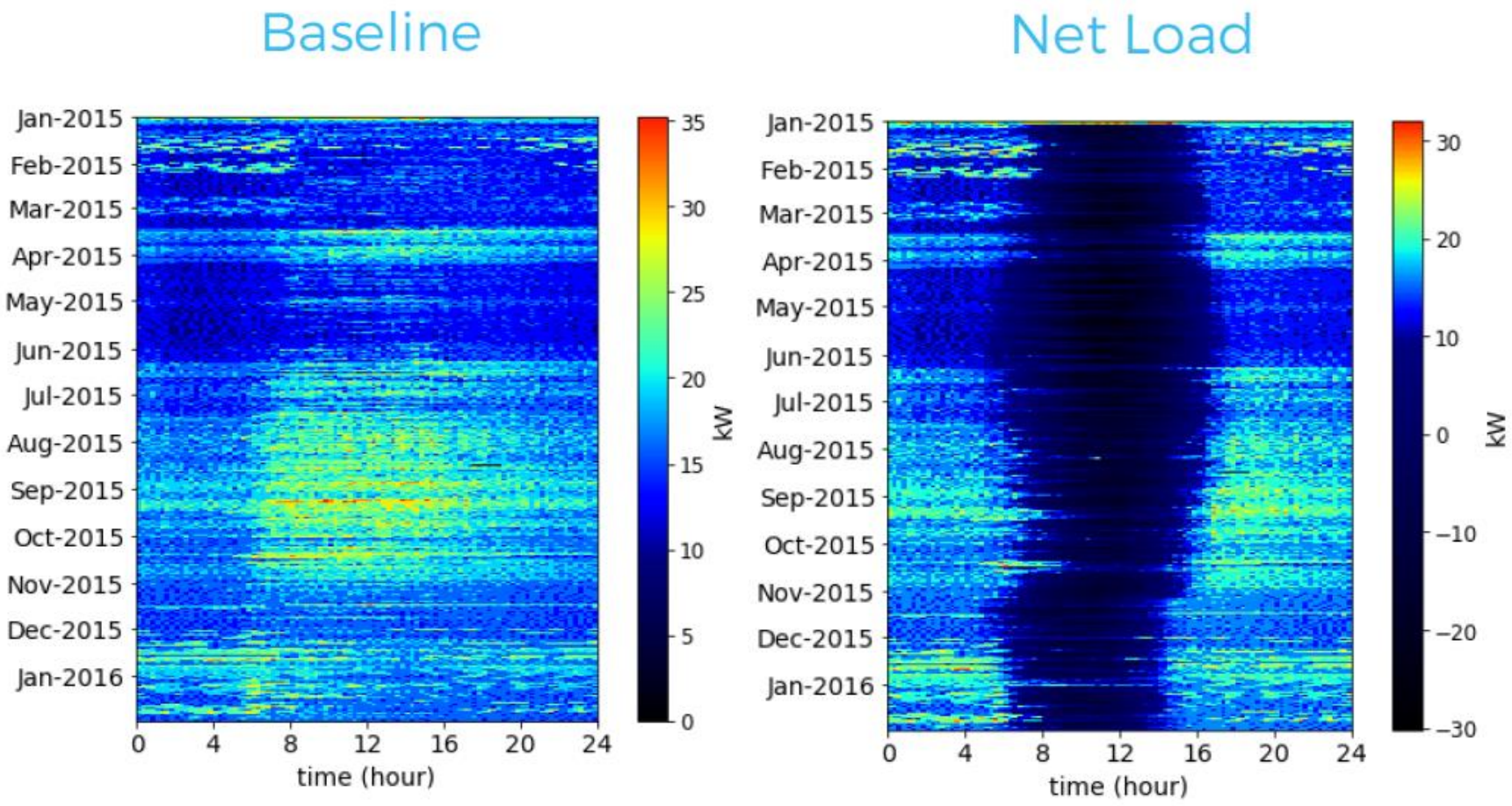
Baseline



Solar



Load Analysis: Heat Maps



Site Analysis: Baseline

	Net Energy (kWh)			Max Demand (kW)			Charges *			
Season	off peak	on peak	partial peak	monthly max	on peak	partial peak	Energy	Demand	Fixed	Total
winter	6,287	0	4,489	32	0	0	$757	$495	$209	$1,461
winter	5,094	0	3,650	26	0	0	$614	$396	$209	$1,219
winter	6,830	0	4,695	32	0	0	$808	$495	$209	$1,513
winter	5,124	0	4,207	26	0	0	$658	$396	$209	$1,264
winter	4,814	0	3,904	26	0	0	$615	$396	$209	$1,220
summer	6,209	2,336	3,302	32	32	26	$905	$1,136	$209	$2,250
summer	6,575	2,642	3,743	32	32	29	$997	$1,146	$209	$2,353
summer	7,090	2,832	3,950	32	32	29	$1,066	$1,146	$209	$2,422
summer	7,380	3,096	4,283	35	35	35	$1,141	$1,273	$209	$2,624
winter	7,299	0	6,159	32	0	0	$951	$495	$209	$1,655
winter	7,000	0	3,988	32	0	0	$766	$495	$209	$1,470
winter	7,919	0	5,254	32	0	0	$923	$495	$209	$1,627
winter	7,151	0	4,878	32	0	0	$843	$495	$209	$1,548
	84,771	10,906	56,502				$11,049	$8,864	$2,717	$22,631

Proposed Solution

Solar PV

49.0 kW

Energy Storage

30kW / 60kWh

Battery Supplier

LG Chem

Inverter Supplier

Ideal Power

Software Supplier

Geli

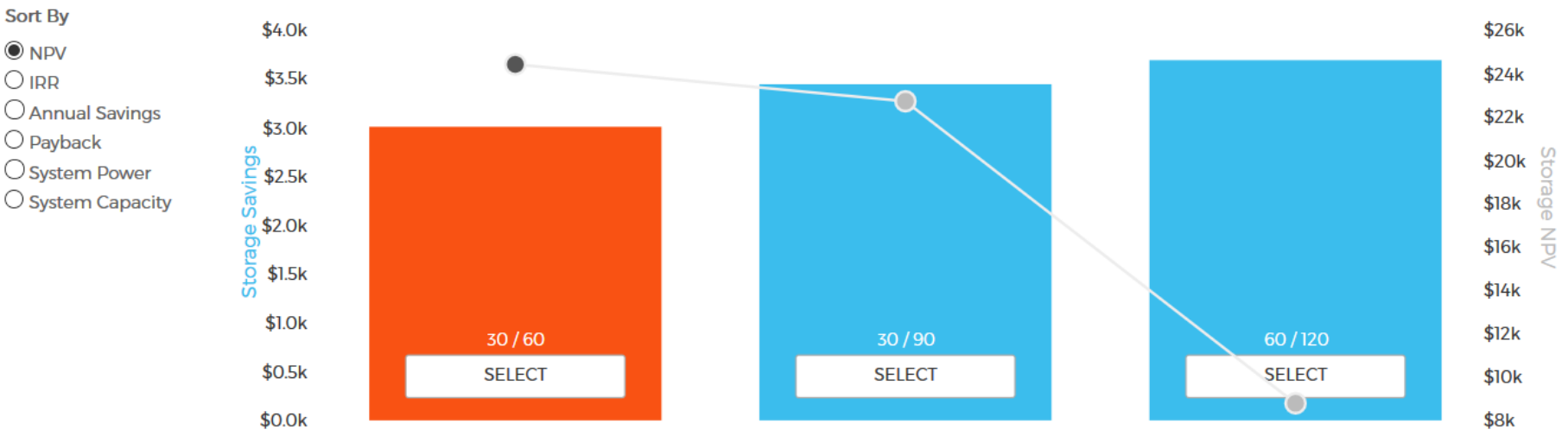
Model

Ideal Power-LG Chem

System Supplier

Ideal Power-LG Chem

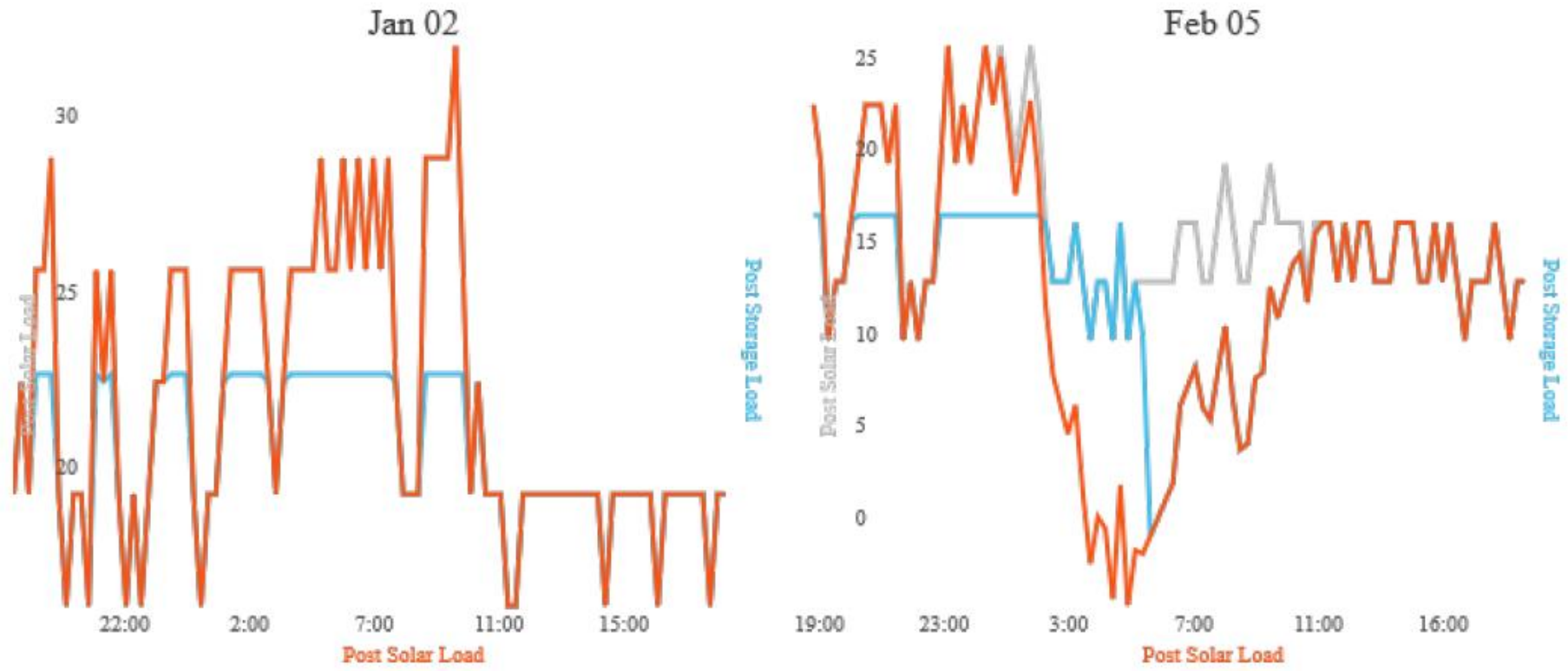
Energy Storage Selection



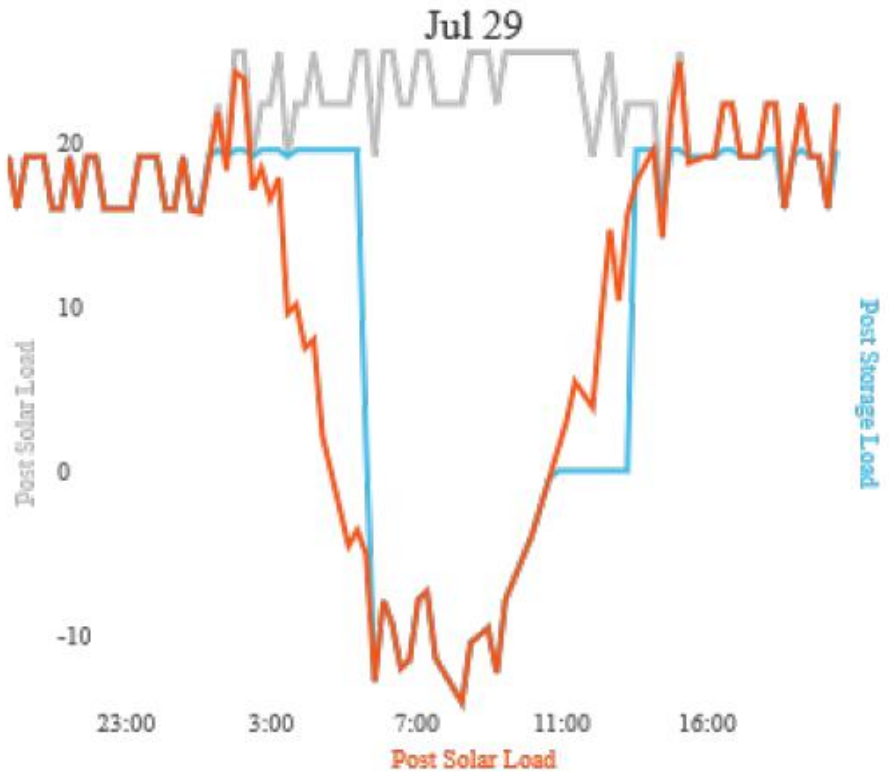
+ Solar + Storage Financial Performance

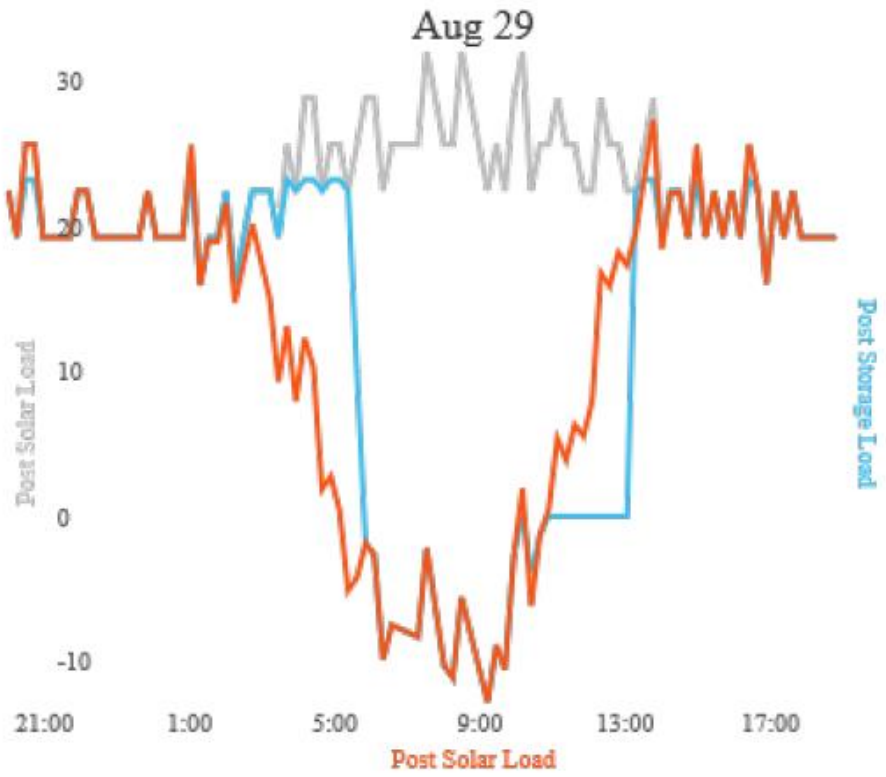
Solar + Storage Payback (Yrs)	6.7	7.1	7.9
Solar + Storage NPV	$58,752	$56,552	$41,430
Solar + Storage IRR (%)	11.3	10.6	9.2

Load Estimate: Winter



Load Estimate: Summer





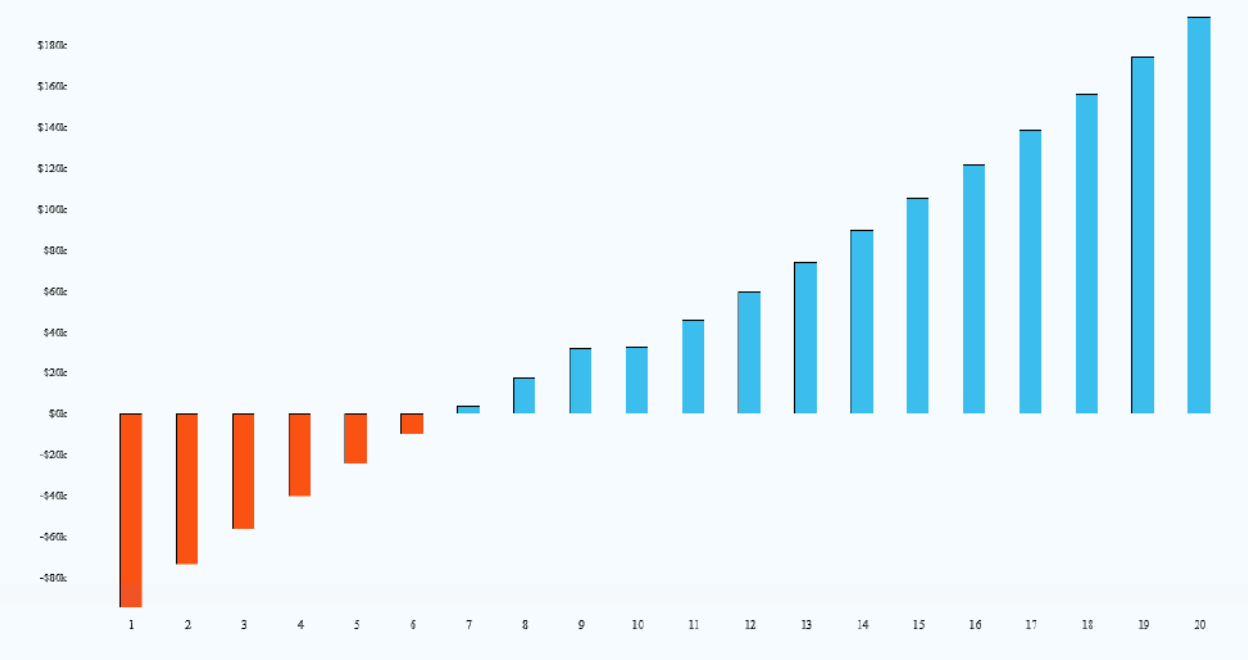
Site Analysis: Post Solar+Storage

	Net Energy (kWh)			Max Demand (kW)			Charges *			
Season	off peak	on peak	partial peak	monthly max	on peak	partial peak	Energy	Demand	Fixed	Total
winter	4,793	0	1,431	23	0	0	$425	$350	$209	$984
winter	3,414	0	219	16	0	0	$242	$253	$209	$705
winter	4,203	0	304	19	0	0	$300	$287	$209	$797
winter	2,789	0	-1,033	14	0	0	$105	$218	$209	$533
winter	2,870	0	-1,352	11	0	0	$86	$172	$209	$467
summer	3,580	-1,010	1,497	22	1	22	$213	$433	$209	$856
summer	4,182	-1,006	1,527	20	0	20	$252	$369	$209	$831
summer	4,578	-771	2,179	23	0	23	$355	$437	$209	$1,001
summer	5,302	-377	2,608	23	5	23	$478	$509	$209	$1,197
winter	5,661	0	1,718	20	0	0	$504	$307	$209	$1,021
winter	4,976	0	1,067	19	0	0	$409	$287	$209	$906
winter	6,411	0	2,359	22	0	0	$603	$334	$209	$1,146
winter	5,635	0	1,963	20	0	0	$521	$306	$209	$1,037
	58,396	-3,164	14,489				$4,500	$4,270	$2,717	$11,487

Site Analysis: Post Solar+Storage

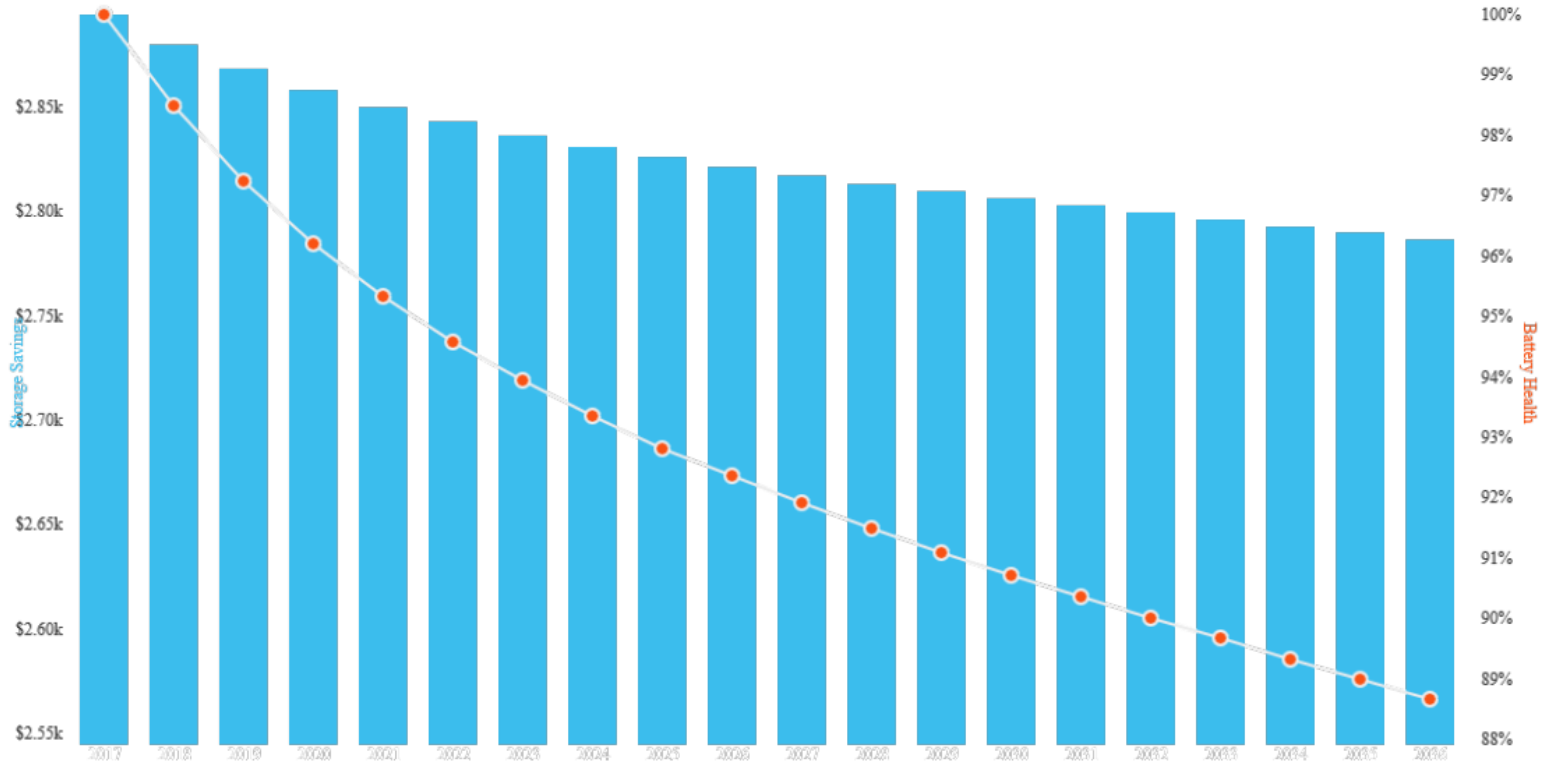
	Energy	Demand	Fixed	Total
Baseline	$11,049	$8,864	$2,717	$22,631
Solar+ Storage	$4,500	$4,270	$2,717	$11,487
Savings	**$6,549**	**$4,594**	**$0**	**$11,144**

Projected Lifetime Savings



Year 1 Annual Savings	$11,109
Gross Lifetime Savings	$942,945
Net Present Value of Investment	$58,752
Project Payback	6.74 years

Battery Health



With every project simulation Geli Esyst generates a battery health model. Combining anticipated lifetime battery cycles, charge and discharge rates, and OEM-supplied degradation curves enables Geli to predict what the economic impact will be as the effective capacity of the battery decreases over time.

Battery warranties vary by vendor and can be tied to years, number of cycles, or both.

Financial Model: Simulation Output

YEAR		1	2	3	4	5
ESS System Cycles	#	54	54	54	54	54
ESS Battery Health	%	100.00%	98.49%	97.24%	96.21%	95.33%
ESS Effective Capacity	kWh	60	59	58	58	57
ENERGY						
Solar PV Consumed On-Site	kWh	56,621	56,338	56,056	55,776	55,497
Solar PV Exported to Grid / Curtailed	kWh	21,699	21,591	21,483	21,375	21,268
Total Solar PV Generation	kWh	78,320	77,928	77,539	77,151	76,765
Savings from Solar PV Consumed On-Site	$/yr	$ 4,477	$ 4,455	$ 4,432	$ 4,410	$ 4,388
Savings from Solar PV Exported to Grid	$/yr	$ 1,725	$ 1,716	$ 1,708	$ 1,699	$ 1,691
Total Solar PV Generation Savings	$/yr	6,202	6,171	6,140	6,109	6,079
ESS Energy Savings (Cost)**	$/yr	$ 31	$ 32	$ 33	$ 33	$ 34
Total Energy Savings	$/yr	6,233	6,203	6,173	6,142	6,113
DEMAND						
ESS Demand Charge Savings	$/yr	$ 2,863	$ 2,848	$ 2,836	$ 2,825	$ 2,816
PV Demand Charge Savings	$/yr	$ 1,586	$ 1,578	$ 1,570	$ 1,562	$ 1,554
Demand Savings from post-PV tariff Switch	$/yr	$ 0	$ 0	$ 0	$ 0	$ 0
Total Demand Savings	$/yr	$ 4,449	$ 4,426	$ 4,406	$ 4,387	$ 4,370
FIXED CHARGE						
Fixed Charge Savings from post-PV Tariff Switch	$/yr	$ 0	$ 0	$ 0	$ 0	$ 0
Total Annual Savings	$/yr	$ 10,682	$ 10,629	$ 10,579	$ 10,529	$ 10,483

Financial Model: CAPEX

CAPEX ASSUMPTIONS		
Solar PV		
Array Size	kW DC	49
Solar PV Hardware Cost	$/W	$ 1.50
Solar PV Soft Costs	$/W	$ 1.50
Solar PV Cost per Watt	$/W	$ 3.00
Solar PV CAPEX (without sales tax)	$	$ 147,000
Energy Storage		
Rated Power	kW	30
Rated Capacity	kWh	60
Energy Storage Hardware Cost	$/kWh	$ 600
Energy Storage Soft Costs	$/kWh	$ 200
Energy Storage Cost per kWh	$/kWh	$ 800
Energy Storage CAPEX (without sales tax)	$	$ 47,999
Total Upfront Cost		
Total System Hardware Cost	$	$ 109,500
Total System Soft Cost	$	$ 85,499
State Sales Tax	%	7.50%
City/County Sales Tax	%	0.00%
Total System Upfront Cost	$	$ 203,211

Financial Model: OPEX

OPEX ASSUMPTIONS		
Solar PV		
PV Annual O&M Cost per kW Est.	$/kW/yr	$ 25
PV Total OPEX	$/yr	$ 1,225
PV OPEX Escalator	%	3.00%
Panel Degradation (Annual)	%	0.50%
Inverter Replacement Year	yr	10
Inverter Cost	$/W	$ 0.25
Energy Storage		
ESS Est. Annual O&M Cost per kW	$/kW/yr	$ 20
ESS Total OPEX	$/yr	$ 600
ESS OPEX Escalator	%	3.00%
Battery Replacement Threshold (Percent of Start-of-life Capacity)	%	80.00%
Battery Replacement Cost Est.	$/kWh	$ 150
Total Annual OPEX	$	$ 1,825

Financial Model: Inputs & Incentives

COMMERCIAL & FINANCIAL INPUTS		
Project Term	yrs	20
Taxable Entity	True/False	TRUE
Tax on Incentive	True/False	FALSE
Tax on Savings	True/False	FALSE
Federal Corporate Income Tax	%	35.00%
State Corporate Income Tax	%	8.84%
Combined Income Tax	%	40.75%
Discount Rate	%	6.00%
Depreciation Schedule (Federal)	selection	5-year Bonus MACRS
Depreciation Schedule (State)	selection	Straight-Line
Utility Tax	%	4.00%
Energy Charge Escalator	%	3.00%
Demand Charge Escalator	%	5.50%
FEDERAL TAX INCENTIVE		
ITC on Storage System	True/False	TRUE
ITC Rate	22.5% - 30%	30.00%
ITC Value	$	$ 60,963

Financial Model: Project Payback

YEAR		0	1	2	3	4	5
Revenue from Energy Savings			$ 6,482	$ 6,645	$ 6,811	$ 6,980	$ 7,155
Revenue from Demand Charge Savings			$ 4,627	$ 4,856	$ 5,100	$ 5,357	$ 5,630
Revenue from Demand Savings from post-PV Tariff Switch			$ 0	$ 0	$ 0	$ 0	$ 0
Revenue from Fixed Charge Savings from post-PV Tariff Switch			$ 0	$ 0	$ 0	$ 0	$ 0
Total Annual Revenue			$ 11,109	$ 11,501	$ 11,911	$ 12,338	$ 12,786
Solar PV O&M Cost			-$ 1,225	-$ 1,262	-$ 1,300	-$ 1,339	-$ 1,379
Energy Storage O&M Costs			-$ 600	-$ 618	-$ 637	-$ 656	-$ 675
Solar PV Inverter Replacement			$ 0	$ 0	$ 0	$ 0	$ 0
Battery Replacement			$ 0	$ 0	$ 0	$ 0	$ 0
Total Annual O&M Costs			-$ 1,825	-$ 1,880	-$ 1,936	-$ 1,994	-$ 2,054
SGIP Rebate			$ 0	$ 0	$ 0	$ 0	$ 0
Total Annual Rebate			$ 0	$ 0	$ 0	$ 0	$ 0
EBITDA			**$ 9,284**	**$ 9,621**	**$ 9,975**	**$ 10,344**	**$ 10,731**
Income Tax			$ 0	$ 0	$ 0	$ 0	$ 0
Investment Tax Credit			$ 60,963	$ 0	$ 0	$ 0	$ 0
State Depreciation Tax Savings			$ 1,796	$ 1,796	$ 1,796	$ 1,796	$ 1,796
Fed Depreciation Tax Savings			$ 36,273	$ 9,673	$ 5,804	$ 3,482	$ 3,482
Total Tax Benefit (Cost)			$ 99,032	$ 11,469	$ 7,600	$ 5,278	$ 5,278
Annual Cash Flow		-$ 203,211	$ 108,317	$ 21,090	$ 17,575	$ 15,622	$ 16,009
Cumulative Cash Flow		-$ 203,211	-$ 94,895	-$ 73,805	-$ 56,229	-$ 40,608	-$ 24,598
Payback			1.00	1.00	1.00	1.00	1.00
EST. FINANCIAL OUTCOME							
Payback	yr		6.74				
Net Present Value	$		$ 58,754				
Internal Rate of Return	%		11.32%				

We're Here to Help

Confused?
Not sure how to get started?

Let us know.

Clean Energy Group is offering free ESyst training and analysis assistance to nonprofit organizations working in disadvantaged communities.

Q&A

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Innovation in Finance, Technology & Policy

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Upcoming Webinar

Solar Risk: How Energy Storage Can Preserve Solar Savings in California Affordable Housing

Thursday, June 15, 2-3 pm ET

www.cleanegroup.org/webinars

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