Residential Solar + Storage Systems

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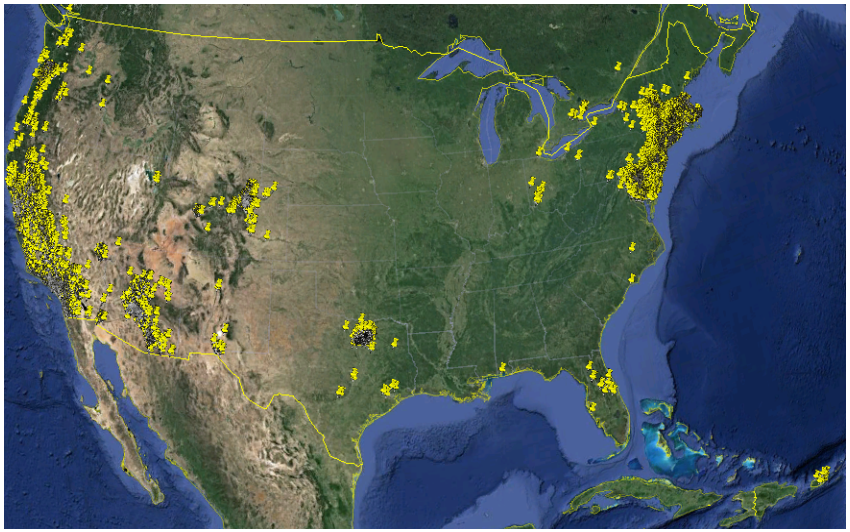
Annual NECPUC Symposium 2015

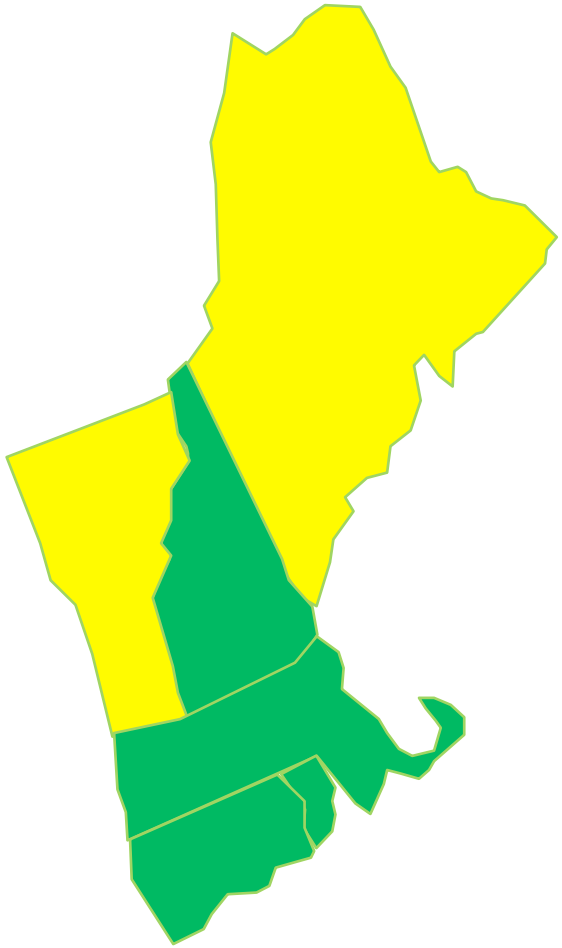
SolarCity Corporate Overview

- **Publicly traded with $5B+ in total funds to deploy renewables**
  - (NASDAQ:SCTY)
- **Booked projects with 218,000+ customers**
  - Largest solar installer in US
- **10,000+ Employees**
- **Building 1GW panel factory in Buffalo, NY**
  - Largest in W. Hemisphere



SolarCity in New England

- Serving over 5,500 customers
- Employs more than 700
- 6 Warehouses



Connecticut

Maine

Massachusetts

New Hampshire

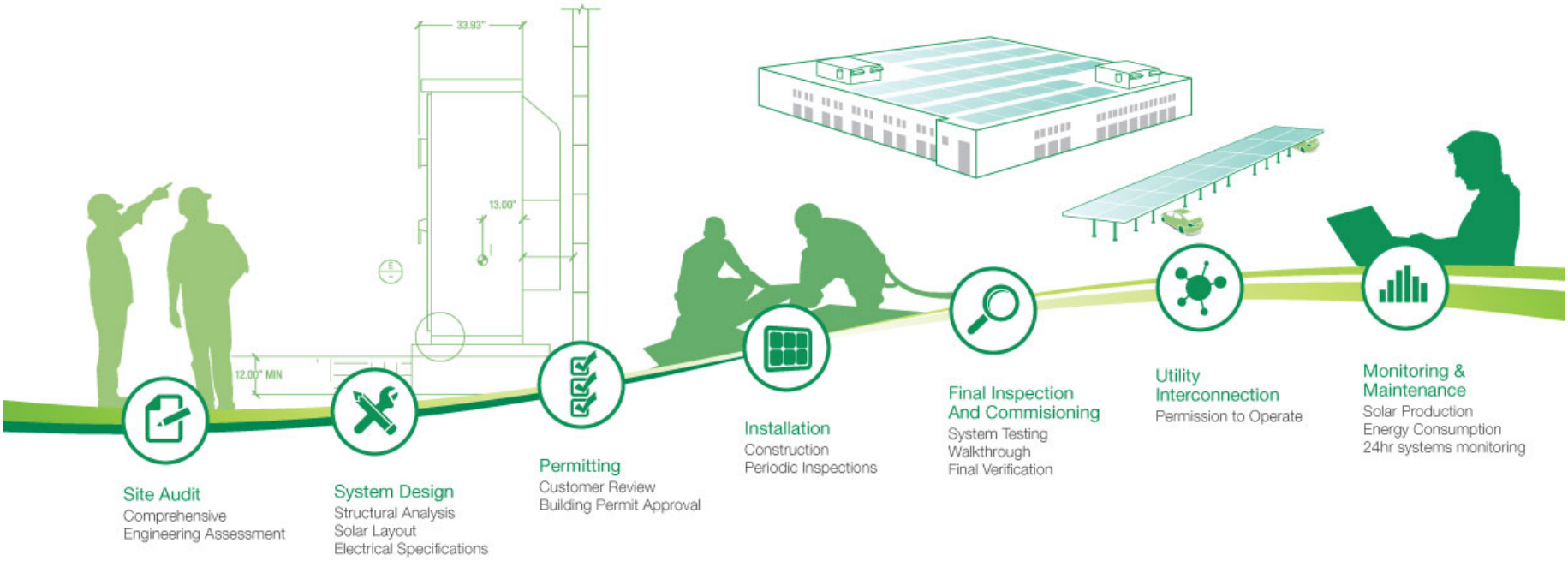
Rhode Island

Vermont

Served by SolarCity

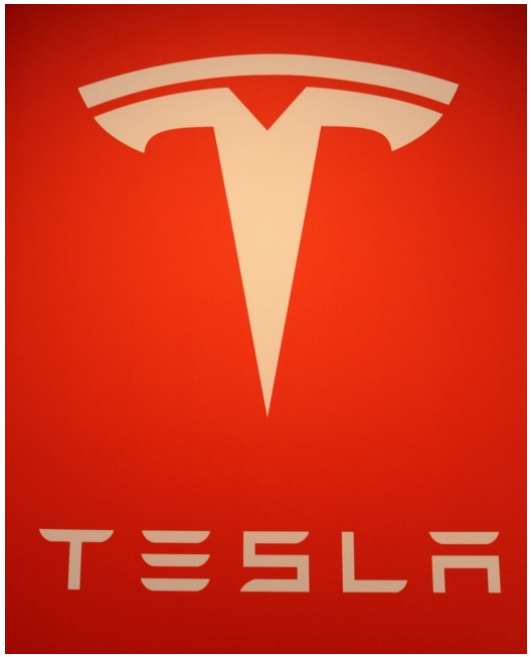
SolarCity Provides An Integrated Approach

- SolarCity provides a single source for financing, engineering design, installation, monitoring and maintenance
- Better customer experience with single point of contact
- Multiple financing options: Power Purchase Agreement, Lease, MyPower loan program, Direct Purchase



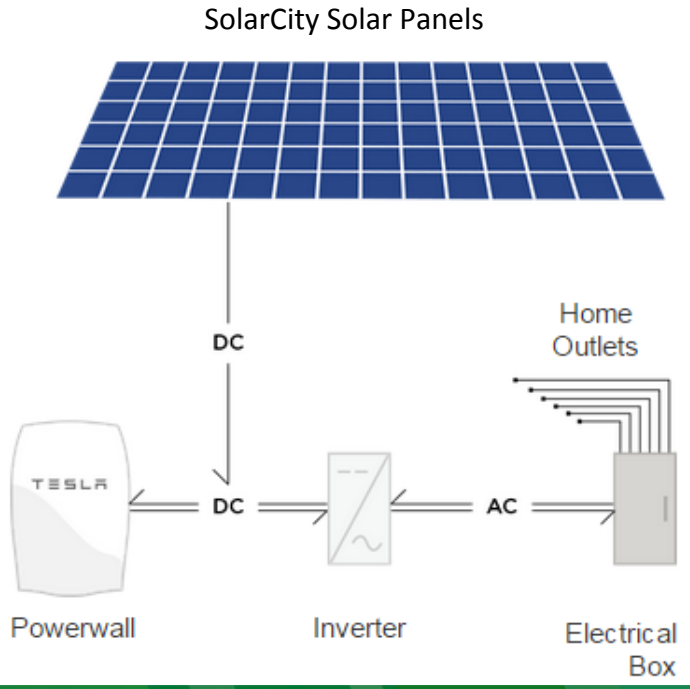
SolarCity & Tesla Motors

- 5 year collaboration on energy storage development / deployment
- Over 300 batteries deployed by SolarCity throughout California
- DemandLogic uses solar + storage systems to reduce costs for commercial and industrial customers



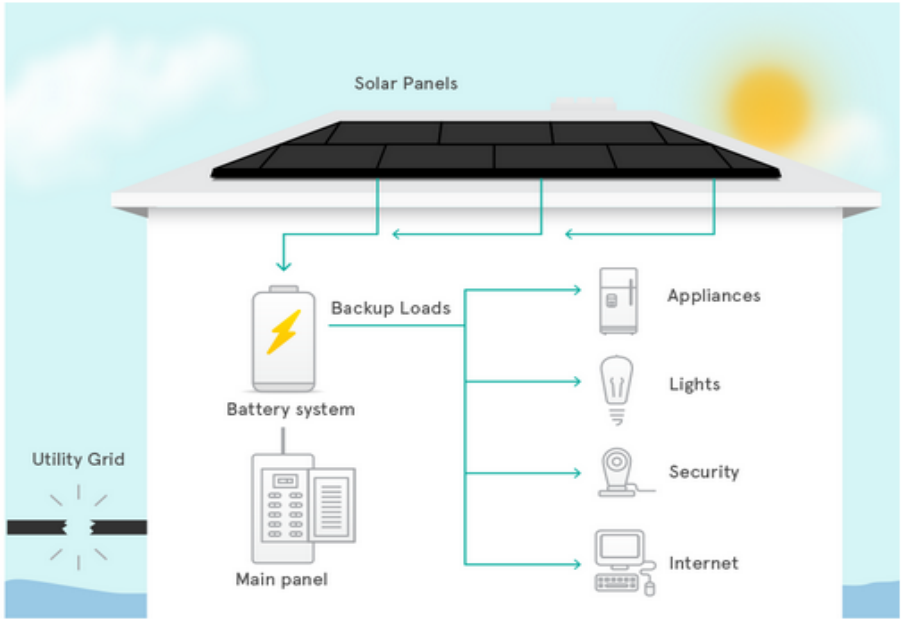
SolarCity Residential Backup

- 9.2 kWh energy capacity
- 100% solar charging (battery does not charge from grid)
- PV and battery utilize a single inverter
- MySolarCity monitors system 24/7 and suggests future savings for eligible customers
- 9-year warranty
- Final installed cost to customer of $5,000 after credits and incentives

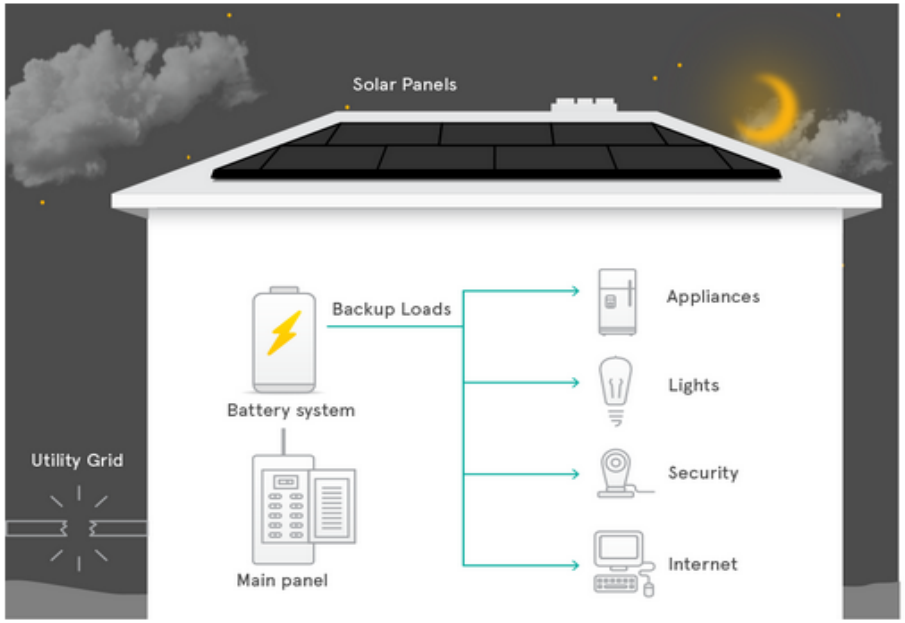


Backup Power Service

- Provide backup power for up to four electrical circuits up to 1,900 watts (120 V / 20 Amps)
- Can function indefinitely while battery charges from solar panels, even during grid outages



During the day, solar energy charges your battery while it powers your home.



As day transitions to night, your battery backup system keeps things running smoothly, so if the grid goes down, the essential devices in your home will not.

Solar + Storage Backup Power Service

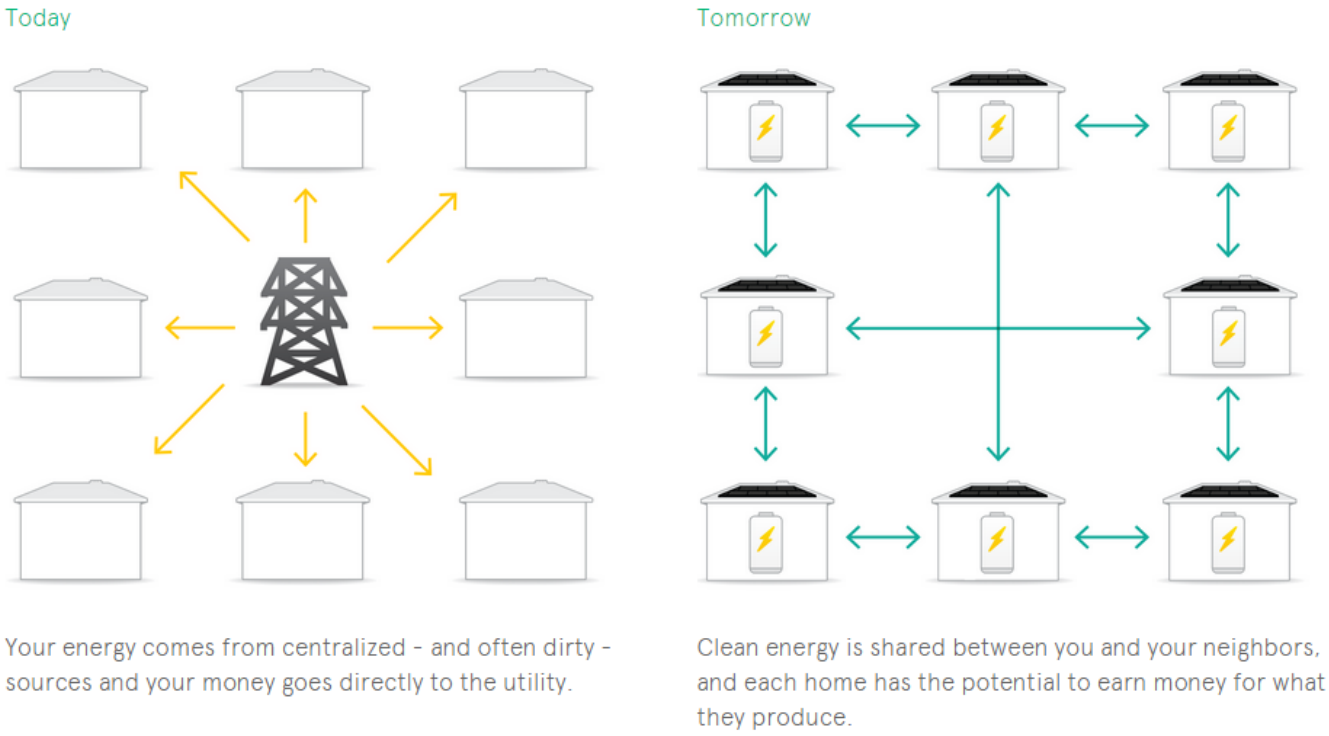
	Solar power with battery backup	Gas-powered portable generator	Natural gas or liquid propane stationary generator
Convenience	• Wall-mounted, indoors or outdoors • System turns on seamlessly to power your backup loads immediately after an outage occurs	• Must be rolled out and plugged in every time it's used • Requires manual start-up when an outage occurs	• Must be placed outdoors • Must be tied to home's gas line (or run a new gas line) • Automatic transfer switches start the system immediately when an outage occurs
Maintenance	Energy comes from solar – no need to refuel as power supply is renewable.	Must be refueled every few hours.	Energy comes from natural gas or propane – may need to refuel if the power supply is interrupted.
Environmental Impact	• Powered by clean, renewable energy • Quiet operation	• Emits noxious fumes • Makes considerable noise	• Emits noxious fumes • Makes considerable noise
Additional Savings	Time-of-use energy-shifting algorithm automatically suggests ways your battery can save you money.	No additional savings.	No additional savings.

What is the value of residential batteries?

- "For utilities and grid operators, the technology is designed to enable remote-aggregated control of solar battery systems."

  -Peter Rive, SolarCity Co-Founder and CTO

- "SolarCity's customer contract explicitly contemplates future market opportunities and creates a revenue-sharing opportunity for customer."



Potential Value of Energy Storage Systems

RTO/ISO Level

- Capacity
- Energy
- Frequency regulation

Utility Level

- Enable customers to take advantage of time-differentiated rates in order to utilize least-cost resources
- Improve utilization of transmission and distribution assets by improving overall load factor
- Voltage support

How can regulators help customers extract the maximum value from solar + storage systems?

- Clarify application of existing rules to solar+storage systems
  - Net energy metering
  - Interconnection procedures
- Ensure the possibility of participation in multiple programs
  - Net energy metering and provision of grid services
- Ensure that programs value *services*, not specific resource parameters
- Programs for specific resource types should contemplate the range of services provided by that resource and design incentives to meet balanced program objectives

Let the Digital Revolution Work for Customers

- Make requirements for data, not hardware
  - Identify necessary information
  - Ensure accuracy
  - Do not require specific hardware (e.g., meters)
- Companies already collect these data and rely on its accuracy to be fairly compensated by customers
- Meter requirements are expensive for customers and could be prohibitive for single-inverter systems that otherwise reduce costs and improve efficiency

Example Distributed Storage Programs

CA Self-Generation Incentive Program

- Provides incentives to support distributed energy resources
- 144 MW of storage projects reserved, in progress, or completed
- 2-hour minimum runtime
- Incentive for “Advanced Energy Storage” of $1.46/W
- Key part of achieving CA Storage Mandate goals
  - Similar proposal at federal level

NY Proposed Tax Credit

- Personal income tax credit
- 25% of installed cost of storage system

Resiliency Rebate

- Consider system duration
  - Rebate based on kWh, or
  - Include 2-hour minimum runtime
- Step down incentive levels over time to reduce reliance on rebates as industry gains experience

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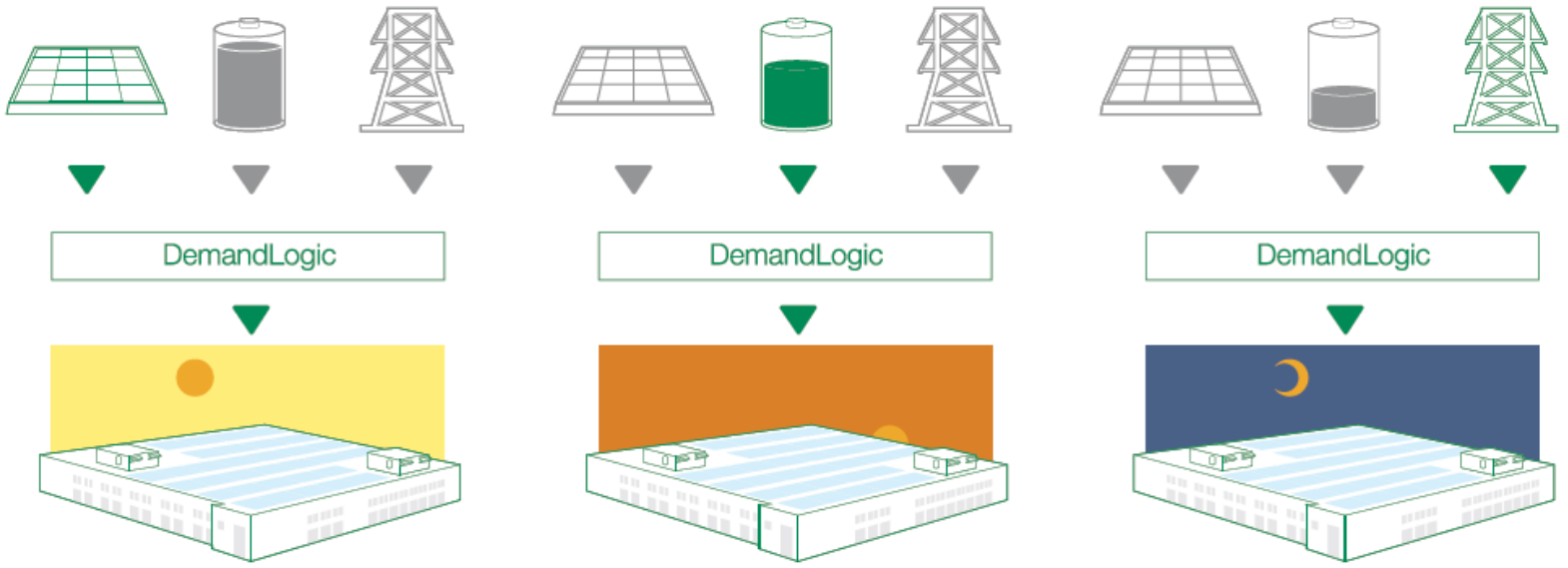
Questions?

DemandLogic: PV + Battery Solution

- Battery system installed in conjunction with new solar PV system
- SolarCity finances the combined system at no upfront cost to customer
- Customer saves on both energy ($ / kWh) and demand ($ / kW)



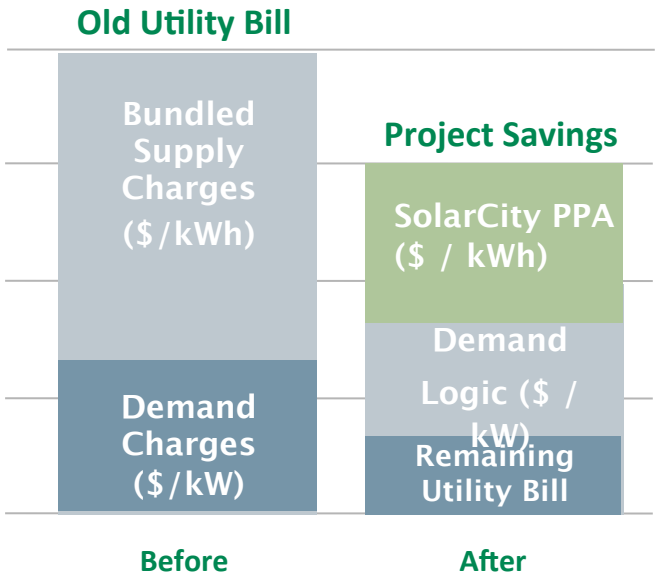
12 PM
Your system is at full production, charging your battery and reducing your need for utility power.

5 PM
As solar production decreases, the battery is intelligently discharged to reduce peak demand charges.

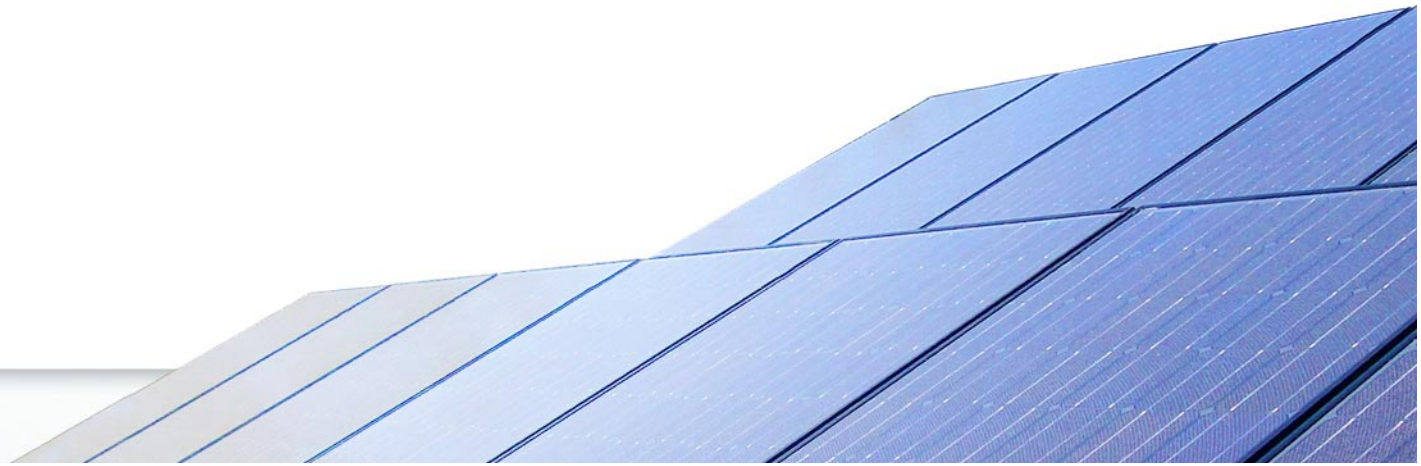
10 PM
You draw power from the utility company at night at lower off-peak demand rates.

DemandLogic Overview

- Solar PPA only addresses “energy” ($/kWh) charges from the grid
- Tariffs also have demand charges with varying $ / kW costs
- Solar alone is unreliable for peak demand reduction due to intermittency
- Battery supplements solar to provide firm power and reduce peak demand
- ***Customer pays SolarCity a lower $ / kW than the utility demand charge – and saves money***

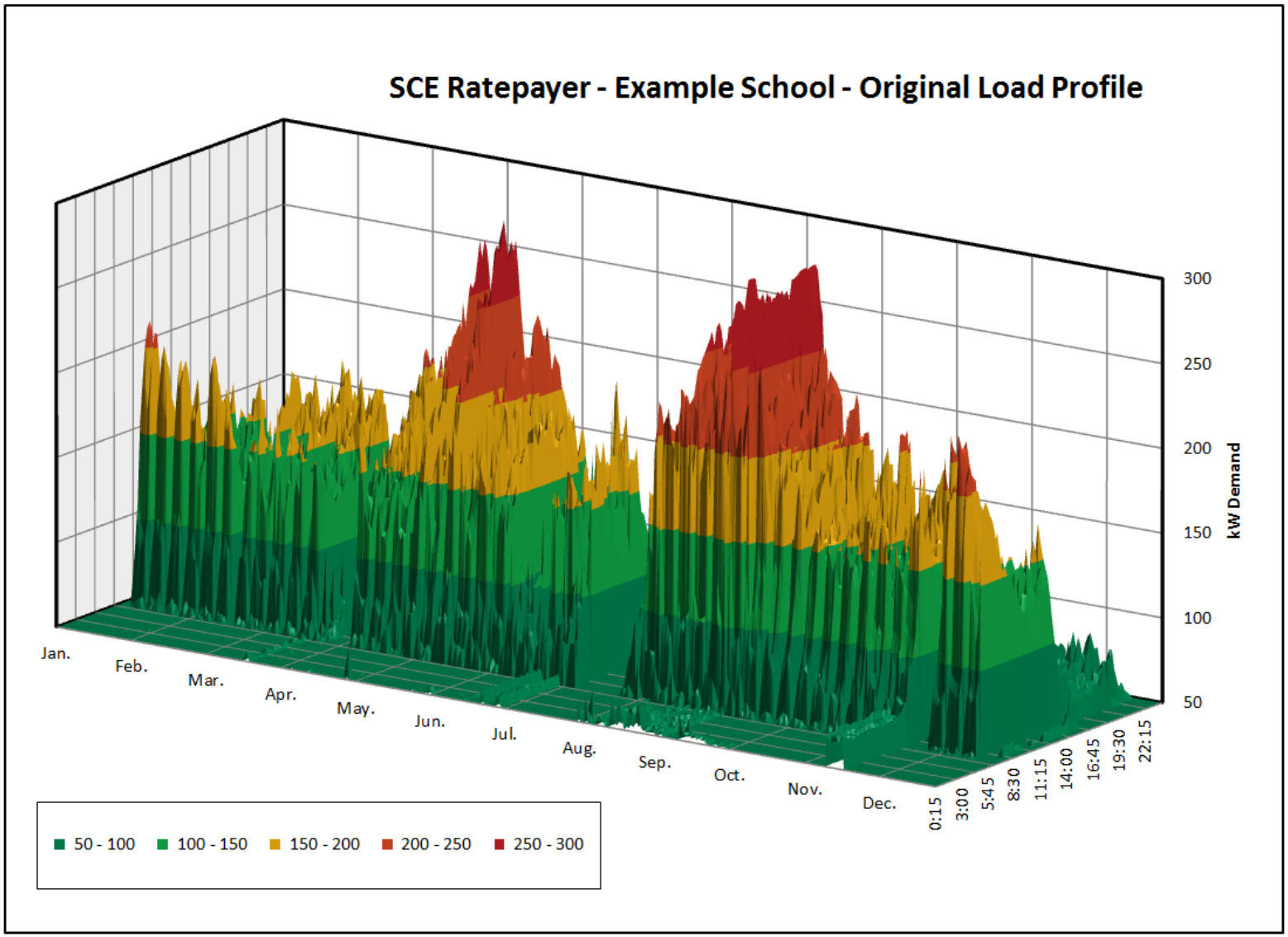


Example SCE Customer (K-12)

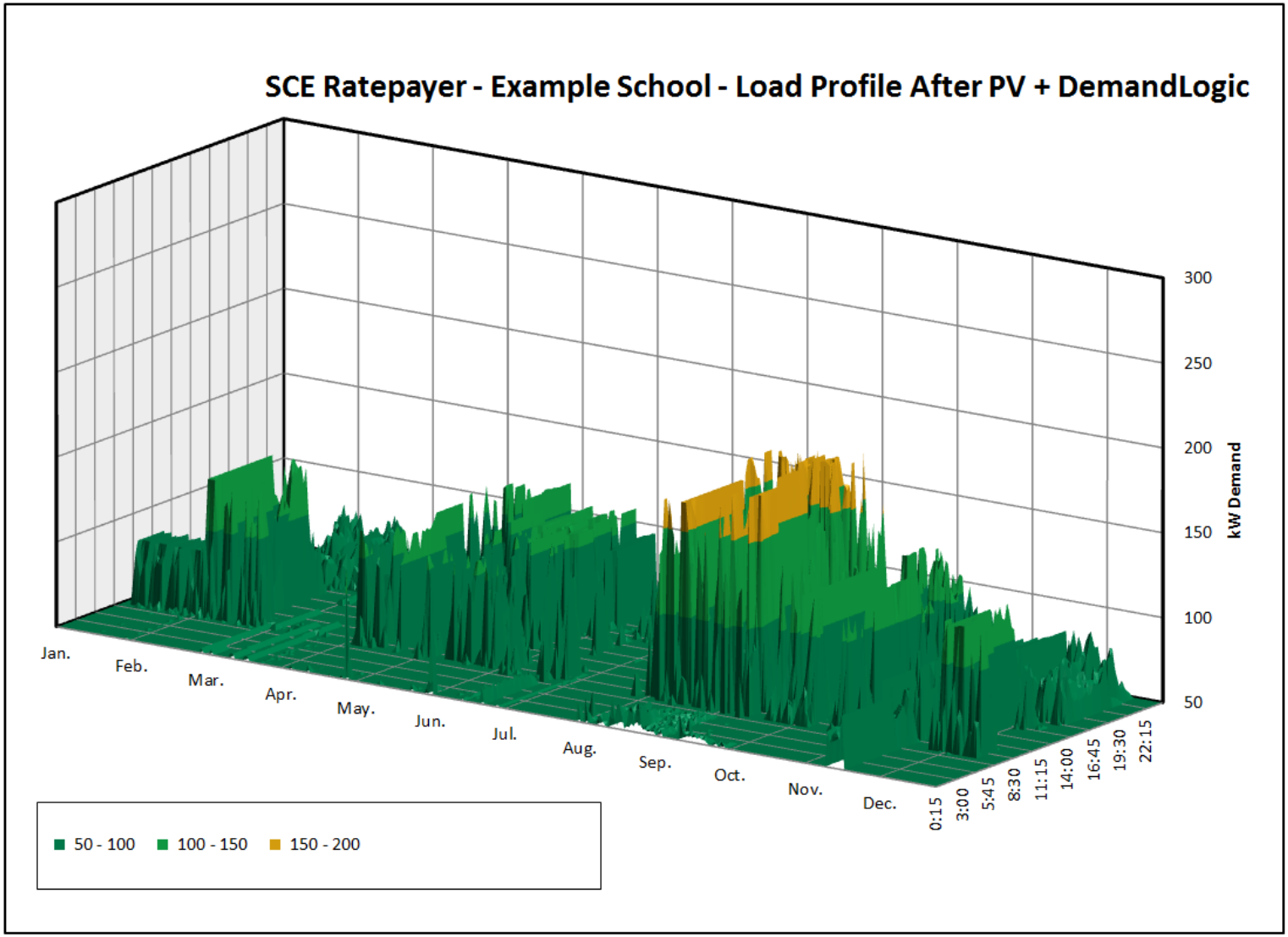


SolarCity

Original Load Profile



Load Profile after DemandLogic



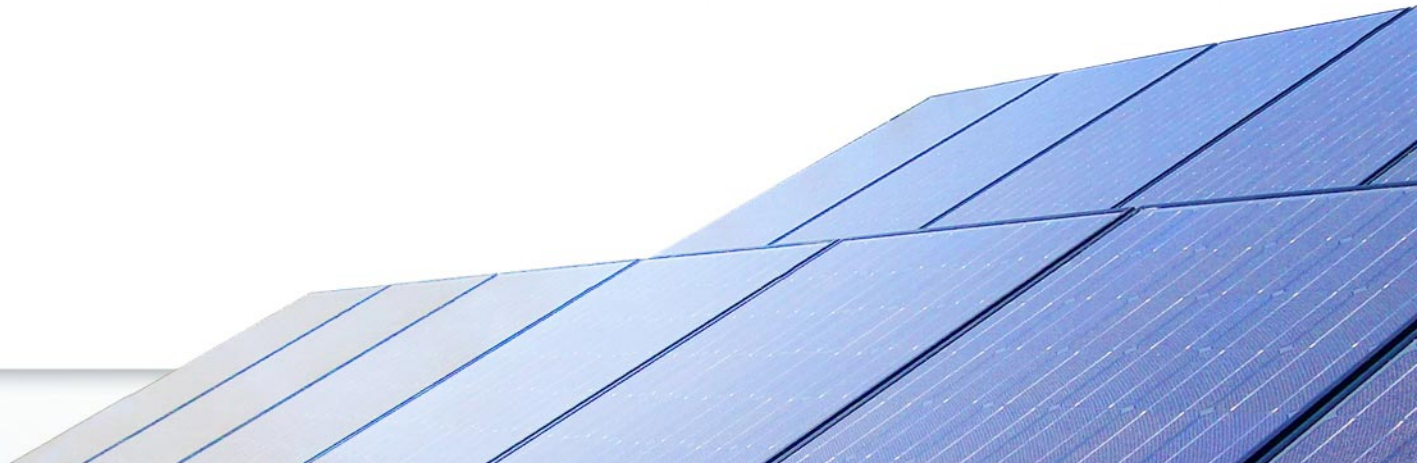
K-12 – Economic Overview

Avoided Energy Cost ($/kWH)	$	0.145
Solar PPA Rate ($/kWh)	$	0.125
Avoided Demand Cost ($/kW)	$	10.25
SolarCity Demand Rate ($/kW)	$	8.00

PV System Size (kW)	315
Storage System Size (kW)	100
Storage System Size (kWh)	200

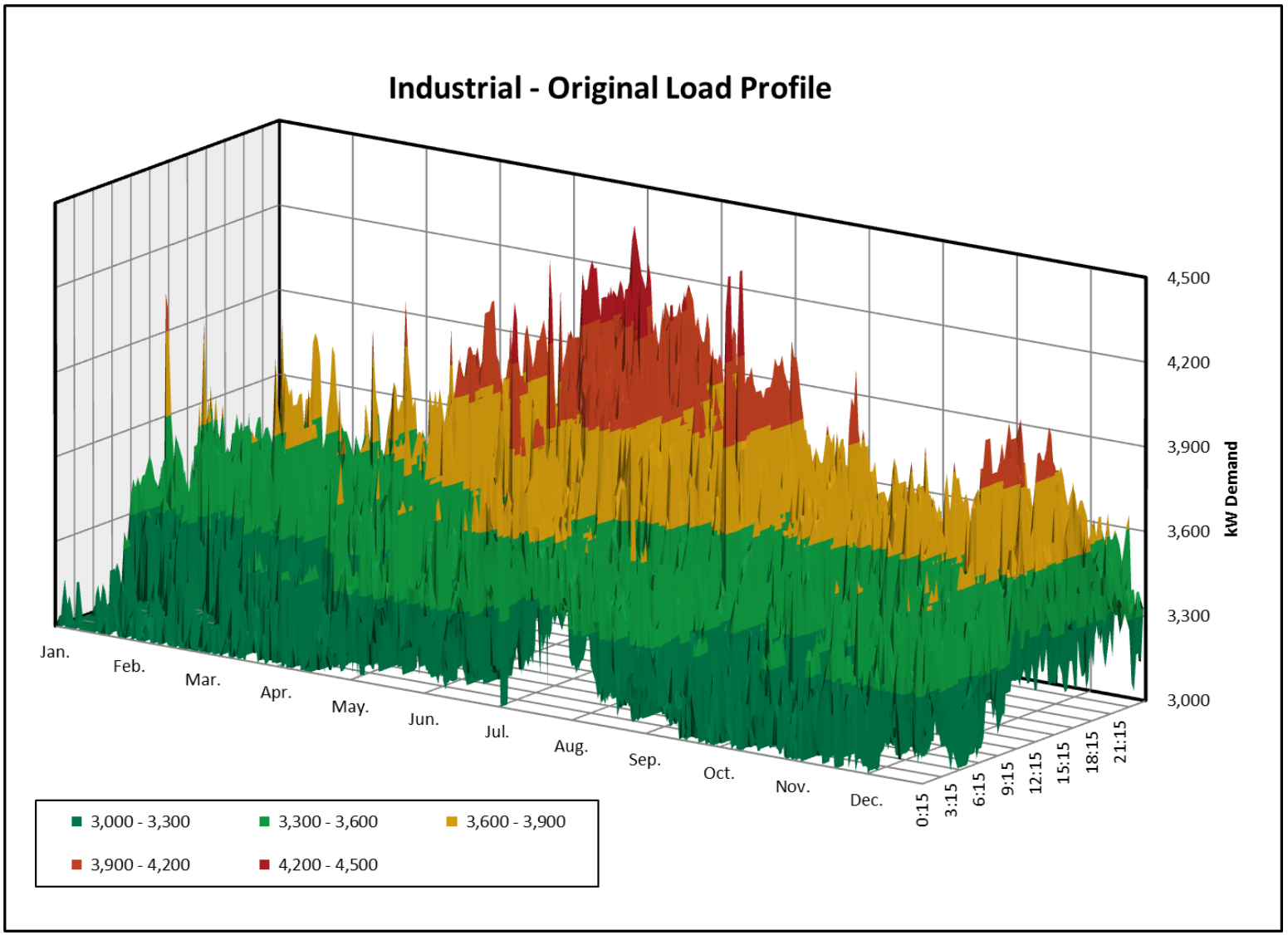
	Demand			*Energy*			
Month	**MAX Demand Reduction (kW)**	**Demand Payments to SolarCity**	**Utility Demand Cost Reduction**	**Solar Production (kWh)**	**Energy Payments to SolarCity**	**Utility Energy Cost Reduction**	**Total Project Savings**
January	98	$ 784	$ 1,005	26,238	$ 3,280	$ 3,805	$ 745
February	98	$ 784	$ 1,005	30,583	$ 3,823	$ 4,435	$ 832
March	98	$ 784	$ 1,005	41,152	$ 5,144	$ 5,967	$ 1,044
April	98	$ 784	$ 1,005	29,347	$ 3,668	$ 4,255	$ 807
May	98	$ 784	$ 1,005	55,983	$ 6,998	$ 8,117	$ 1,340
June	98	$ 784	$ 1,005	55,847	$ 6,981	$ 8,098	$ 1,337
July	98	$ 784	$ 1,005	54,156	$ 6,770	$ 7,853	$ 1,304
August	98	$ 784	$ 1,005	52,782	$ 6,598	$ 7,653	$ 1,276
September	98	$ 784	$ 1,005	47,863	$ 5,983	$ 6,940	$ 1,178
October	98	$ 784	$ 1,005	34,307	$ 4,288	$ 4,974	$ 907
November	98	$ 784	$ 1,005	26,057	$ 3,257	$ 3,778	$ 742
December	98	$ 784	$ 1,005	18,593	$ 2,324	$ 2,696	$ 592
Annual Totals	**1,176**	**9,408**	**$ 12,054**	**472,908**	**$ 59,114**	**$ 68,572**	**$ 12,104**
		Savings from DemandLogic:	*$ 2,646*			*Savings from Solar*	*$ 9,458*

Example SDGE Customer (Industrial)

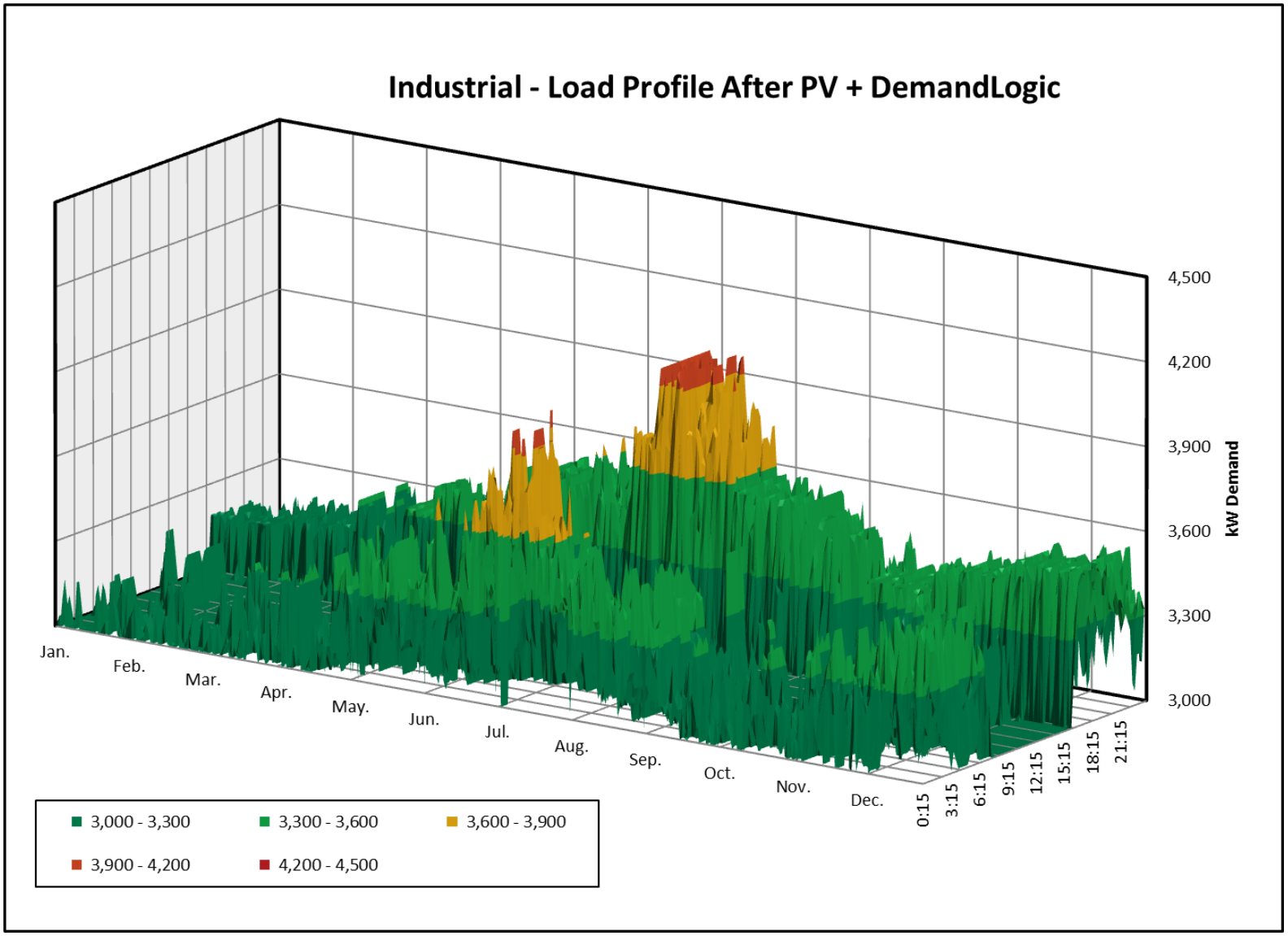


SolarCity

Industrial – Original Load Profile



Industrial – Load Profile with DemandLogic



Industrial – Economic Overview

Avoided Energy Cost ($/kWH)	$	0.100
Solar PPA Rate ($/kWh)	$	0.093
Avoided Demand Cost ($/kW)	$	12.05
SolarCity Demand Rate ($/kW)	$	9.00

PV System Size (kW)	11,400
Storage System Size (kW)	2,000
Storage System Size (kWh)	4,000

	Demand			*Energy*			
Month	**MAX Demand Reduction (kW)**	**Demand Payments to SolarCity**	**Utility Demand Cost Reduction**	**Solar Production (kWh)**	**Energy Payments to SolarCity**	**Utility Energy Cost Reduction**	**Total Project Savings**
January	1,208	$ 10,872	$ 14,556	922,820	$ 85,822	$ 92,282	$ 10,144
February	1,208	$ 10,872	$ 14,556	1,075,625	$ 100,033	$ 107,563	$ 11,214
March	1,208	$ 10,872	$ 14,556	1,447,352	$ 134,604	$ 144,735	$ 13,816
April	1,208	$ 10,872	$ 14,556	1,032,165	$ 95,991	$ 103,217	$ 10,910
May	1,208	$ 10,872	$ 14,556	1,968,942	$ 183,112	$ 196,894	$ 17,467
June	1,208	$ 10,872	$ 14,556	1,964,161	$ 182,667	$ 196,416	$ 17,434
July	1,208	$ 10,872	$ 14,556	1,904,705	$ 177,138	$ 190,471	$ 17,017
August	1,208	$ 10,872	$ 14,556	1,856,356	$ 172,641	$ 185,636	$ 16,679
September	1,208	$ 10,872	$ 14,556	1,683,353	$ 156,552	$ 168,335	$ 15,468
October	1,208	$ 10,872	$ 14,556	1,206,591	$ 112,213	$ 120,659	$ 12,131
November	1,208	$ 10,872	$ 14,556	916,441	$ 85,229	$ 91,644	$ 10,099
December	1,208	$ 10,872	$ 14,556	653,927	$ 60,815	$ 65,393	$ 8,262
Annual Totals	**14,496**	**130,464**	**$ 174,677**	**16,632,438**	**$ 1,546,817**	**$ 1,663,244**	**$ 160,640**
		Savings from DemandLogic:	*$ 44,213*			*Savings from Solar*	*$ 116,427*