



Managing Energy Costs with ENERGY STORAGE

CASE STUDY

MANAGING ENERGY COSTS: A Corporate Priority

Leading edge managers use energy storage to manage energy costs

Managing, forecasting, and reducing energy costs has become a corporate level priority for many organizations that recognize the impacts of recent changes in the electric power industry and the opportunity for cost reductions from efficiency, solar, wind, and energy storage solutions. What was once seen as an uncontrollable and ever increasing expense that dominated overhead costs, is now a manageable liability and opportunity to gain a competitive operating advantage over corporate rivals. Meanwhile, reducing energy consumption and increasing commitments to renewable energy also present the opportunity for powerful and positive sustainable brand messaging. Many businesses have already capitalized on the available quick fixes and simple energy-saving solutions. In these situations, corporate energy managers must look to more sophisticated technologies and business models to achieve greater savings and thought leadership branding.

Today, leading edge energy managers are increasingly deploying onsite battery energy storage systems to reduce operating expenses and hedge against rising costs. By leveraging third-party financed, performance based contracts energy managers can eliminate upfront costs, remove performance risks, and achieve operational savings from Energy Storage Solutions day one. Experienced, financially stable, and technology agnostic system integrators offer solutions and resources that today energy managers can leverage to realize savings, improve branding, and control energy costs.



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Demand charges increase 5-10%

The electricity industry is currently experiencing an unprecedented evolution with ever increasing penetration of renewable generating resources, flattening of consumption and peak demand from energy efficiency improvements, and greater impacts from severe weather events, all of which create a more volatile grid and unstable economic environment for electric utilities. For these and many other reasons, utility consumption rates and peak demand charges continue to increase. Utility rate structures can change as many as four times a year, with little warning, and can be very difficult to decipher. While energy commodity rates have increased slowly over time, demand charges have increased 5-10% annually over the past five years (Figure 1).







Figure 1. Since 2011, utility demand charges have typically risen at rates between 5-10%.

SCE: Southern California Edison PG&E: Pacific Gas & Electric SDG&E: San Diego Gas & Electric



Demand charge rates

A facility's demand charge is determined by multiplying its maximum power consumption, measured in kilowatts (kW) by the utility's demand rates (expressed as dollars per kW) in each of those periods. Utility demand rates change over the course of the day, on-peak, mid-peak, and off-peak periods, and across seasons, generally reflecting shifts in the costs that the utility incurs to serve load in each time period.

For example, higher "on-peak" utility demand charges typically occur during the mid to late afternoon hours when energy consumption on the grid is at its highest. Each utility establishes its tariffs with different rates and time periods (Table 1). In certain scenarios, a single 15-minute period of peak demand in a month sets the demand charge for the entire month, and can be as much as 50% of the utility bill. A 15-minute period can set Demand Charges that can be as much as ~50% of your energy bill each month

	UTILITY	PG&E	SCE	SDG&E	
	TARIFF	E20-P no PDP	TOU-8-B mid voltage	ALTOU P no PDP	
SUMMER	Summer On-Peak	\$ 19.26 /kW	\$ 18.97 /kW	\$ 20.76 /kW	
	Summer Mid-Peak	\$ 5.13 /kW	\$ 3.58 /kW	\$ 0.00 /kW	
	Non-Coincidental	\$ 15.09 /kW	\$ 18.34 /kW	\$ 23.89 /kW	
WINTER	Winter On/Mid-Peak	\$ 0.12 /kW	\$ 0.00 /kW	\$ 7.52 /kW	
	Non-Coincidental	\$ 15.09 /kW	\$ 18.34 /kW	\$ 23.89 /kW	

DEMAND CHARGE RATES IN CALIFORNIA

Table 1. Demand charge structures for the California investor-owned utilities.



Reducing peak consumption

Energy storage solutions are optimized to discharge to reduce the 15-minute period of peak consumption according to each facility's unique load profile and tariff structure (Figure 2). By lowering peak demand from the grid during on-peak periods, energy storage solutions reduce utility demand charges resulting in dramatically lower utility bills. As demand charges continue to increase, savings will increase accordingly, creating a financial hedge and competitive advantage for the energy manager's business.

Energy Storage creates a hedge and a competitive operations advantage for businesses.



TYPICAL INDUSTRIAL SUMMER WEEK LOAD PROFILE

Figure 2. Energy storage systems are controlled to dispatch power to a facility during peak load hours, thereby significantly reducing demand charges.



Energy Storage Business Models

Many businesses have recognized that they can hedge, control, and lower their energy commodity costs with third-party financed power purchase agreements (PPAs) for onsite or offsite renewable energy projects. However, renewable PPAs are intended to only address the energy commodity half of the problem of rising utility rates. Meanwhile renewable energy systems are not appropriate for all businesses and geographies. Battery energy storage solutions provide a valuable opportunity to hedge against rising demand charges with third-party financed business models such as shared savings and lease contracts. Each type of contract has unique benefits and risks, however both result in zero upfront cost to the customer as opposed to purchasing the energy storage solution.

Companies can leverage 3rd party financing to reduce demand changes and eliminate up front cost.

PURCHASE	LEASE	SHARED SAVINGS
 Savings Begin on day one Capture 100% of savings and future revenues 	 Fixed price provides long term predictable costs No upfront customer investment Savings begin on day one No operations and maintenance responsibilities Flexibility to incorporate new revenues from additional battery services in the future 	 Payments are 100% tied to performance, aligning the incentives of both parties As demand charges increase over time, both savings and payments will increase No upfront customer investment Savings begin on day one No operations and maintenance responsibilities Flexibility to incorporate new revenues from additional battery services in the future

Table 2. Alternative Financing Model Characteristics



Facility characteristics

There is a wide range of viable candidate facilities for energy storage solutions, from office buildings to manufacturing facilities to water treatment plants. Each facility's unique load profile and accompanying utility tariff will dictate the feasibility of energy storage solutions. There are several electricity consumption characteristics that can be used to quickly identify attractive candidates for energy storage.

Ideal Facility Characteristics

- Low load factors (average Load / peak Load)
- Demand charges exceeding \$15/kW
- Operations that cause predictable peaks
- Base load greater than 1MW

ACME CORPORATION: Energy Storage Analysis

Acme Corporation has a representative facility located in Northern California that exemplifies many of the ideal characteristics for energy storage. The facility has a "peaky" load profile with a low load factor as a result of late afternoon air conditioning requirements. Peaks in the facility's consumption overlaps well with the "On-peak" time period of Pacific Gas and Electric's E20 Tariff – the period when demand charges are at their highest. As a result, demand charges make up approximately 38% of the energy bill every month.

ACME CORPORATION: Utility Bill Summary

Tariff	PG&E E20
Voltage	Primary
Base Load	1.8MW
Load Factor	69%
On-Peak \$/kW Demand Charge	\$19.26
Annual Energy Charges	\$1,488,419
Annual Demand Charges	\$911,185





ACME CORPORATION: Load Characteristics

Acme Corporation demonstrates the ideal characteristics which result in

\$136,000 of energy savings in year one.

ACME CORPORATION FACILITY LOAD CHARACTERISTICS				
Month	Peak Load (kW)	Average Load (kW)	Load Factor	
3/1/2016	2,832	2,059	73%	
4/1/2016	3,082	1,858	60%	
5/1/2016	2,506	1,822	73%	
6/1/2016	2,702	1,909	71%	
7/1/2016	2,466	1,773	72%	
8/1/2016	2,626	1,766	67%	
9/1/2016	3,026	1,896	63%	
10/1/2016	2,733	1,991	73%	
11/1/2016	2,645	1,807	68%	
12/1/2016	2,240	1,648	74%	
1/1/2017	2,347	1,605	68%	
2/1/2017	2,506	1,612	64%	
Annual Average	2,642	1,813	69%	

Ideal Facility Characteristics

- ✓ 69% Load Factor
- ✔ \$19.26/ kW Demand Charge
- 1.8 MW Base Load
- ✓ 300 kW+ Peak Shaving Opportunity

IMPACTS OF 1 MW - 2 MWH ENERGY STORAGE SOLUTION

		MAX DEMA	AND (KW) W/	O BATTERY	MAX DEM	AND (KW) W	/ BATTERY	D	EMAND CHARGE	S
Month	Season	NC / Max	On Peak	Mid Peak	NC / Max	On Peak	Mid Peak	Without Battery	With Battery	Savings
January	Winter	2,347	-	2,347	1,974	-	1,974	\$ 39,702	\$ 34,028	\$ 5,673
February	Winter	2,506	-	2,506	2,250	-	2,002	\$ 42,120	\$ 38,196	\$ 3,924
March	Winter	2,832	-	2,832	2,383	-	2,383	\$ 47,078	\$ 40,249	\$ 6,829
April	Winter	3,082	-	3,082	2,423	-	2,423	\$ 50,881	\$ 40,858	\$ 10,023
May	Summer	2,506	2,461	2,506	2,053	2,053	2,053	\$ 102,074	\$ 85,056	\$ 17,018
June	Summer	2,702	2,702	2,629	2,230	2,230	2,230	\$ 110,304	\$ 92,044	\$ 18,260
July	Summer	2,466	2,466	2,376	2,057	2,013	2,057	\$ 100,900	\$ 84,367	\$ 16,533
August	Summer	2,626	2,390	2,491	2,261	1,901	2,261	\$ 102,440	\$ 86,334	\$ 16,106
September	Summer	3,026	3,026	2,882	2,639	2,639	2,639	\$ 122,731	\$ 108,191	\$ 14,540
October	Summer	2,733	2,733	2,488	2,294	2,253	2,294	\$ 110,646	\$ 93,781	\$ 16,865
November	Winter	2,645	-	2,645	2,281	-	2,281	\$ 44,234	\$ 38,698	\$ 5,536
December	Winter	2,240	-	2,240	1,926	-	1,926	\$ 38,074	\$ 33,298	\$ 4,776
							TOTAL	\$911,185	\$775,101	\$136,083



ACME CORPORATION: Financial

Ultimately, the shared savings model and outright purchase of the system are the two ends of contracting spectrum. Purchasing a battery storage system typically requires additional operations, maintenance, and monitoring contracts and expenses. Interestingly, taking both the financial and performance risk by purchasing the system results in only a marginal 6% improvement economic benefits.¹ Taking both the financial and performance risk by purchasing the system results in only a marginal 0.5% improvement in the investment's present value

Financial Results			
Simple Breakeven	Year 6		
Internal Rate of Return	15.8%		
Shared Savings NPV (@7%)	\$446,000		
Purchase Option NPV (@7%)	\$473,000		

Energy Storage Solution		
Battery Size	1 MW-2hr	
Install year	2018	
O&M Provider	EDF RE	
Term	12 years	

Modeling Assumptions				
Demand Charge Annual Increase	5%			
SGIP Storage Incentive (Tier 2)	\$800,000			
СарЕх	\$1,600,000			
Operation & Maintenance Costs	\$18,000/yr			
Operations & Maintenance Escalation	2.4%/yr			

Simple Cash Flows ³	Shared Savings	Purchase
Customer Share of Savings	30%	100%
Customer Annual O&M Costs	\$0	(\$18,000)
Customer Year 1 Investment	\$0	(\$800,000)
Year 1 Savings	\$41,000	\$118,000
Year 2	\$43,000	\$124,000
Year 3	\$45,000	\$131,000
Year 4	\$47,000	\$138,000
Year 5	\$50,000	\$146,000
Year 6	\$52,000	\$153,000
Year 7	\$55,000	\$162,000
Year 8	\$58,000	\$170,000
Year 9	\$61,000	\$179,000
Year 10	\$64,000	\$189,000
Year 11	\$67,000	\$199,000
Year 12	\$70,000	\$209,000
Total Net Project Cash Flow	\$653,000	\$1,118,000

Values are for demonstration purposes only and subject to change without notice.

¹Net present value comparison assumes 7% discount rate

²California's Self Generation Incentive Program (SGIP) provides utility incentive for battery energy storage systems. Assumes Tier 2 Incentive Levels

³For sake of simplicity, example assume customer receives 100% of SGIP year 1. In reality SGIP is paid out over 5 year time period. 50% year 1 and 10% for next 5 years



Start your competitive advantage

Battery Energy Storage solutions provide today's energy managers with a sophisticated tool to reduce, manage, and predict operational energy costs and support corporate priorities. When combined with existing onsite energy efficiency, solar, and traditional generation assets batteries can be the backbone for flexible holistic solutions that can both reduce costs and increase energy resilience and reliability. Integrating next generation onsite system with commitments to large offsite renewable energy solutions also present the opportunity for powerful and very positive sustainable brand messaging. By working with nationally recognized, financially stable, holistic systems integrator, corporate businesses are taking the next step and turning traditionally volatile energy expenses into a low cost, predictable, competitive advantage with strong positive brand messaging.



EDF Renewable Services Operations Control Center (OCC)







This case study was writen by Michael Robinson, Business Development Manager – EDF Renewable Energy.

Michael has been working with EDF Renewable Energy since 2013, developing relationships and renewable energy solutions with clients in the public and private sectors. After receiving an International MBA from University of San Diego, Michael joined EDF RE's Government Energy Solutions group where he worked primarily with the Department of Defense developing holistic energy solutions to increase renewable penetration and energy resilience on base. Now as part of the Distributed Electricity and Storage group, Michael providing onsite energy storage and solar solutions for corporate and industrial customers looking to take control of their energy costs. Michael's passion for the energy sector goes outside of the office where he is a founding board member and acting Co-President of Young Professionals in Energy's (YPE) San Diego chapter.



ABOUT EDF RE DISTRIBUTED ELECTRICITY AND STORAGE GROUP

EDF RE's Distributed Electricity and Storage group specializes in working with commercial and industrial customers to design, finance, install, and operate holistic energy storage and solar solutions in order to help businesses:

- Lower operational energy costs
- Control and forecast long term energy budgets
- Increase energy reliability
- Support sustainability and renewable energy goals

The EDF RE – groSolar team brings together a thorough understanding of energy storage and solar energy in local markets, with the global procurement and financial wherewithal of an international energy firm. As a subsidiary of one of the largest energy companies in the world, EDF RE is a single interface that provides comprehensive turnkey energy storage and solar energy solutions.



Jamie Link WEST (858) 395-3510 jamie.link@edf-re.com www.edf-re.com Thomas Leyden EAST (609) 532-3642 thomas.leyden@edf-re.com www.edf-re.com