AABC Commissioning Group

AIA Provider Number 50111116

Exploring Data Analytics to Calculate ROI on Energy Storage

Course Number: CXENERGY1626

John Merritt, Ideal Power

April 13, 2016

Credit(s) earned on completion of this course will be reported to AIA CES for AIA members. Certificates of Completion for both AIA members and non-AIA members are available upon request.

This course is registered with AIA CES for continuing professional education. As such, it does not include content that may be deemed or construed to be an approval or endorsement by the AIA of any material of construction or any method or manner of handling, using, distributing, or dealing in any material or product.

Questions related to specific materials, methods, and services will be addressed at the conclusion of this presentation.

Copyright Materials

IDEAL POWER

CONTINUING EDUCATION AIA

Course Description

This session explores the data analytics, system capabilities, cost drivers and best practices for evaluating and sizing energy storage systems for demand management applications using real-world building load profile data. Peak demand management is a principle concern for commercial and industrial building owners and operators. Payback analyses for energy storage are more complex than calculating savings for onsite energy generation because they require a larger set of data points based on utility peak demand charges and a building's energy consumption profile.

Learning Objectives

At the end of the this course, participants will be able to:

1. Understand what metrics are used by utilities to calculate peak demand charges.

2. Understand what makes a building's load profile a likely candidate for peak demand management.

3. Learn about the process used to analyze building energy/power loads to properly size energy storage system and time of deployment for a specific commercial & industrial consumer.

4. Understand some of the cost drivers affecting capital expenditures (CAPEX) and operating expenses (OPEX) for energy storage systems used for peak demand management.

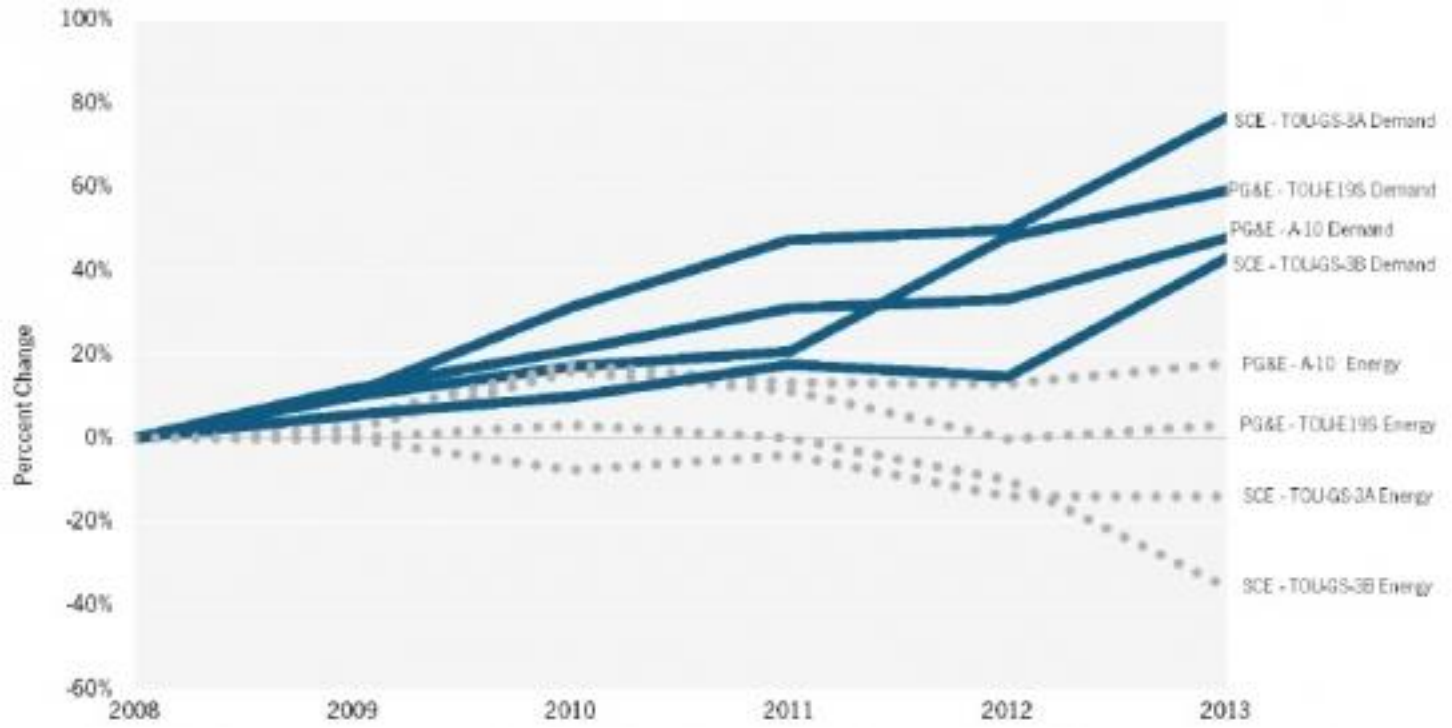
Demand Charges 101

A commercial or industrial electricity customer's bill is typically comprised of two parts: energy charges (measured in kWh) and demand charges (measured in kW). Energy charges are based on total consumption, while demand charges are calculated by a customer's peak power consumption, typically calculated over a 15 minute interval during the billing cycle.

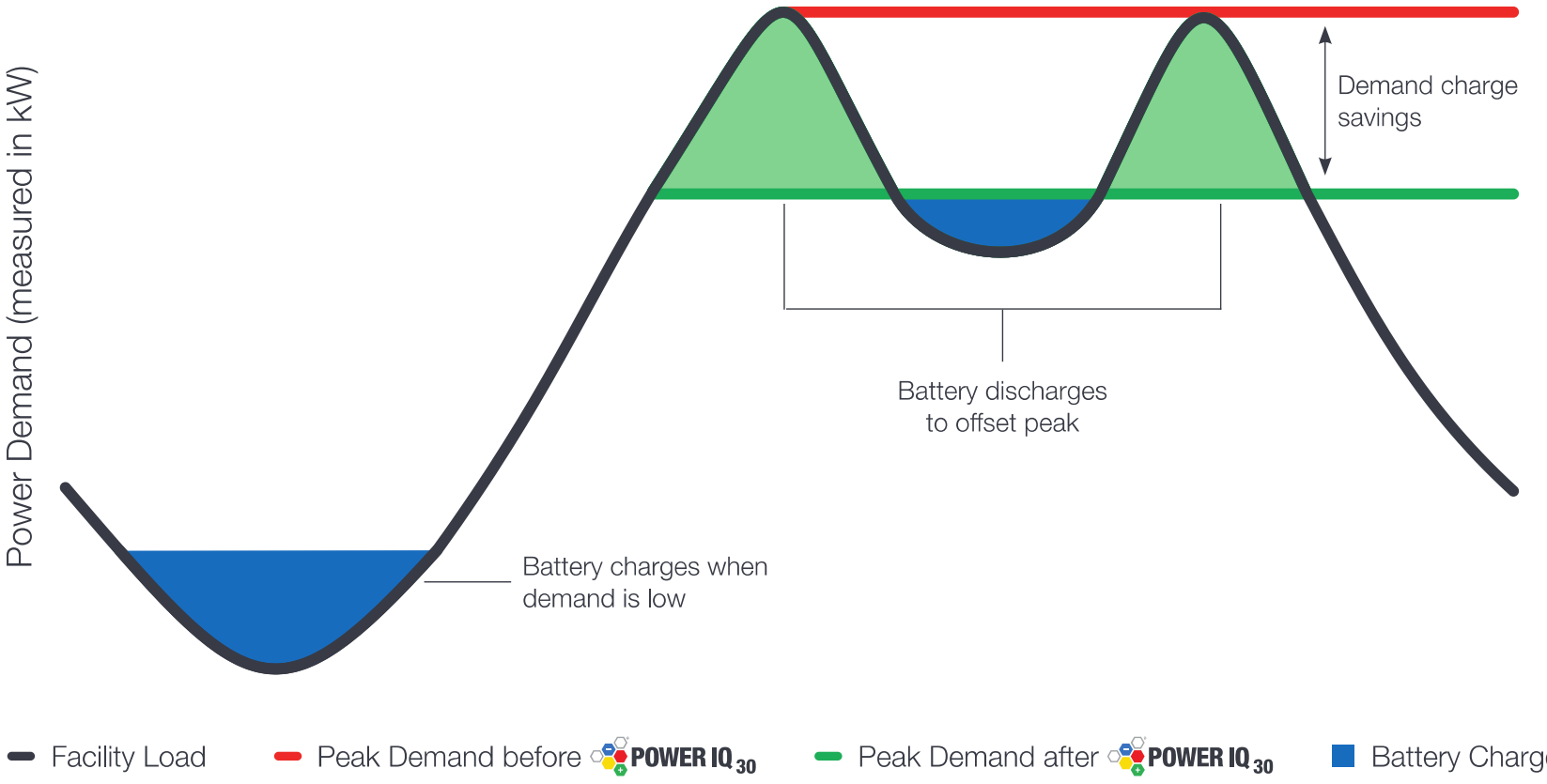
Demand charges can account for up to half of a C&I electricity customer's bill!

Why you should be concerned about demand charges

Since 2008, demand charges have steadily increased, where as energy charges have stayed flat or decreased. For potential PV customers, this means that less of their bill is addressable by a PV system and, therefore, the economics of PV have become slightly worse.



How demand charge management (DCM) works



Equipment required to perform demand charge management

Batteries store the energy – either from the grid or from solar PV – that is used to offset customers' peak consumption.

Intelligent software is critical to the automation of these systems which must operate with the 9^9 accuracy to hit revenue targets.

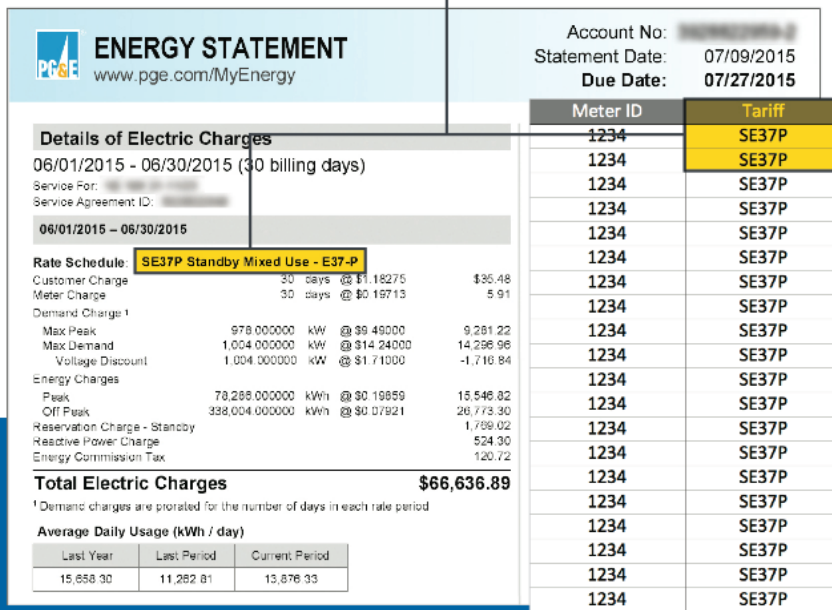
A **power converter** delivers AC-power to the load; the size of the power converter is the limiter of how much instantaneous load can be reduced.

Identifying facilities that are viable demand charge management candidates

If building demand charges **total** more than $20/kW, it is worth assessing interval data.

Interval data will show whether or not the load is “peaky” enough for a battery to cost-effectively manage demand charges.

Current electricity tariff



ENERGY STATEMENT
www.pge.com/MyEnergy

Account No: [redacted]
Statement Date: 07/09/2015
Due Date: 07/27/2015

Details of Electric Charges
06/01/2015 - 06/30/2015 (30 billing days)
Service For: [redacted]
Service Agreement ID: [redacted]

06/01/2015 – 06/30/2015

Rate Schedule: SE37P Standby Mixed Use - E37-P

Customer Charge	30 days	@ $1.18275	$35.48
Meter Charge	30 days	@ $0.19713	5.91
Demand Charge [1]			
Max Peak	978.000000 kW	@ $9.49000	9,281.22
Max Demand	1,004.000000 kW	@ $14.24000	14,296.96
Voltage Discount	1,004.000000 kW	@ $1.71000	-1,716.84
Energy Charges			
Peak	78,288.000000 kWh	@ $0.19859	15,546.82
Off Peak	338,004.000000 kWh	@ $0.07921	26,773.30
Reservation Charge - Standby			1,789.02
Reactive Power Charge			524.30
Energy Commission Tax			120.72
Total Electric Charges			**$66,636.89**

[1] Demand charges are prorated for the number of days in each rate period

Average Daily Usage (kWh / day)

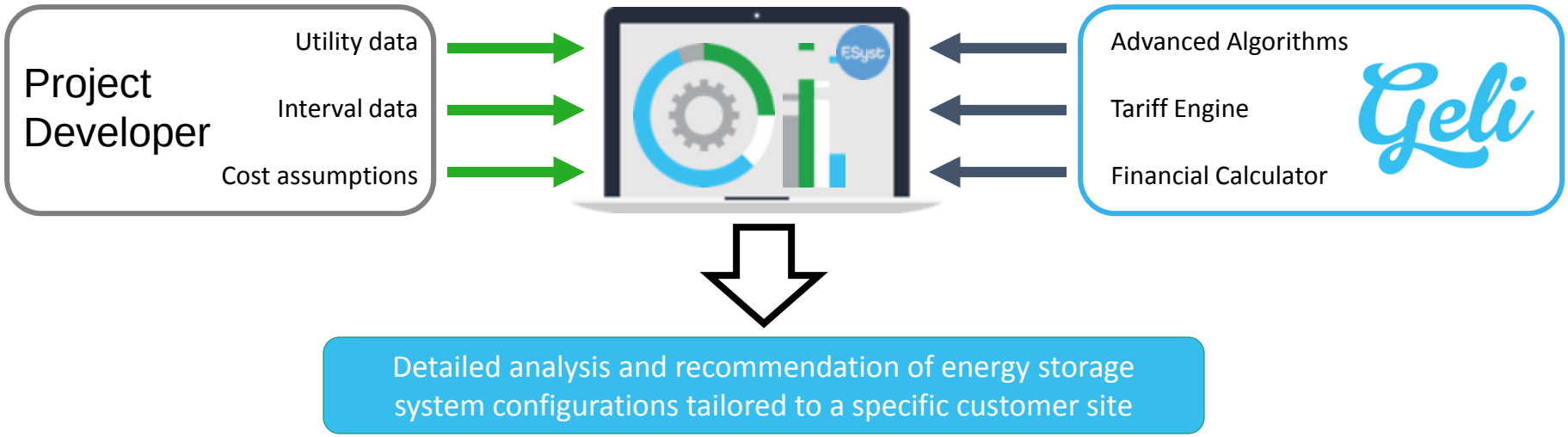
Last Year	Last Period	Current Period
15,658.30	11,282.81	13,876.33

Power demand (measured in kW)

Meter ID	Tariff	Date	Time	Demand (kW)	Energy (kWh)
1234	SE37P	6/1/14	12:00 AM	626	117
1234	SE37P	6/1/14	12:15 AM	506	145
1234	SE37P	6/1/14	12:30 AM	747	377
1234	SE37P	6/1/14	12:45 AM	897	238
1234	SE37P	6/1/14	1:00 AM	664	399
1234	SE37P	6/1/14	1:15 AM	627	204
1234	SE37P	6/1/14	1:30 AM	618	418
1234	SE37P	6/1/14	1:45 AM	698	121
1234	SE37P	6/1/14	2:00 AM	696	192
1234	SE37P	6/1/14	2:15 AM	838	328
1234	SE37P	6/1/14	2:30 AM	998	113
1234	SE37P	6/1/14	2:45 AM	955	342
1234	SE37P	6/1/14	3:00 AM	569	132
1234	SE37P	6/1/14	3:15 AM	506	271
1234	SE37P	6/1/14	3:30 AM	766	337
1234	SE37P	6/1/14	3:45 AM	574	388
1234	SE37P	6/1/14	4:00 AM	505	146
1234	SE37P	6/1/14	4:15 AM	985	397
1234	SE37P	6/1/14	4:30 AM	680	259
1234	SE37P	6/1/14	4:45 AM	599	203
1234	SE37P	6/1/14	5:00 AM	904	264
1234	SE37P	6/1/14	5:15 AM	596	351
1234	SE37P	6/1/14	5:30 AM	670	196
1234	SE37P	6/1/14	5:45 AM	921	351
1234	SE37P	6/1/14	6:00 AM	610	338

Tool for analyzing customer interval data

Online tools like Geli ESyst enable users to quickly analyze customer interval data and determine what size energy storage system saves the customer the most money.

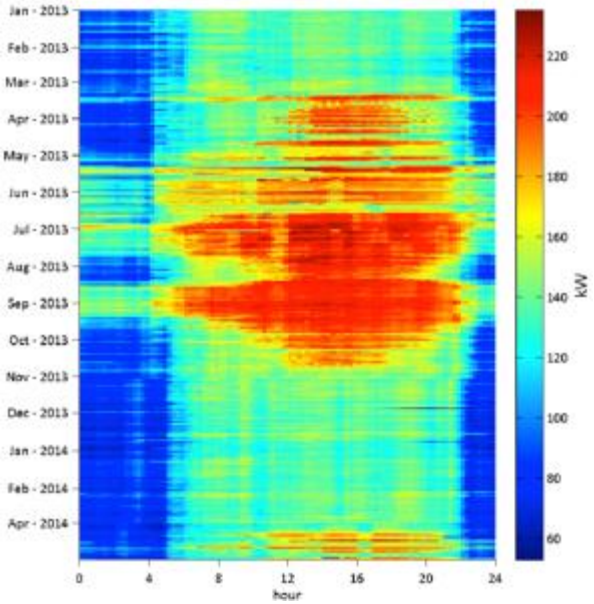


You can sign up for a free Geli ESyst beta account at **esyst.io**

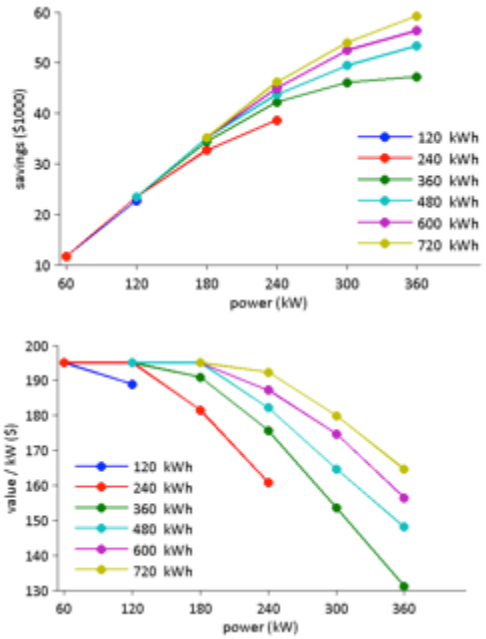
How Geli ESyst works

Geli ESyst is an online tool that enables users to quickly analyze customer interval data and determine the what size energy storage system saves the customer the most money.

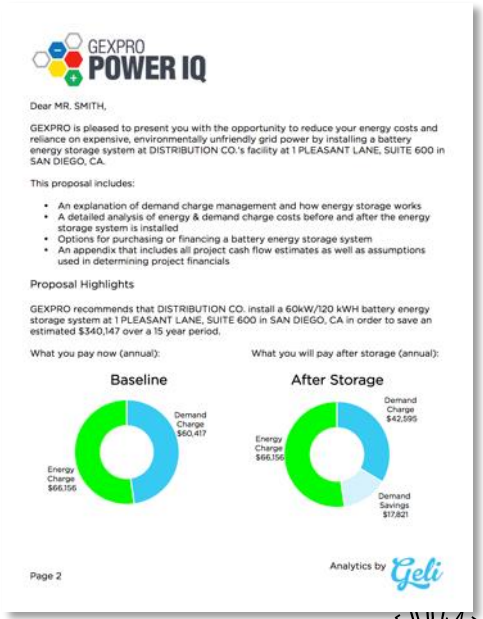
Host Site Analysis



System Simulations



Analysis Reports

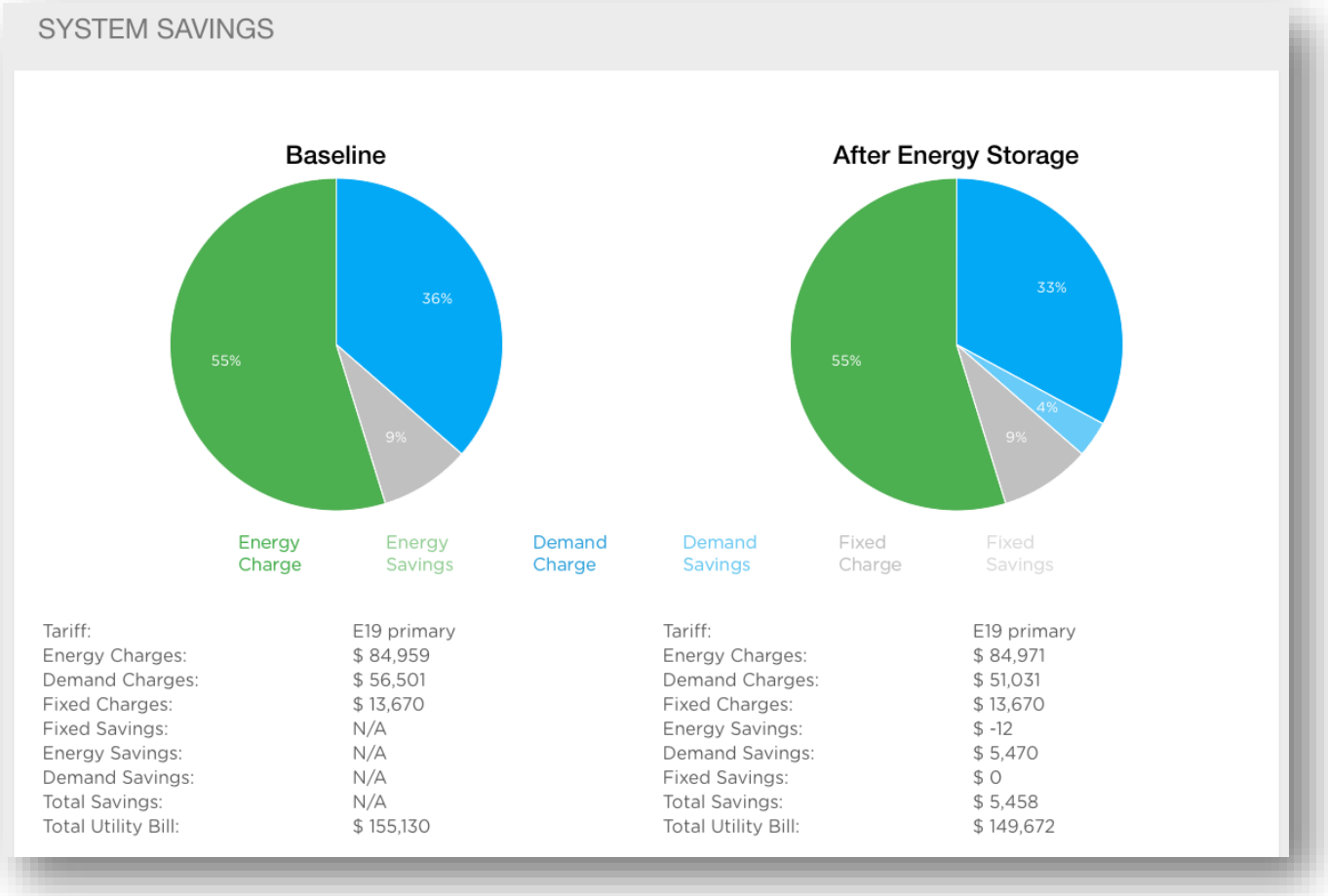


System selection in Geli ESyst

Select your ideal system based on total savings, payback, NPV, and IRR

System savings analysis in Geli ESyst

Review project savings



Analysis will recommend the appropriately sized energy storage system

Geli ESyst beta provides system hardware recommendations, including some that include IdealPower, such as Gexpro PowerIQ$_{30}$ and Gexpro PowerIQ$_{125}$

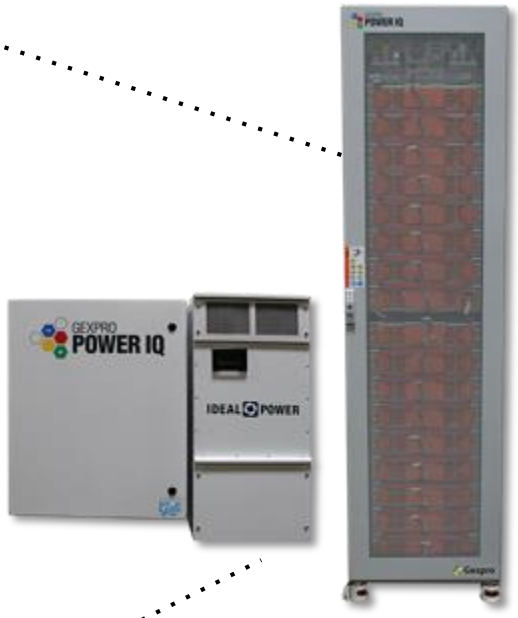
Gexpro

- 16 kits from **30**kW/**45**kWh to **500**kW/1080kWh
- Gexpro 10 year warranty
- Batteries provided by LG Chem
- Power conversion provided by IdealPower
- Automation software provided by Geli (this is critical, as analysis is used to inform operations at the customer site!)

LG Chem

Geli EOS

IDEAL POWER



This concludes The American Institute of Architects
Continuing Education Systems Course

John Merritt

(512) 264-1542

john.merritt@idealpower.com