RESILIENT POWER

A Project of Clean Energy Group

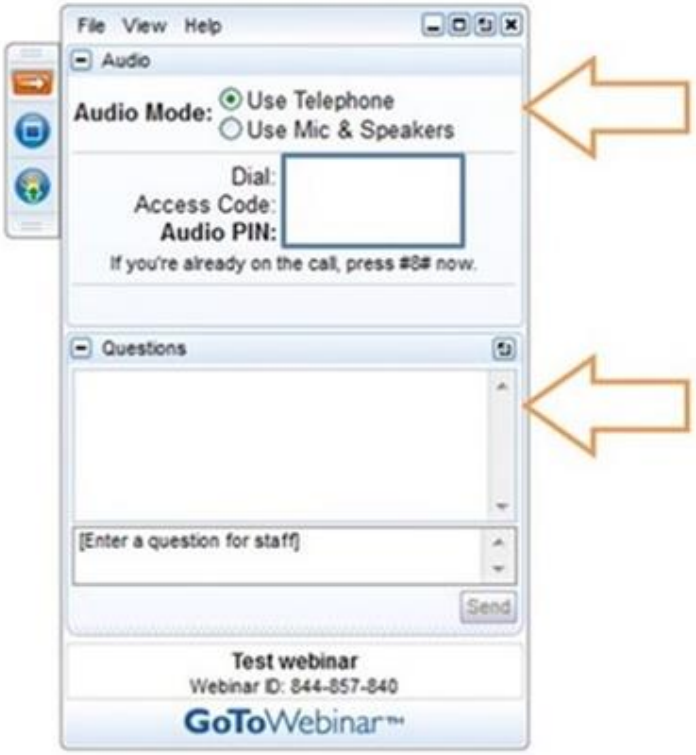
Energy Storage for Demand Charge Management

Wednesday, June 24, 2015

Seth Mullendore
Program Associate
Clean Energy Group

CleanEnergyGroup
Innovation in Finance, Technology & Policy

Housekeeping



All participants are in "Listen-Only" mode. Select "Use Mic & Speakers" to avoid toll charges and use your computer's VOIP capabilities. Or select "Use Telephone" and enter your PIN onto your phone key pad.

Submit your questions at any time by typing in the Question Box and hitting Send.

This webinar is being recorded.

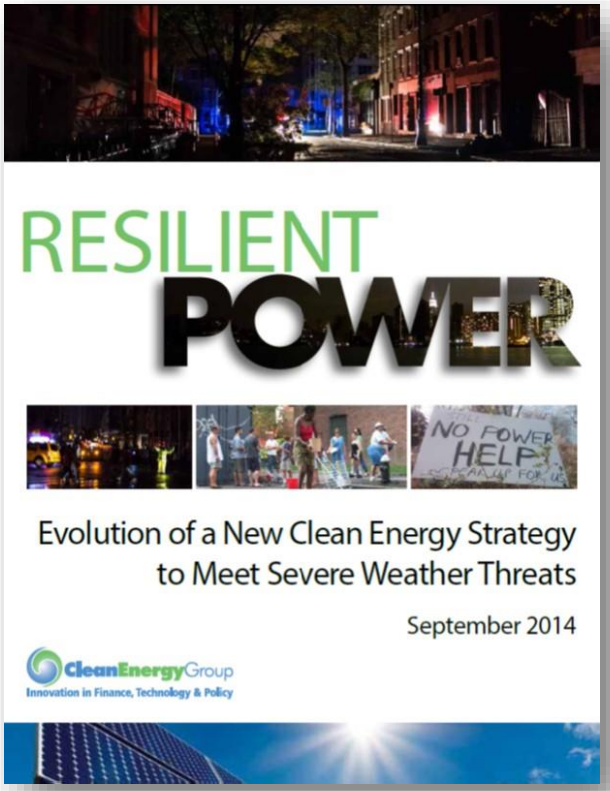
You will find a recording of this webinar, as well as previous Resilient Power Project webinars, online at:

www.cleanegroup.org/ceg-projects/resilient-power-project/webinars/

and at

vimeo.com/channels/resilientpower

Who We Are



www.cleanegroup.org

CleanEnergyGroup
Innovation in Finance, Technology & Policy

Meridian Institute
Connecting People to Solve Problems

CleanEnergy States Alliance

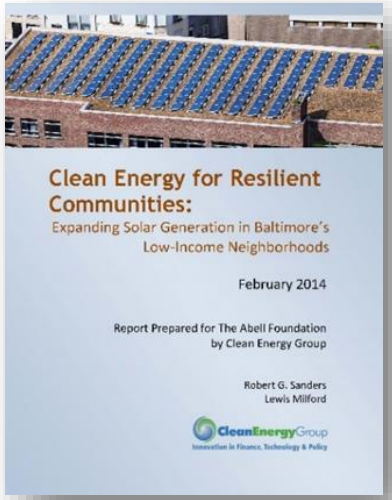
THE JPB FOUNDATION

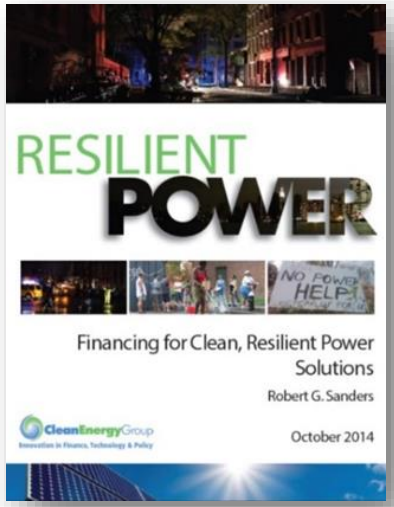
THE KRESGE FOUNDATION

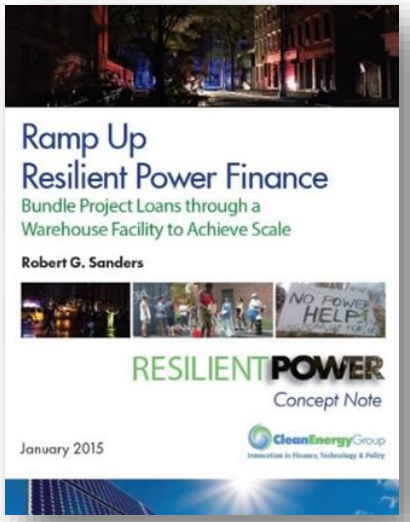
SURDNA FOUNDATION
Fostering sustainable communities in the United States

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







Today's Guest Speakers

- **Steve Kelley**, Senior Vice President, Green Charge Networks info@greencharge.net
- **Mark Johnson**, Smart Cities & MW Battery Energy Storage Microgrids, Schneider Electric mark.johnson1@schneider-electric.com

greencharge networks

www.greencharge.net

RESILIENT POWER
A Project of Clean Energy Group

INTELLIGENT ENERGY STORAGE

Power Up. Costs Down.

Stephen Kelley, SVP Sales

greencharge networks

- Largest Provider of Commercial Energy Storage
  - Systems installed coast-to-coast
- Proven track record of savings
- No cost, no risk solution
- Founded in 2009
- Headquartered in Santa Clara, CA with offices in NY

NAVIGANT RESEARCH

Rank	Company
1	AES Energy Storage
2	NEC Energy Solutions
3	RES Americas
4	LG CNS
5	Younicos
1	Green Charge Networks
2	Sharp
3	Greensmith
9	ZBB Energy
10	S&C Electric
4	CODA Energy
5	Stem

1st among energy storage companies in the commercial market.

PROBLEM

Electric bills are increasing and half the charges cannot be addressed with energy efficiency.

"Our energy costs are going up at a rate that makes your head spin"

- Tony Knight, Superintendent, Oak Park USD

Two Customers Segments

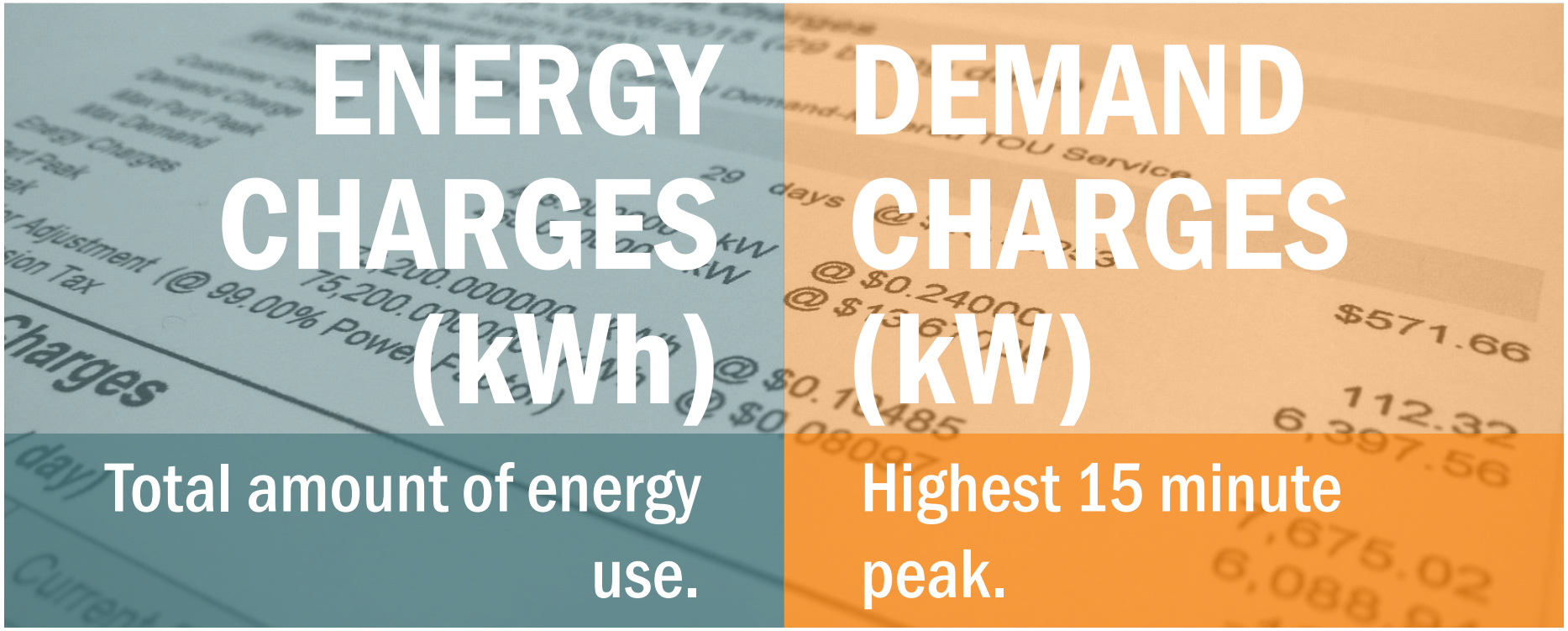
Customer Side
(“Behind the Meter”)

- Peak Demand Savings
- Energy Arbitrage
- Demand Response
- Micro Grid/ Resiliency
- No operational Impact

Utility Side
(“Front of the Meter”)

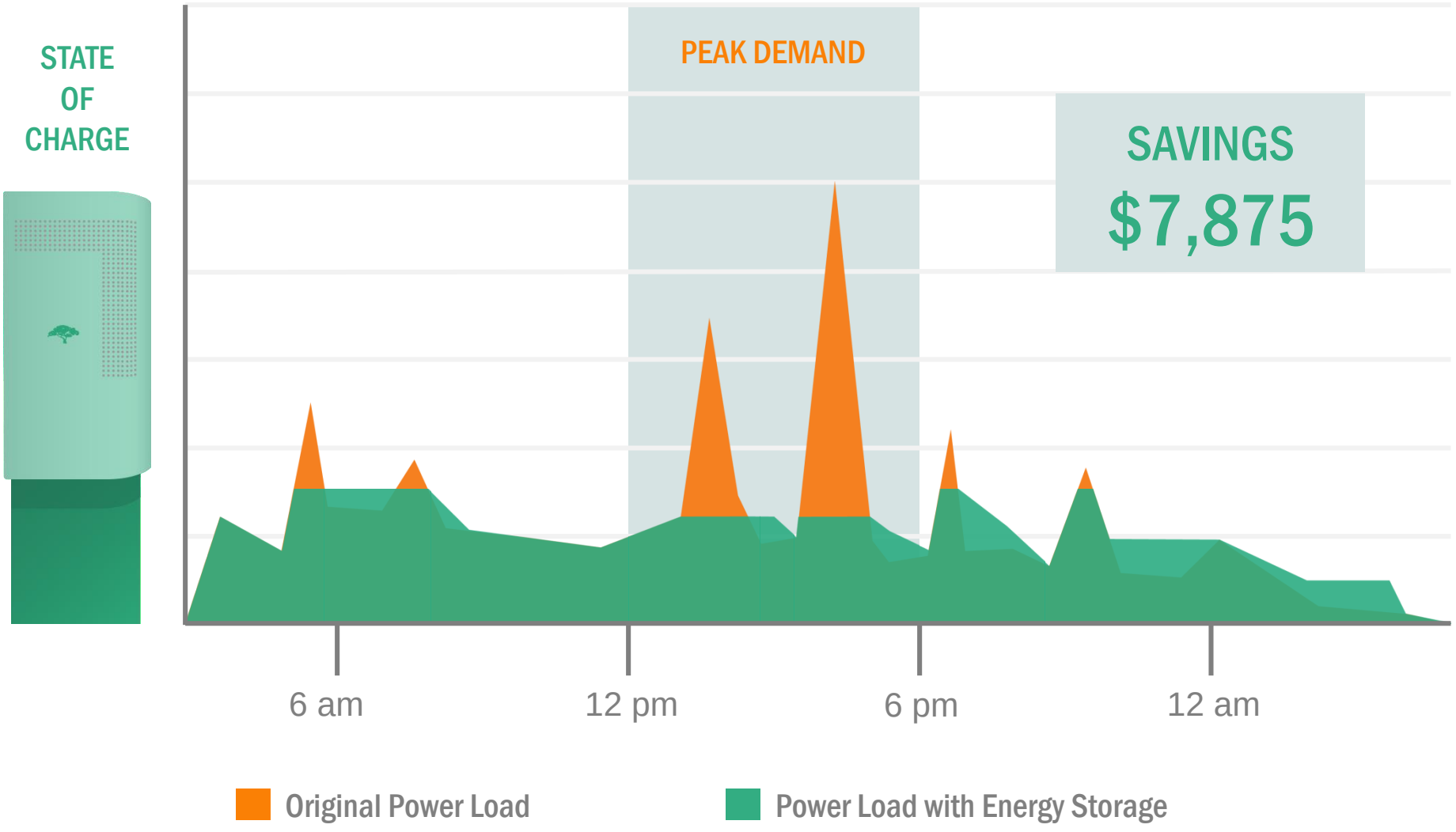
- Distributed Generation
- Substation Deferral
- Ancillary services
- Renewable firming

Two Components of Commercial Utility Bills



Demand Charges can account for over 50% of an electric bill.

Save On Demand Charges



California Demand Charges

Year	Southern California Edison	PG&E	SDG&E	
2005	$23.30	$16.10	$16.19	Cost Per kW
2006	$26.62	$22.07	$18.65	
2007	$25.43	$22.13	$15.42	
2008	$26.11	$18.28	$21.31	
2009	$28.16	$21.13	$25.38	
2010	$29.22	$21.43	$24.75	
2011	$27.40	$21.31	$28.02	
2012	$28.10	$26.19	$30.68	
2013	$33.14	$28.40	$35.68	
2014	$38.14	$30.96	$41.87	
2015	$43.14	$36.46	$45.75	
Avg. Year Over Year Increase '05 – '15	7.7%	11.5%	16.6%	

SDG&E demand charges have gone up 180% over the past decade and 49% over just the last three years!

Sample Customers

Ideal Markets

Variable Load Profile
-Breweries/Wineries
-Schools
-Industrial
-Farming
-Pharma
-Retail

"Our energy costs are going up at a rate that makes your head spin"

- Tony Knight, Superintendent, Oak Park USD

greencharge networks

Schools		60-500kw system	$12-80K Savings per Year	$120 – $2M 10 year Savings
Retail		30 – 500kw system	$7,000-$70k Savings per Year	$70k- $700k 10 year Savings
Industrial		250 – 1000 kw system	$45 - $250K Savings per Year	$450 - $3M 10 year Savings
Multi-Family Housing		60 – 250 kw system	$15 – 40K Savings per Year	$150 – 480k 10 year Savings
Muni		30 – 500 kw system	$12 – 75K Savings per Year	$120 – 1M 10 year Savings

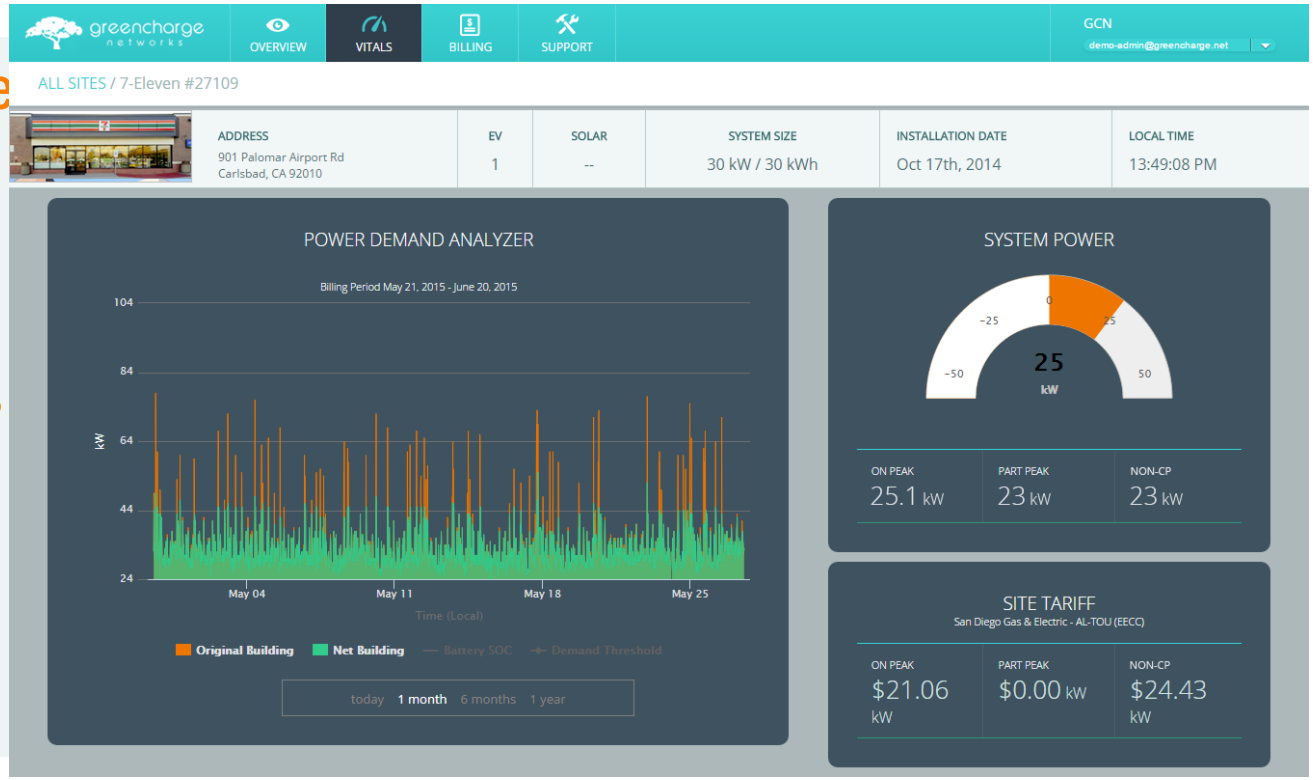
ENERGY STORAGE SOLUTION

- Intelligent Cloud-Based Software
- Lithium-ion Energy Storage
- Integrated Risk Free Financing

"They install it, they pay for it, and over 10 years we split the savings. How could you possibly say no to that?"

- Rex Parris, Mayor, City of Lancaster

Intelligent software automatically responds to peaks in demand by learning a facility's energy use patterns.



- 5 years of proven savings
- Scalable software platform
- Easily measure and communicate energy performance and savings

- Leverage data to identify additional energy savings
  - Daily weather feed
- Additional Utility service revenue
  - Demand response
  - Utility services

Energy Storage Solution – Hardware

Flexible and proven hardware options designed to perform optimally in various environments.

- Industry leading lithium-ion batteries
- Modular and expandable
- 10-year warranty
- Indoor/outdoor
- HVAC cooling
- Perfect Safety Record

A no cost financing option with equipment, installation, warranty and maintenance all included.

POWER EFFICIENCY AGREEMENT

No cost. No risk. Just savings.

- No cost or risk
  - Green Charge owns and operates the system absorbing all risk
  - No operational impact to customers
  - 10 year warranty
- Just savings
  - Savings are shared between customer and Green Charge
  - Aligned incentives to increase savings

INTELLIGENT ENERGY STORAGE

Power Up. Costs Down.

www.greencharge.net

Resilient Power Project Webinar:
Energy Storage for Demand Charge Management

Wed, Jun 24, 2015 1:00 PM - 2:00 PM EDT

Mark Johnson | Mark.Johnson1@Schneider-Electric.com

June 24th 2015

RESILIENT POWER
A Project of Clean Energy Group

Schneider Electric

Presenter: Mark Johnson

Schneider Electric Smart Cities & MW Battery Energy Storage Microgrids

‘Graduate’ of:

U.S. Department of Energy in Washington, DC

IBM Energy & Utilities

Navigant Consulting

Johnson Controls

Several energy startups

BA University of Notre Dame

MBA Loyola University of Chicago

Mark.Johnson1@Schneider-Electric.com

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Energy consumption continues to grow with no signs of slowing down.

What drives this demand?

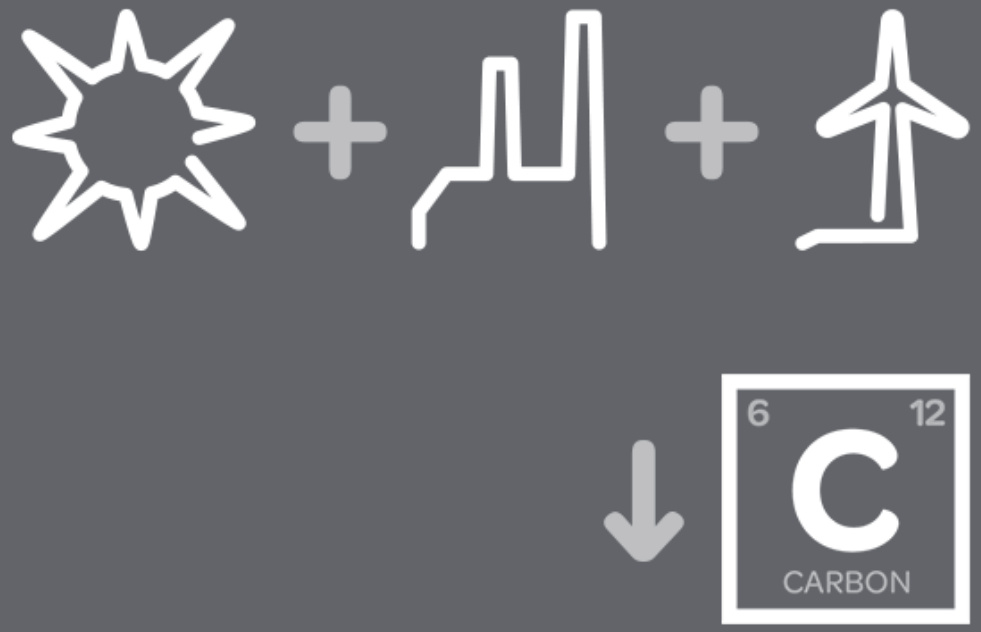
Urbanization

Digitization

Economic & Government rebalancing

Industrialization

How can we ensure we won’t cook the planet?



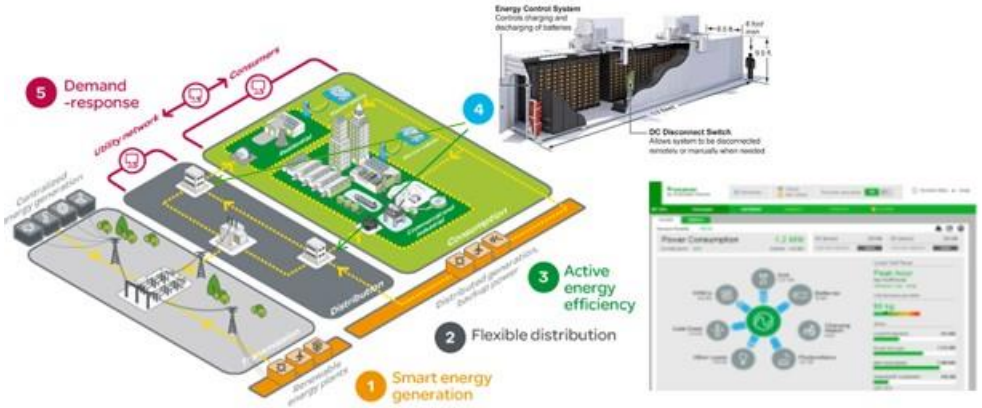
> **Consume Green**
  > Change your energy mix by utilizing renewable resource fuels to replace fossil fuels whenever possible.

> **Consume Low Carbon**
  > Replace high carbon fuels with lower carbon alternatives such as shale gas.

Neither approach keeps pace with demand.

We need to eliminate every element of waste and reduce demand, while improving profitability and resource productivity.

We believe conservation efforts should build a route to a secure energy future.



In this new economy, economic growth is decoupled from rising energy consumption.

Success = Growth ≠ Rising energy consumption

Think about it

What if your multi-billion dollar investment towards a new power plant was premature? What if the gas extraction field you started to build wasn’t necessary?

According to the IEA:

230 GW of coal-fired and 120 GW of gas-fired power plants could go offline worldwide by 2035 if proper energy efficiency programs are put into place.

Think about it

What if digitization no longer focuses on optimizing communications but aims to maximize capacity and minimize energy consumption?

According to Microsoft:

Cloud solutions can reduce power consumption by 40% and carbon emissions from 30-90% when compared to on-premise applications.

Think about it

What if investing in smart infrastructure helped minimize consumption and reduce waste to create a cleaner planet?

According to an EPRI study:
Smart grid could prevent nearly 4% of global emissions by 2020 and could reduce CO2 emissions by 60 to 211 million metric tons by 2030.

Driving innovation and sustainability

Achieve more while using less of our common planet by utilizing smart solutions for a more sustainable world.

This is where we come in with MW battery energy storage microgrids.

From smart devices through to big data, we provide our customers with services, systems and technology to:

Reduce energy consumed

Reduce cost per kWh

Reduce CO2 footprints

Reduce operating expenditures

Realize measurable efficiency

Produce energy locally across the grid

Site Optimization

To help businesses use their resources in the most efficient way possible, we access smart, real-time data and information through open platforms. This allows us to optimize energy usage across integrated systems, providing higher return on investment on CapEx and OpEx through improved site performance.

30%

less energy per unit produced

increased availability and target

<100 kWh/m2/yr

in commercial buildings

Grid Optimization

By balancing loads and more effectively managing, shifting and sharing capacity across the grid, we can reduce consumption and optimize overall performance. We create this level of smart, renewable integration through full network visibility and management.

We deliver this promise!

We are:

Global with USA coverage

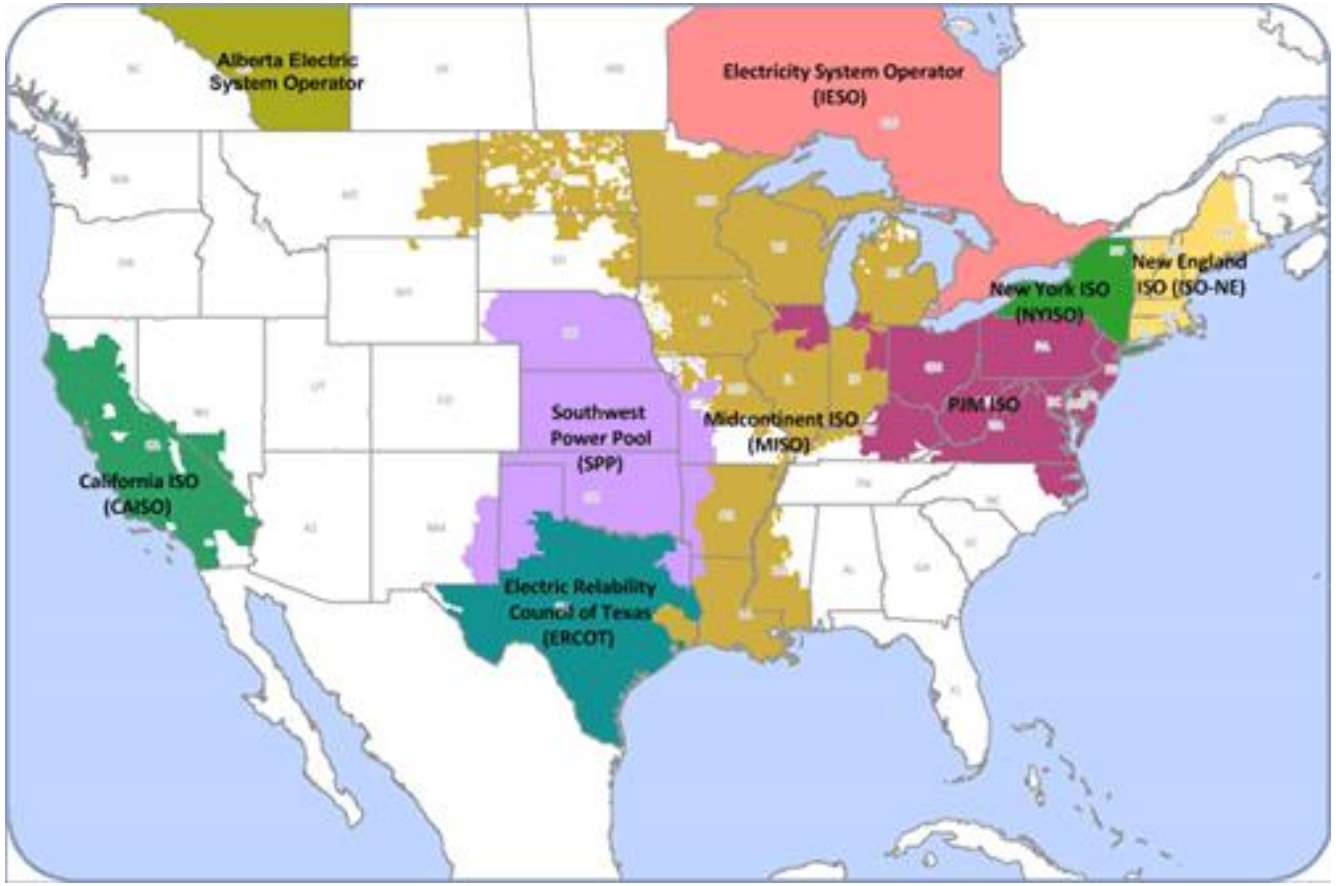
Innovative

A solution provider

Green

Reliable

ISO Markets:



Member	Headquarters	Installed Capacity	Miles Lines	Population
AESO	Calgary, AB	14,568 MW	16,155	3.7 M
CAISO	Folsom, CA	57,124 MW	26,000	30 M
ERCOT	Austin, TX	84,000 MW	40,530	23 M
IESO	Toronto, ON	35,858 MW	18,641	13.7 M
ISONE	Holyoke, MA	32,000 MW	8,130	14 M
MISO	Carmel, IN	205,759 MW	62,250	48 M
NYISO	Rensselaer, NY	37,978 MW	11,056	19.5 M
PJM	Valley Forge, PA	183,604 MW	62,566	61 M
SPP	Little Rock, AR	63,000 MW	46,921	15 M
Total		**713,838 MW**	**291,596**	**228 M**

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ISO program details:

IRC ISO/RTO COUNCIL	AESO	CAISO	ERCOT	Ontario	ISO-NE	MISO	NYISO	PJM	SPP
Market Types									
Centralized Capacity Market					✓	✓	✓	✓	
Day-Ahead Market	Ancillary Services procurement only	✓	✓	DA Commitment process	✓	✓	✓	✓	✓
Financial Transmission Rights		✓	✓	✓	✓	✓	✓	✓	✓
Offline Reserve Market	✓	✓	✓	✓	✓	✓	✓	✓	✓
Ramping Market		✓							
Real-Time Market	✓	✓	✓	✓	✓	✓	✓	✓	✓
Regulation Market	✓	✓	✓	Contract Service	RT Only	✓	✓	RT Only	✓
Resource Adequacy Requirement		✓		✓	✓	✓	✓	✓	✓
Synchronous Reserve Market	✓	✓	✓	✓	RT Only	✓	✓	RT Only	✓
Market Pricing									
Co-Optimization of Energy & Reserves		✓	✓	✓	✓	✓	✓	✓	✓
Energy Pricing	System	Locational	Locational	Uniform	Locational	Locational	Locational	Locational	Locational
Marginal Losses		✓			✓	✓	✓	✓	✓
Settlements									
Resource Make-Whole	✓	✓	✓	✓	✓	✓	✓	✓	✓
Settlement Interval	Hourly	5 &15 min	15 min	5 min	Hourly	Hourly	5 min	Hourly	5 min
Other Market Features									
Demand Response	✓	✓	✓	✓	✓	✓	✓	✓	✓
Must Offer in Day-Ahead	✓	✓		✓	✓	✓	✓	✓	✓
Offer Energy Floor/Cap ($/MWh)	0/999	-150/1000	-250/7,000	-2,000/2,000	-150/1000	-500/1000	No Floor/1000	No Floor/1000	-500/1000
Price Floor/Cap ($/MWh)	0/1000			-2,000/2,000					
Scarcity Pricing Mechanism ($/MWh)		✓	9000			3500	✓	2700	✓
Virtual Transactions	✓	✓	✓		✓	✓	✓	✓	✓

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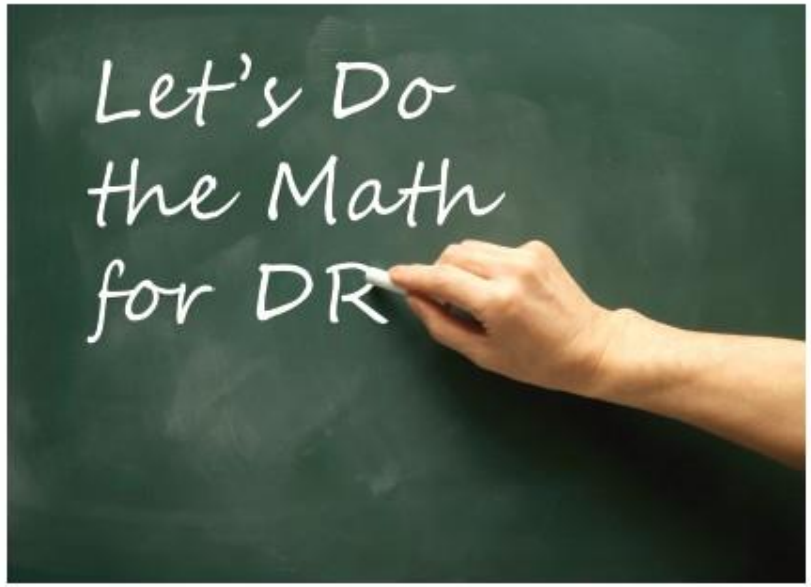
Examples of utility demand savings programs:



($6.00/kW-month)
X (x kW)
X (5 months)
X (Performance Factor %)
= Your DLRP capacity payment

($10.00/kW-month)
X (x kW)
X (5 months)
X (Performance Factor %)
= Your CSRP capacity payment

CURRENT FINANCIAL VALUE OF DEMAND RESPONSE REVENUES IN NYC DR PROGRAMS
In 100kW, 500kW, and 1MW amounts of pledged load reduction.

Programs and kW Enrollments	100 kW	500 kW	1 MW
1. NYISO SCR Capacity: summer and winter (capacity payment) The New York Independent System Operator (NYISO) Special Case Resources (SCR) program pays a capacity payment for the summer and winter seasons. Esentially, the NYISO will call an event (up to 4 hours long) to reduce demand, under conditions when the power grid is stressed. Participating facilities get paid for committing to reduce a specified amount of load capacity, on a 21-hour notice.	$13,035	$65,175	$130,350
2. NYISO SCR Energy Performance: summer and winter (Energy Performance Payment) The NYISO SCR program pays an incentive per kWh of energy reduced during their events.	$750	$3,750	$7,500
3. CECONY DLRP Capacity: summer only (Capacity Payment) The Consolidated Edison Company of New York (CECONY) Distributed Load Response Program (DLRP) pays a reservation payment per specified capacity that organizations pledge to reduce when called, on a 2-hour notice.	$3,000	$15,000	$30,000
4. CECONY DLRP Energy Performance: summer only (Energy Performance Payment) CECONY DLRP pays an incentive per kWh of energy reduced during their events.	$400	$2,000	$4,000
5. CECONY DLRP 3-Year Retention Bonus Paid only after third consecutive year with performance at or above 80% each year.	$2,500	$12,500	$25,000
6. CECONY CSRP Capacity: summer only (Capacity Payment) The utility's Commercial System Relief Program, a 21-hour notice program, pays participating organizations for pledging a specified capacity to shave system peaks.	$5,000	$25,000	$50,000
7. CECONY CSRP Energy Performance: summer only (Energy Performance Payment) CECONY CSRP pays an incentive per kWh of energy reduced during their events.	$1,200	$6,000	$12,000
8. CECONY CSRP 3-Year Retention Bonus: Paid only after third consecutive year with performance at or above 80% each year.	$5,000	$25,000	$50,000
Total Annual DR Revenue (Assumes three events in the summer, one in the winter)	**$30,885**	**$154,425**	**$308,850**

Source: ConEdSolutions.com

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Teaming:

Microgrid

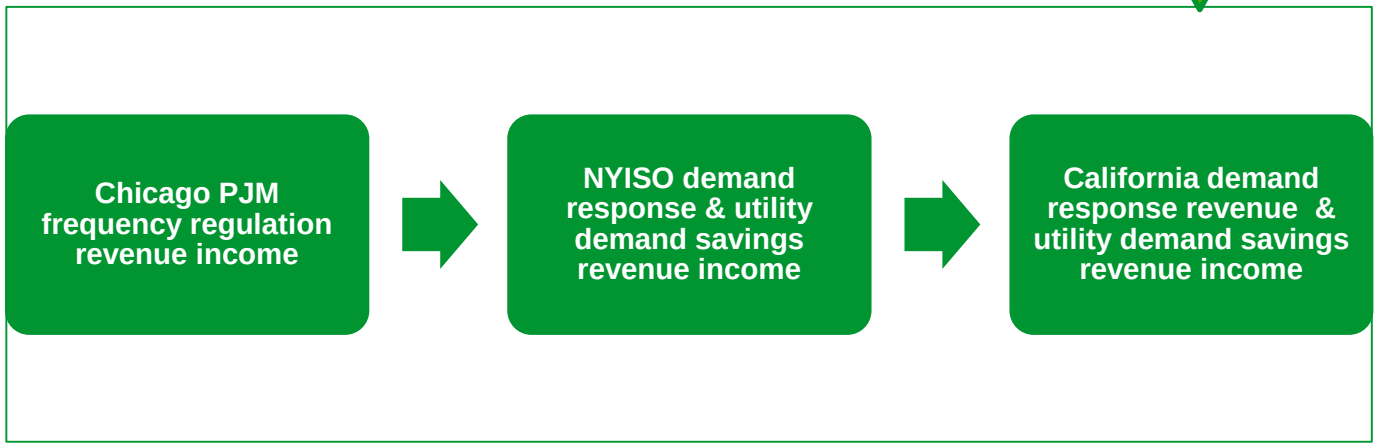
Schneider Electric: engineer, procure & construct with Demand Side Operations, inverters & transformers

Batteries

Batteries & battery management systems in delivered containers

Developer & Operator

MWBattery.com: customer trust, optimization & financial risk responsibility with monthly reporting



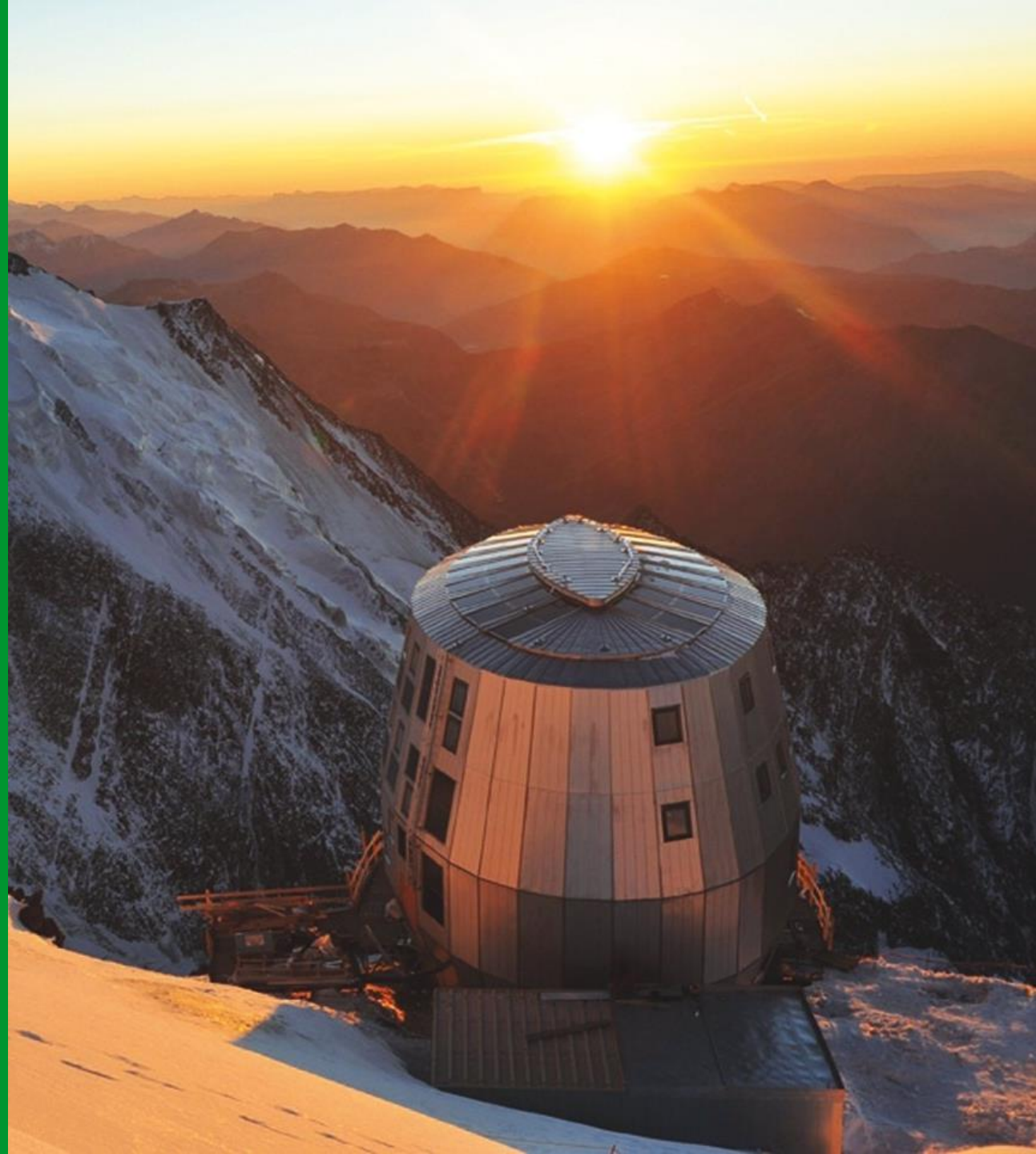
Fast, friendly, focused & flexible timetable:

Energy Storage Timetable Checklist:					
#	Month1	Month2	Month3	Month4	Month5
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					

Our capabilities

Allow us to deliver tangible results for customers, wherever they might be.

Mark.Johnson1@Schneider-Electric.com



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