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Electric Transit Charging Infrastructure and Energy Storage

Prepared for CARB Electric Utility Workgroup
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- Largest provider of commercial, distributed energy storage
 - 50+ MWh deployed/under construction
 - 40+ systems co-installed with EV chargers
- Interconnected with 5 utilities
- Founded in 2009 and headquartered in Santa Clara, CA with offices in New York & San Diego
- \$56 million in equity capital
- \$50 million in project finance



ENVIRONMENTAL LEADER PRODUCT OF THE YEAR 2015



ENERGY STORAGE NORTH AMERICA GOLD AWARD 2014 & 2015



GREENTECH MEDIA'S GRID EDGE 20 2015



STEVIE'S AMERICAN BUSINESS AWARDS FINALIST 2015



PLATT'S GLOBAL ENERGY AWARDS FINALIST 2015



FIERCE INNOVATION AWARD WINNER 2015



SMART GRID NEWS TOP 15 COMPANIES FINALIST 2015



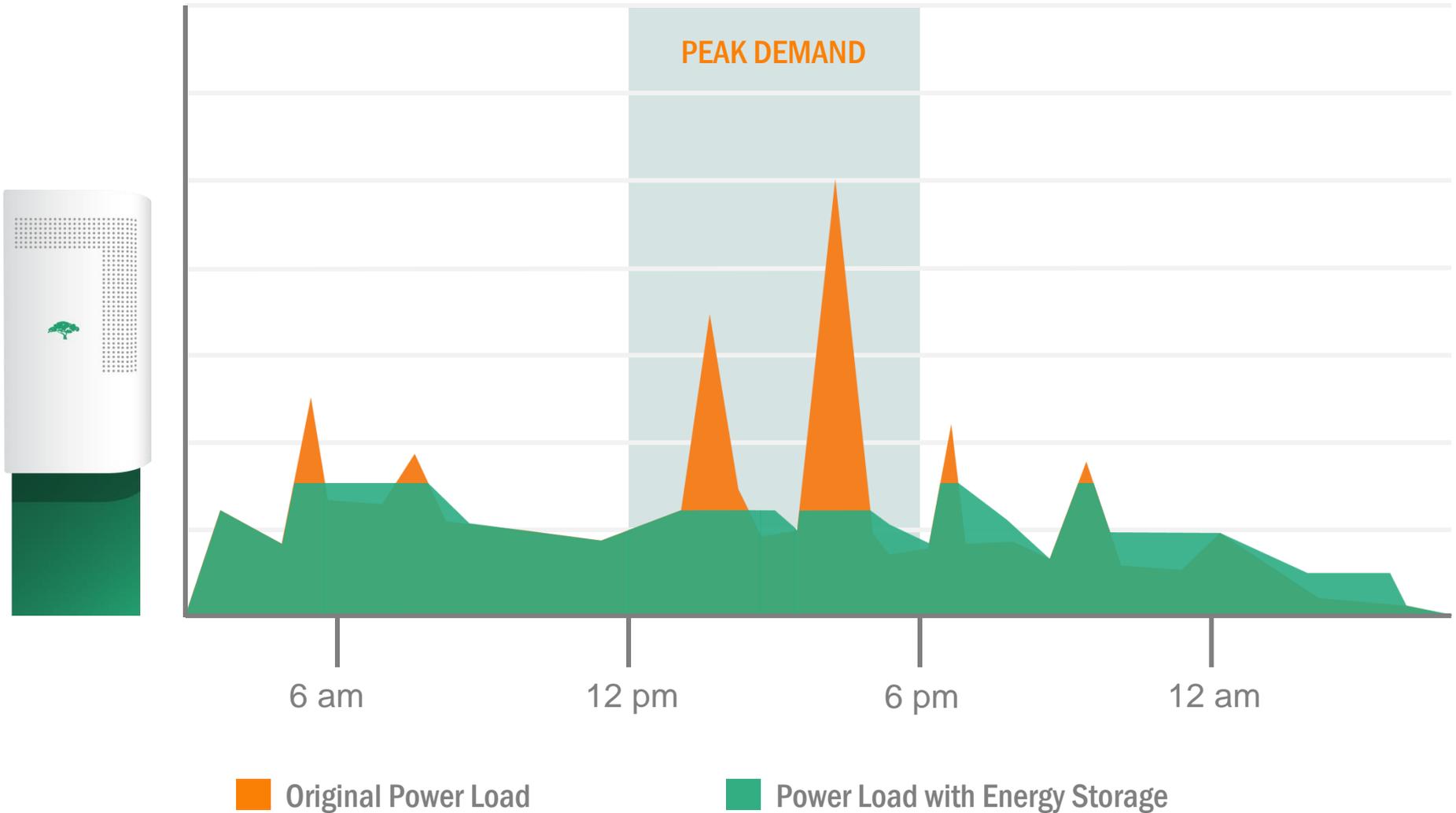
ENERGY CHARGES (kWh)

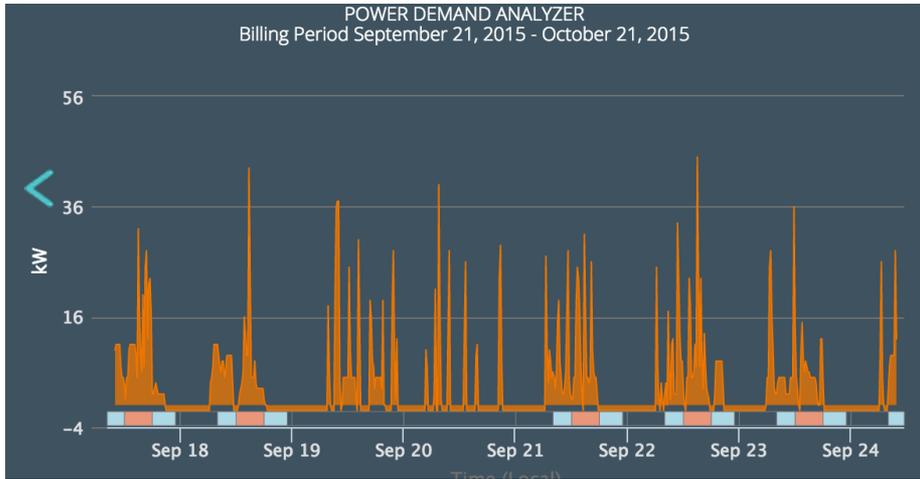
Total amount of energy
use.

DEMAND CHARGES (kW)

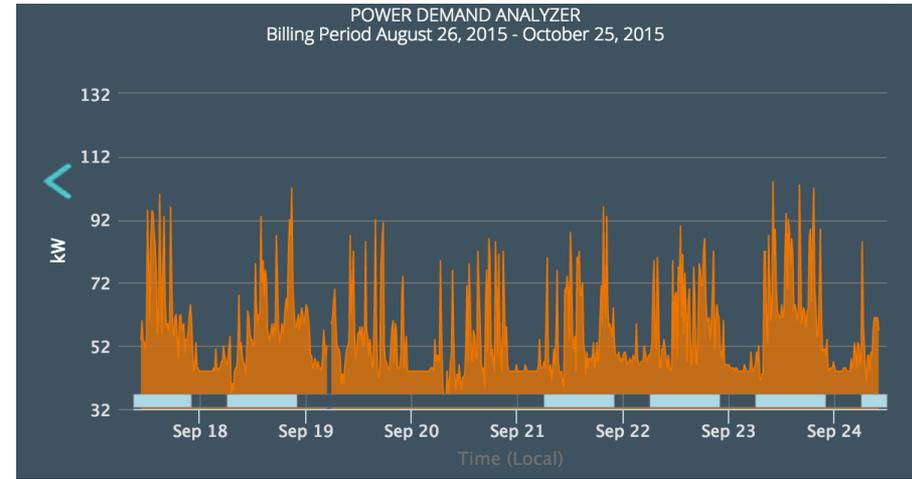
Highest 15 minute
peak.

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

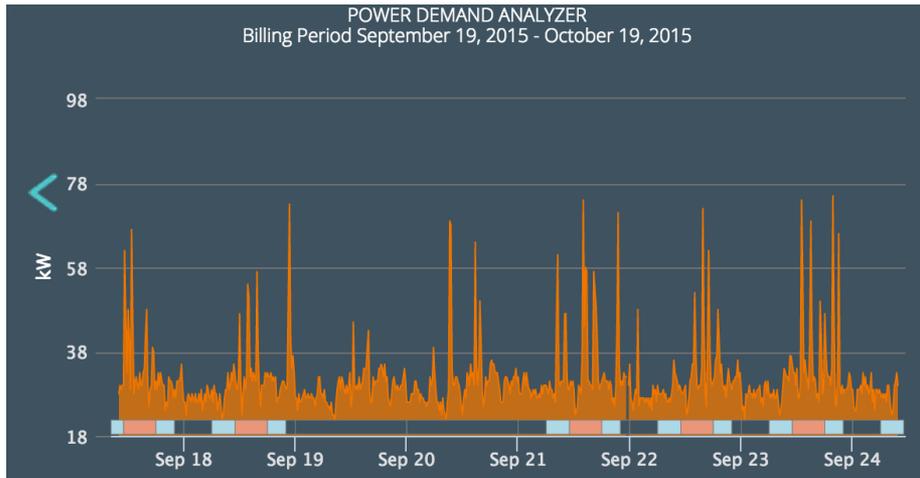




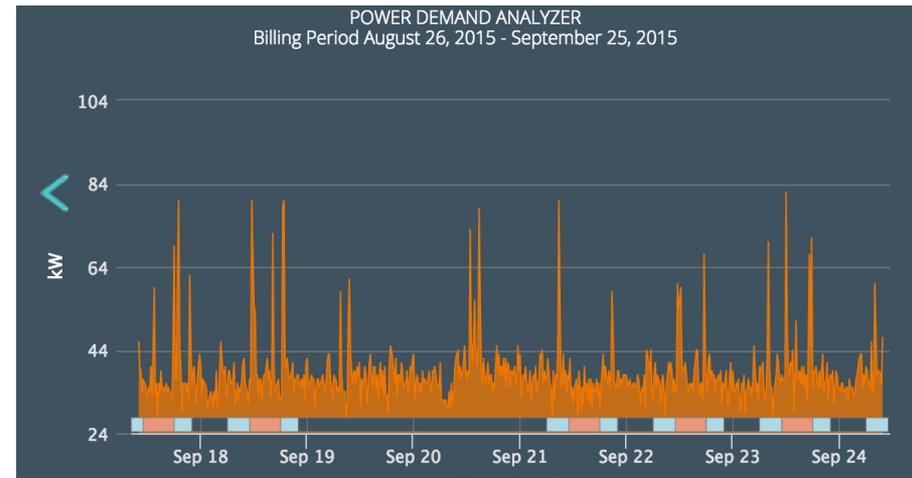
Fullerton Garage



Santa Clara Garage



7-eleven Garnet



7-eleven Convoy

Year	 SOUTHERN CALIFORNIA EDISON	 PG&E	 SDG&E	Cost Per kW
2005	\$23.30	\$16.10	\$16.19	
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!

ENERGY STORAGE SOLUTION

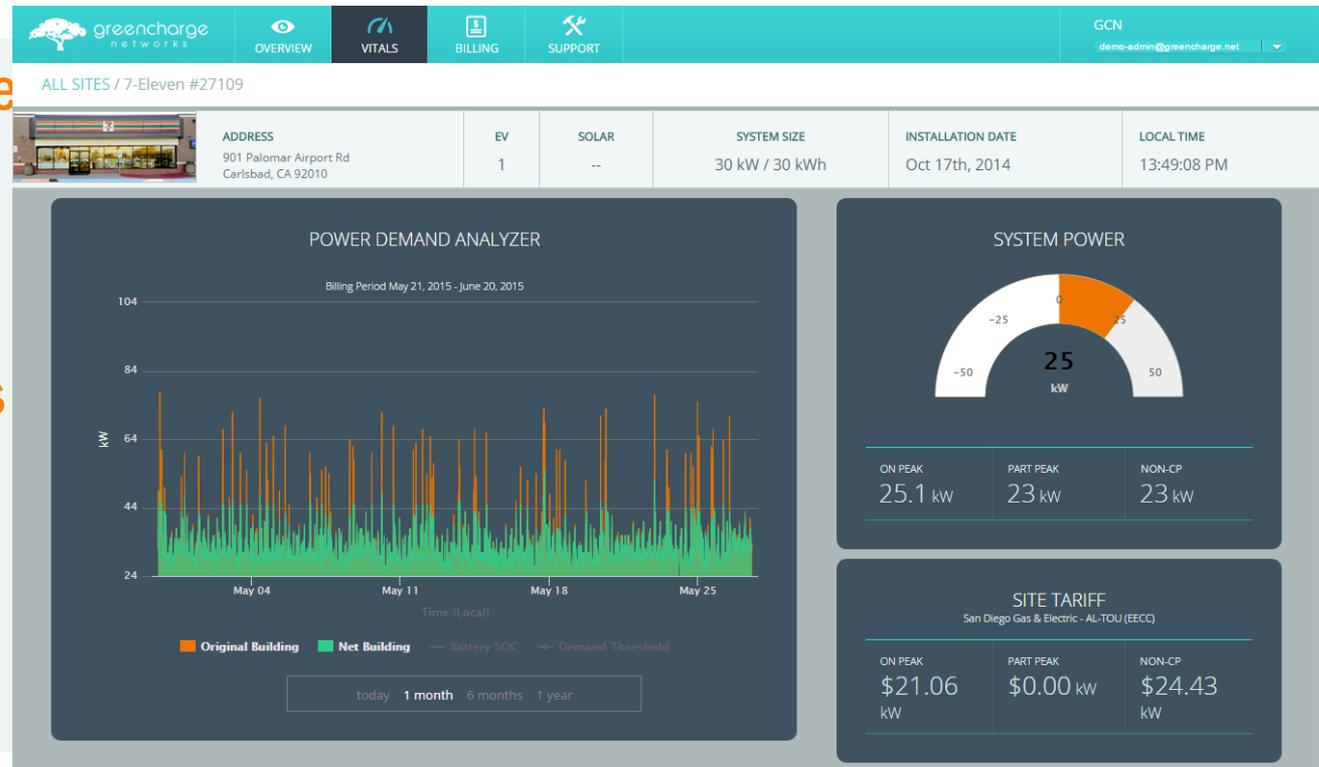
- Intelligent Cloud-Based Software
- Lithium-ion Energy Storage
- Integrated Risk Free Financing

“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.



- 200,000+ operational hours
- 5 years of proven savings
- Scalable software platform
- Easily measure and communicate energy performance and savings
- Leverage data to identify additional energy savings
 - Transit schedules, usage patterns
- Additional Utility service revenue
 - Demand response
 - Utility services

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
- 30kW/30kWh
 - 2' x 2.5' footprint
- 250kW/500kWh & Up

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

Municipality: Redwood City

Size: 84,000 Residents

Locations: 2

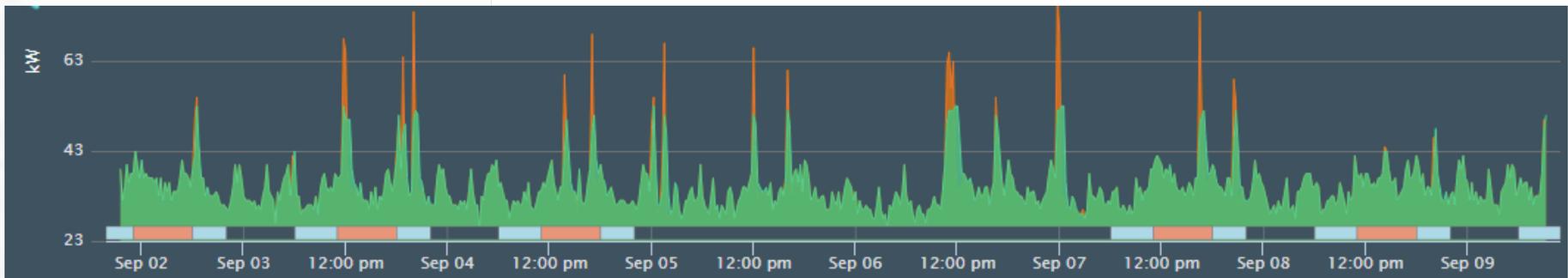
- High-traffic downtown parking garage
- Redwood City Public Library

Annual Savings: \$7,000 per site in demand charges

Financing Model: Green Charge PEA™ Shared Savings



Sample GridSynergy™ Control Software View



KEY DEMAND MANAGEMENT CONSIDERATIONS

ON-ROUTE FAST CHARGING

High power draw

Discussed today

Short-duration

Chargers relatively distributed

OVERNIGHT SLOW CHARGING

Low power draw

Long-duration

Chargers relatively centralized

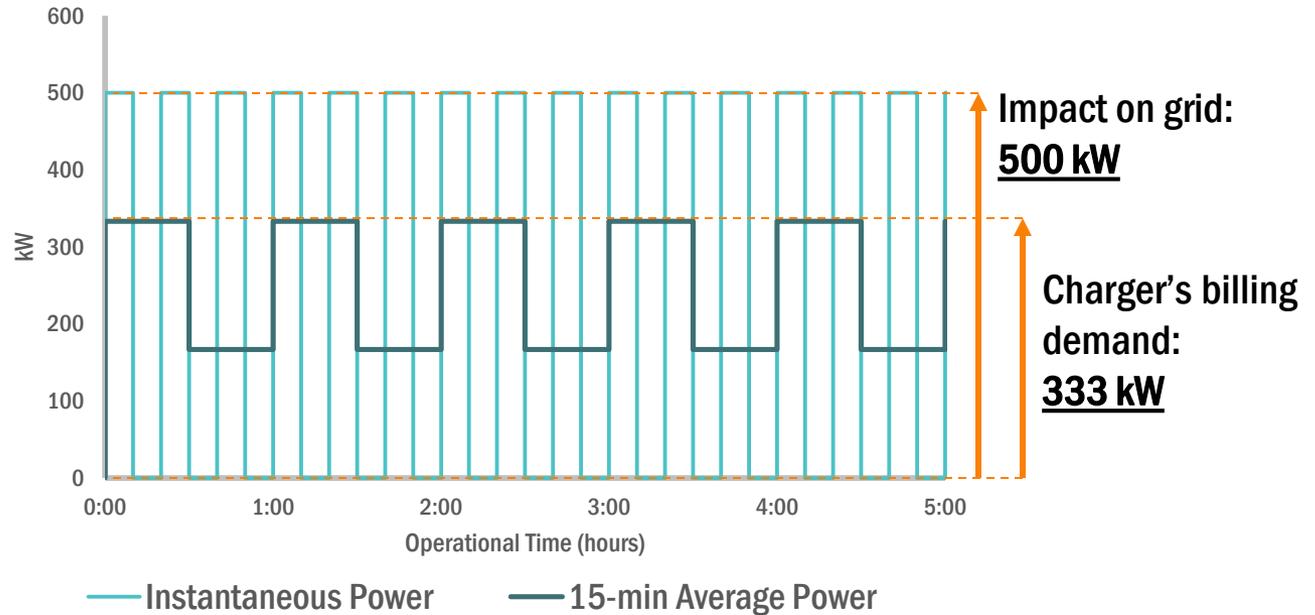
Duration per
charge 10 min

Time
between
charges 10 min

Energy
storage
power 250 kW

Energy
storage
capacity 250 kWh

500 kW Fast Charger Profile (Perfect Adherence to Schedule)



Operation profile generated by referencing Energies 2015 article: *Fast Charging Battery Buses for the Electrification of Urban Public Transport - A Feasibility Study Focusing on Charging Infrastructure and Energy Storage Requirements*, and USDOT 2014 whitepaper: *Peak Demand Charges and Electric Transit Buses*

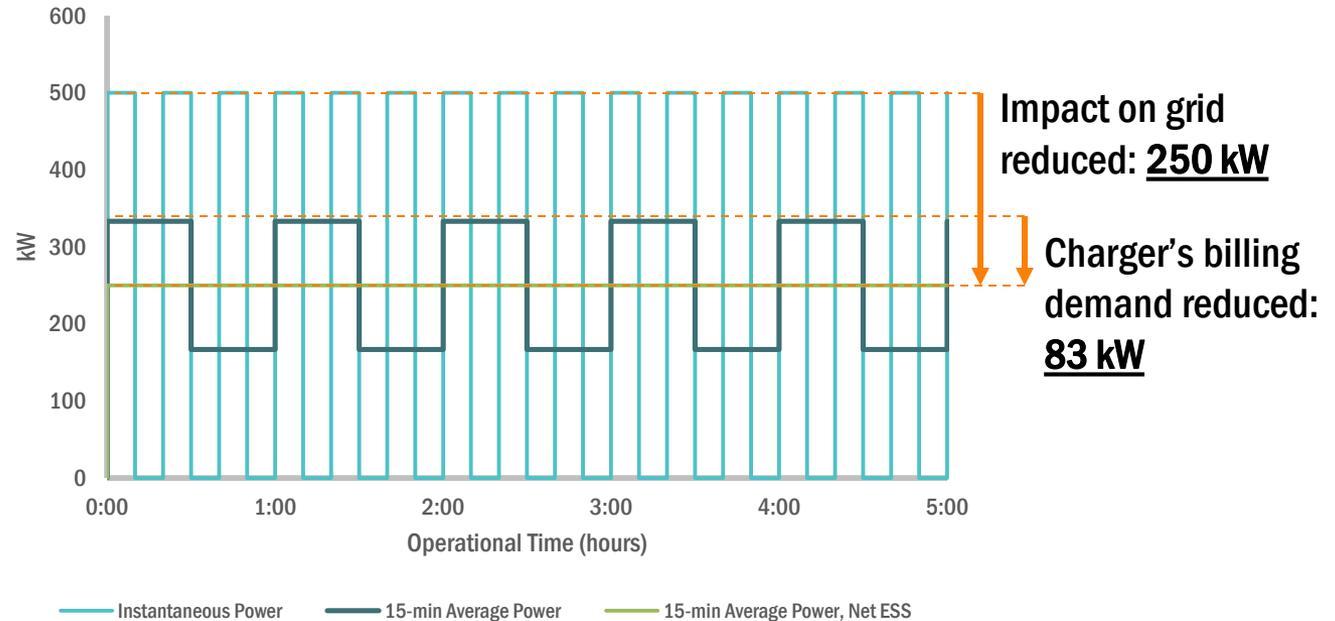
Duration per charge 10 min

Time between charges 10 min

Energy storage power 250 kW

Energy storage capacity 250 kWh

500 kW Fast Charger Profile
(Perfect Adherence to Schedule)



Reduction of 83 kW in billing demand is equivalent to ~\$15,000 to \$30,000 per charger of annual savings, depending on tariff

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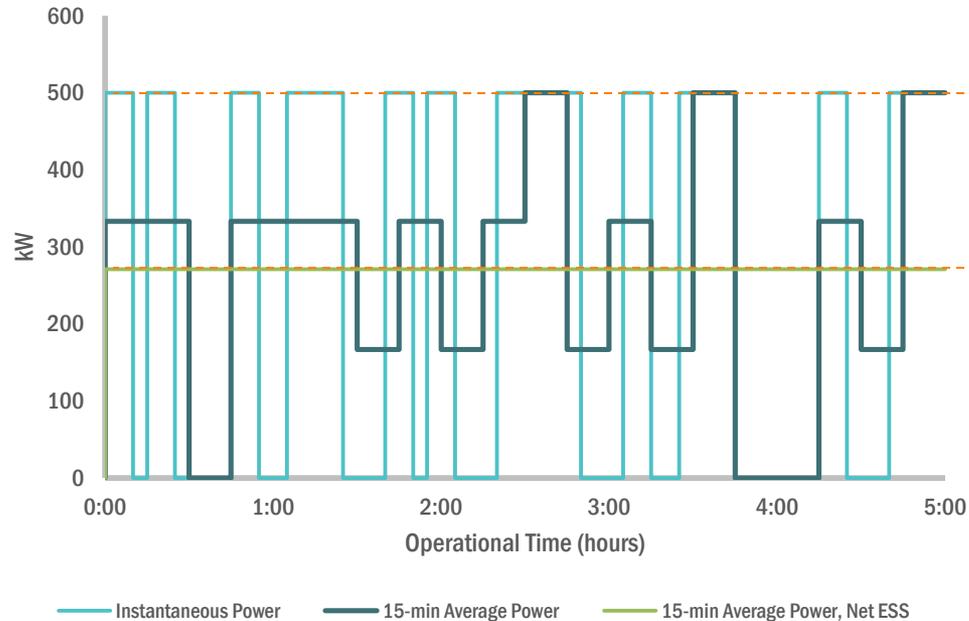
Duration per charge 10 min
+/- 3min

Time between charges 10 min
+/- 3min

Energy storage power 250 kW

Energy storage capacity 250 kWh

500 kW Fast Charger Profile
(Imperfect Adherence to Schedule)



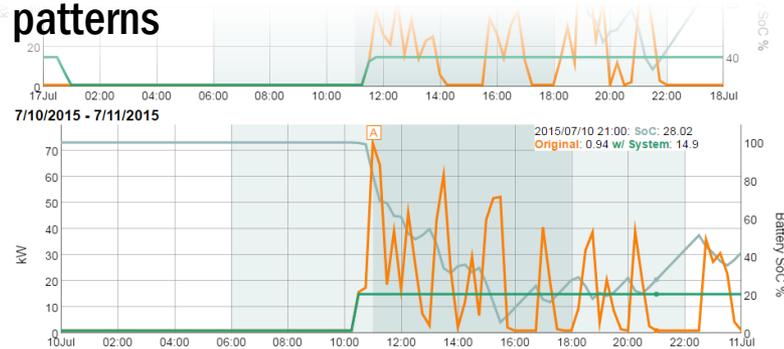
Grid demand and charger's billing demand reduced: **225 kW**

Reduction of 225 kW in billing demand is equivalent to **\$40,000 - \$80,000** per charger of annual savings, depending on tariff

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Technical: Sample assessments for specific charging stations and usage patterns



Financial: Work through business case and financing considerations (peak management; grid services with unused capacity)

	(12/15)	(12/16)	(12/17)	(12/18)	(12/19)	(12/20)	(12/21)	(12/22)	(12/23)	(12/24)
REVENUES & SAVINGS										
SGP Revenue	\$41,200	\$5,040	\$5,040	\$5,040	\$5,040	\$5,040	\$0	\$0	\$0	\$0
Other Revenues										
OPERATIONS & MAINTENANCE										
Plant Optimization Savings	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Customer Charge	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Energy Charge	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Demand Charge	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Other Fuel	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Utility Charge Tar	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Peak Demand Reduction Savings	\$14,720	\$5,466	\$5,240	\$7,082	\$7,504	\$8,799	\$10,720	\$20,720	\$21,760	\$22,880
Net Energy Savings	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Peak Pricing Savings	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Deferred Purchase Revenue	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Wholesale Market Revenues	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Utility Energy Tar Savings	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Equipment Residual Value										
Other Market Revenues										
NET ANNUAL CASHFLOW	(\$9,280)	(\$1,034)	(\$1,274)	(\$1,492)	(\$1,487)	(\$2,254)	\$7,793	\$16,720	\$42,520	\$45,760
CUMULATIVE CASHPOSITION	(\$9,280)	(\$14,314)	(\$15,588)	(\$17,080)	(\$18,567)	(\$20,821)	(\$13,028)	(\$3,308)	\$19,212	\$65,072



greencharge
networks

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Thank you

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