



Heavy Duty Solar Systems

Application Chart

	80W	165W	220W - 280W	330W to 380W	440W to 660W
Lot Rot Prevention	✓	✓	✓	✓	✓
Battery Maintenance	✓	✓	✓	✓	✓
Jump Start Avoidance	✗	✓	✓	✓	✓
Telmatics	✗	✓	✓	✓	✓
Hotel Loads	✗	✗	✗	✓	✓
eHVAC	✗	✗	✗	✓	✓



- **Bergstrom Solar addresses every requirement, provides power, takes care of voltage drops, has built-in temp compensations for adequate charge, can charge both starting batteries and auxiliary batteries, eliminates dead battery events, maintains batteries properly. INCREASES RUN TIME of eHVAC**
- ✓ **Proper charging** vs *Inadequate charging via DC to DC converters or Capacitors*
- ✓ **Jump starts are eliminated** vs *Boost via Ultra Capacitors that provide temporary relief*
- ✓ **Topped off batteries after every cycle** vs *Excessive battery discharge*
- ✓ **Unused vehicles can be sitting on yards** vs *Lack of use results in auxiliary charging devices unable to provide power /charge to batteries, leaving batteries in a discharged state*
- ✓ **Always on and ready to bulk, float or equalize** vs *Driver error and/or need for training*
- ✓ **Maintenance free** vs *Complex built-in diagnostics*
- ✓ **Cost-Effective, one piece of equipment** vs *Expensive DC converters and Capacitors that need alternator and engine to work*

- MST® Patented Technology, Flexible, Rugged, Lightweight, mono cSi PV modules.
- Plug & Play Systems with Peel & Stick Modules
- MST® Delivers 20% More Energy in real world conditions
- MST® 80% Lighter than Glass
- 50x More durable than BusBar
- 2.5x Power Density vs. Thin-Film
- Zero – Maintenance
- Impressive ROI numbers, Customer Validated, with Thousands of Deployments in North America

85W Roof or Fairing Mounted



KIT MODEL: RWS-K0851H

- 1x 85W Bergstrom PV Modules with adhesive for Peel & Stick installation and Edge Tape
- 1x Optimized IP68 Charge Controller
- 1x 20' Wire Harness
- 1x 10' Battery Harness with In-line fuse & Ring Terminals

165W Roof Mounted

KIT MODEL: RWS-K1651R

- 1x 165W Bergstrom PV Modules with adhesive for Peel & Stick installation and Edge Tape
- 1x Optimized IP68 Charge Controller
- 1x 20' Wire Harness
- 1x 10' Battery Harness with In-line fuse & Ring Terminals

Solar Panel Dimensions

	W	L	H1
MM	689	1556	4
IN	27 2/16	61 4/16	3/16

330W Roof Mounted

Ideal for Freightliner Short Roof

KIT MODEL: RWS-3301F



- 1x 330W Bergstrom PV Modules with adhesive for Peel & Stick installation and Edge Tape
- 1x Optimized IP68 Charge Controller
- 1x 20' Wire Harness
- 1x 10' Battery Harness with In-line fuse & Ring Terminals



Solar Panel Dimensions

	W	L	H1
MM	1967	1083	4
IN	77 7/16	42 5/8	3/16

330W Roof Mounted

Ideal for Freightliner Mid-Roof

KIT MODEL: RWS-3302F



- 2x 165W Bergstrom PV Modules with adhesive for Peel & Stick installation and Edge Tape
- 1x Optimized IP68 Charge Controller
- 1x 20' Wire Harness
- 1x 10' Battery Harness with In-line fuse & Ring Terminals

Solar Panel Dimensions (each)

	W	L	H1
MM	689	1556	4
IN	27 2/16	61 4/16	3/16

330W Roof Mounted

Ideal for International LT



KIT MODEL: RWS-3302F

- 2x 165W Bergstrom PV Modules with adhesive for Peel & Stick installation and Edge Tape
- 1x Optimized IP68 Charge Controller
- 1x 20' Wire Harness
- 1x 10' Battery Harness with In-line fuse & Ring Terminals

Solar Panel Dimensions (each)

	W	L	H1
MM	689	1556	4
IN	27 2/16	61 4/16	3/16

330W Roof Mounted

Ideal for Volvo (No Sunroof)

KIT MODEL: RWS-3302F

- 2x 165W Bergstrom PV Modules with adhesive for Peel & Stick installation and Edge Tape
- 1x Optimized IP68 Charge Controller
- 1x 20' Wire Harness
- 1x 10' Battery Harness with In-line fuse & Ring Terminals

Solar Panel Dimensions (each)

	W	L	H1
MM	689	1556	4
IN	27 2/16	61 4/16	3/16

440W Roof Mounted

Ideal for Freightliner Cascadia

KIT MODEL: RWS-4402F

- 2x 220W Bergstrom PV Modules with adhesive for Peel & Stick installation and Edge Tape
- 1x Optimized IP68 Charge Controller
- 1x 20' Wire Harness
- 1x 10' Battery Harness with In-line fuse & Ring Terminals

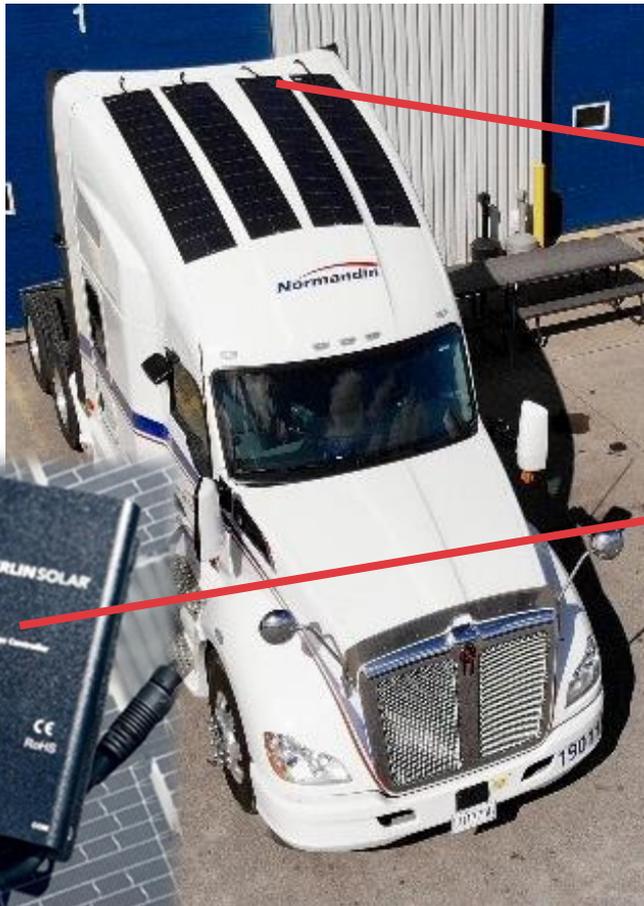
Solar Panel Dimensions (each)

	W	L	H1
MM	683	2030	4
IN	26 7/8	79 7/8	3/16



440W Roof Mounted

Ideal for KW T680



KIT MODEL: RWS-4404F

- 4x 110W Bergstrom PV Modules with adhesive for Peel & Stick installation and Edge Tape
- 1x Optimized IP68 Charge Controller
- 1x 20' Wire Harness
- 1x 10' Battery Harness with In-line fuse & Ring Terminals

Solar Panel
Dimensions (each)

	W	L	H1
MM	372	2030	4
IN	15	79 7/8	3/16

320W Roof Mounted

Ideal for KW T680-52”

KIT MODEL: RWS-3204F



- 4x 80W Bergstrom PV Modules with adhesive for Peel & Stick installation and Edge Tape
- 1x Optimized IP68 Charge Controller
- 1x 20' Wire Harness
- 1x 10' Battery Harness with In-line fuse & Ring Terminals

Solar Panel Dimensions (each)

	W	L	H1
MM	372	1397	4
IN	15	55	3/16

240W Roof Mounted

Ideal for Volvo with Sun Roof

KIT MODEL: RWS-K2403F



- 3x 80W Bergstrom PV Modules with adhesive for Peel & Stick installation and Edge Tape
- 1x Optimized IP68 Charge Controller
- 1x 20' Wire Harness
- 1x 10' Battery Harness with In-line fuse & Ring Terminals

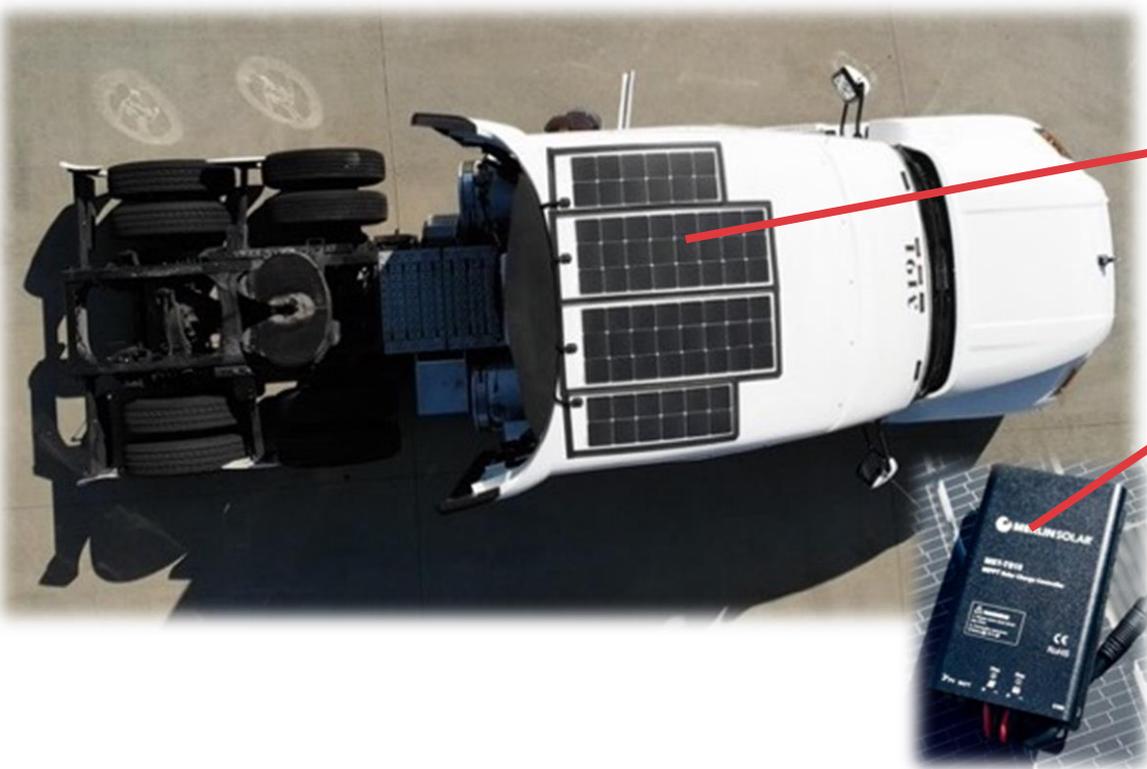
Solar Panel Dimensions (each)

	W	L	H1
MM	372	1397	4
IN	15	55	3/16

360W Roof Mounted

Ideal for Mack Anthem

KIT MODEL: RWS-K3604F

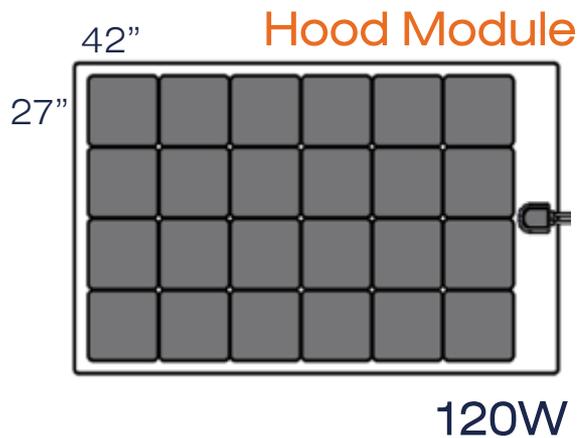


- 2x 120W + 2x 60W Bergstrom PV Modules with adhesive for Peel & Stick installation and Edge Tape
- 1x Optimized IP68 Charge Controller
- 1x 20' Wire Harness
- 1x 10' Battery Harness with In-line fuse & Ring Terminals

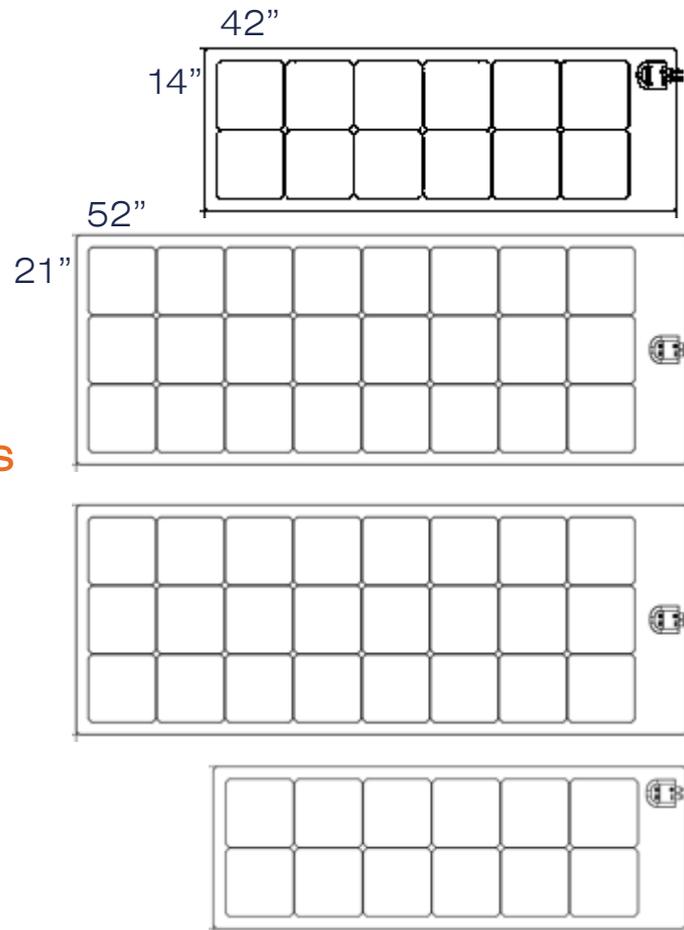
360W Roof Mounted (Mack Anthem)

120W Hood Mounted

Total Nominal Power = 480W



Roof Modules



660W Roof Mounted

Ideal for Freightliner Cascadia



KIT MODEL: RWS-K6603F

- 2x 220W Roof + 1x 220W Hood Bergstrom PV Modules with adhesive for Peel & Stick installation and Edge Tape
- 1x Optimized IP68 Charge Controller
- 1x 20' Wire Harness
- 1x 10' Battery Harness with In-line fuse & Ring Terminals

660W Roof Mounted

Ideal for Freightliner Cascadia



- 2x 220W Roof + 1x 220W Hood Bergstrom PV Modules

Solar Panel Dimensions Roof (each)

	W	L	H1
MM	683	2030	4
IN	26 7/8	79 7/8	3/16

Solar Panel Dimensions Hood (each)

	W	L	H1
MM	1306	1068	4
IN	51 7/16	42 1/16	3/16

- Average battery voltages above 13.2Vdc which eliminates sulfating
- Produce adequate power to off-sett 100% Electric requirements engine-off
- Eliminate Jump Starts albeit driver error , hotel and parasitic loads
- Ruggedness = No Power loss albeit harsh weather and accidental damages
- Electric HVAC, achieved over 45 hours of run-time
 - *Data posted based on* tests and data monitoring with Cooper Freight, Ploger, Heartland Express, Swift & Other major industry players.

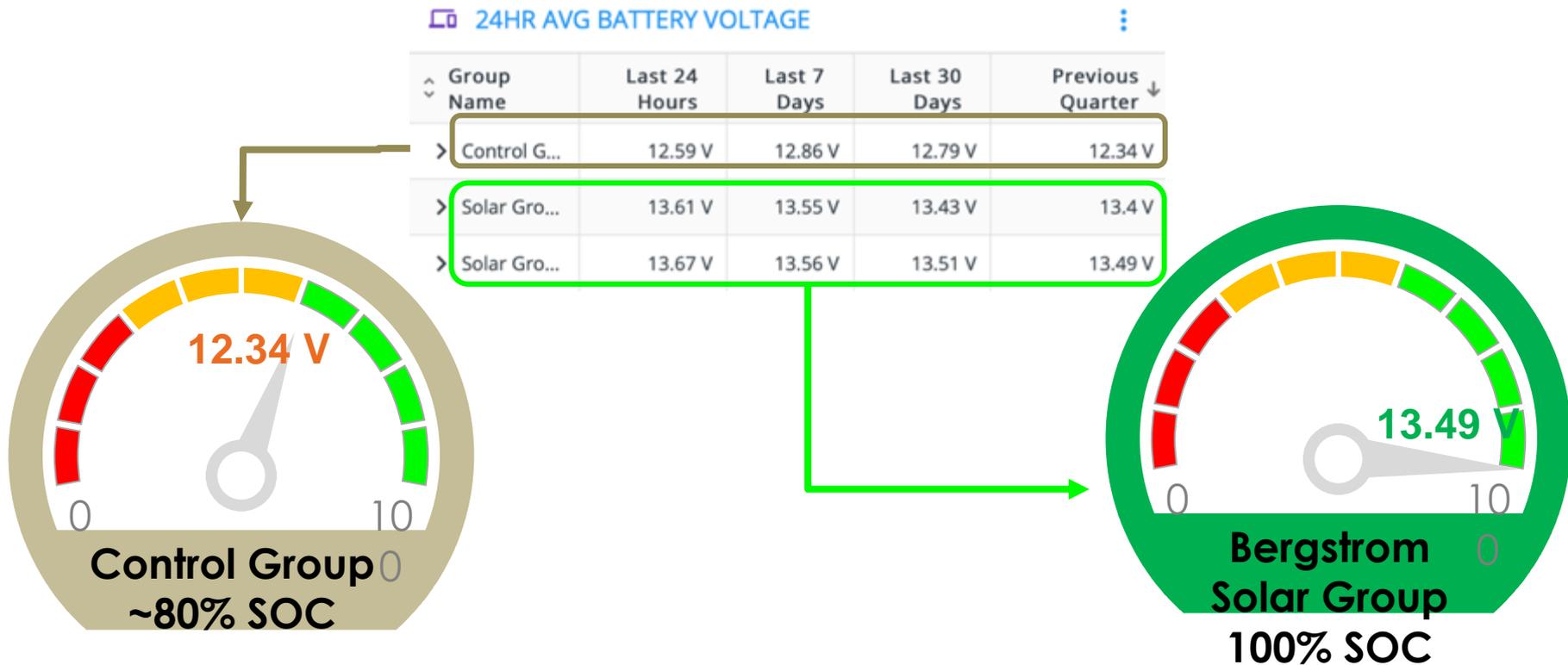
Customer Metric

- Avg Battery Voltages above 13 Vdc
- Produce adequate power and off-setting 100% of power requirements engine off
- Eliminate Jump Starts and dead battery events avoided
- Consistent performance regardless of weather and location including inter-cities with tall buildings.
- Proper battery maintenance

Proven Result

- Bergstrom 100% SOC vs 80% SOC
- Increase power utilization
- Zero events reported since the beginning of pilot with Bergstrom, ~6 Months
- Scattered light, harsh weather and shaded city locations have not affected Bergstrom's performance
- Bergstrom Group is outperforming and exceeding customers expectations*

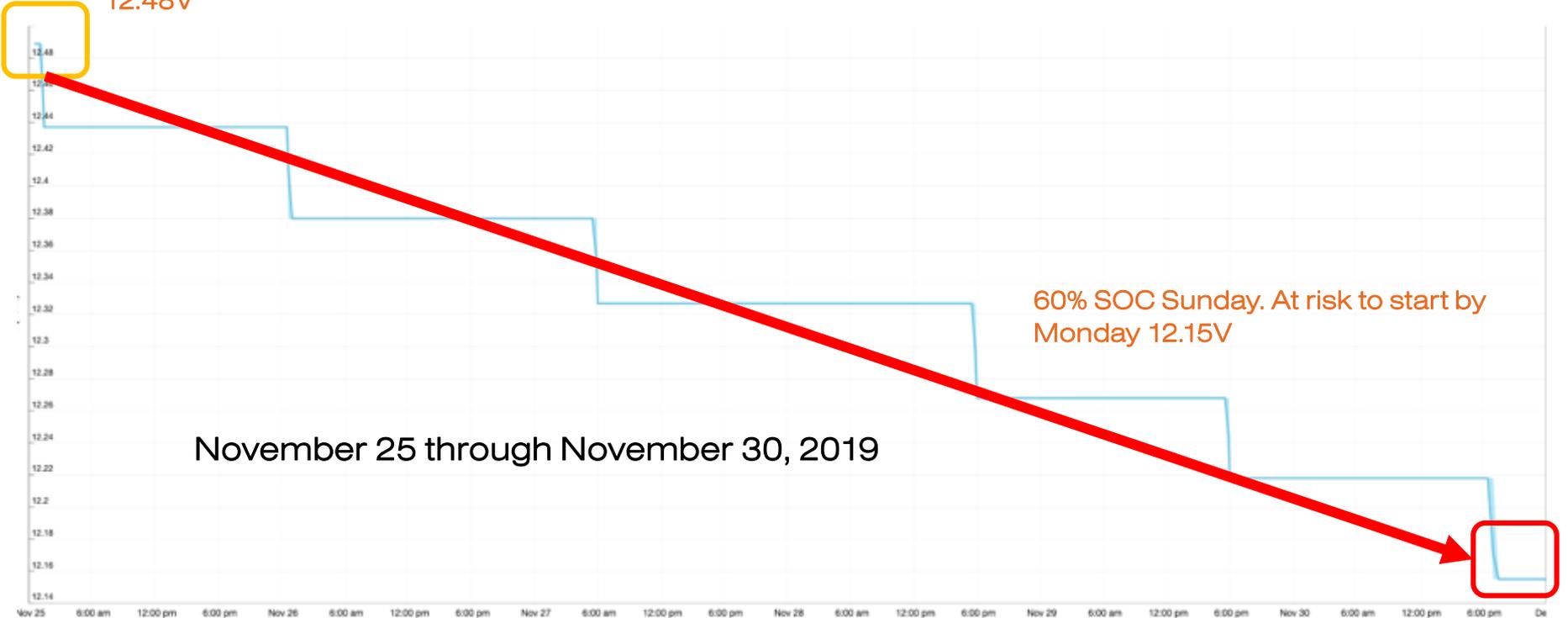
24 Hour Battery Voltages



Bergstrom Fully charges battery bank, every day, every week every month.
Three months in a row in 2020

Batteries without solar

75% SOC beginning the week
12.48V

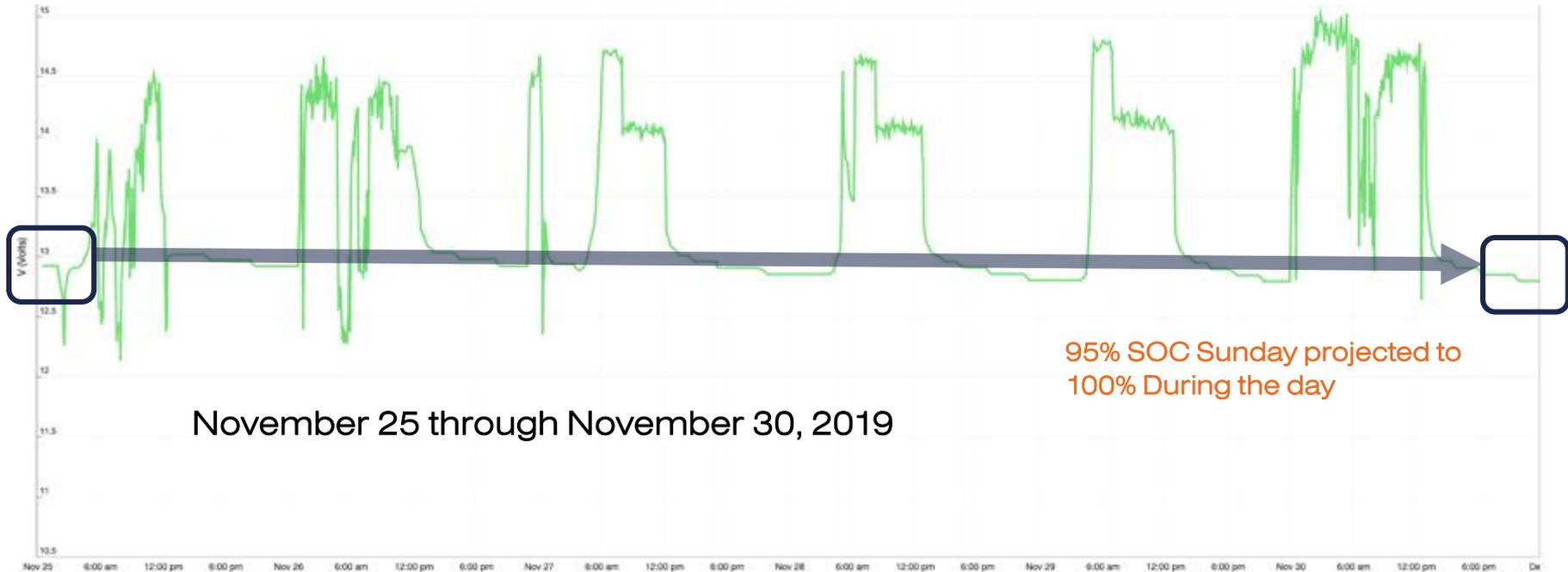


60% SOC Sunday. At risk to start by Monday 12.15V

November 25 through November 30, 2019

Batteries without solar

95% SOC beginning the week
12.95V to 100% during the day



Cooper Freight Test Objective and Profile

Objective: Determine the number of hours a Park Smart Electric HVAC runtime can be extended using Bergstrom Solar. Expectations from customer was at least 2-3 hours **Bergstrom delivered 10X the expectations.**

Test Profile: ParkSmart set to Maximum cooling with windows open to force Electric HVAC unit to work as hard as possible without cycling the compressor on and off based on temperature. No Hotel or Extra loads applied.

Unit 2207 – Cascadia MR
2x Bergstrom 165W (330W)
ParkSmart

Unit 2206 – Cascadia HR
Bergstrom 330W
ParkSmart

Unit 430 – Cascadia HR
No Solar
ParkSmart

Unit 429 – Cascadia MR
No Solar
ParkSmart

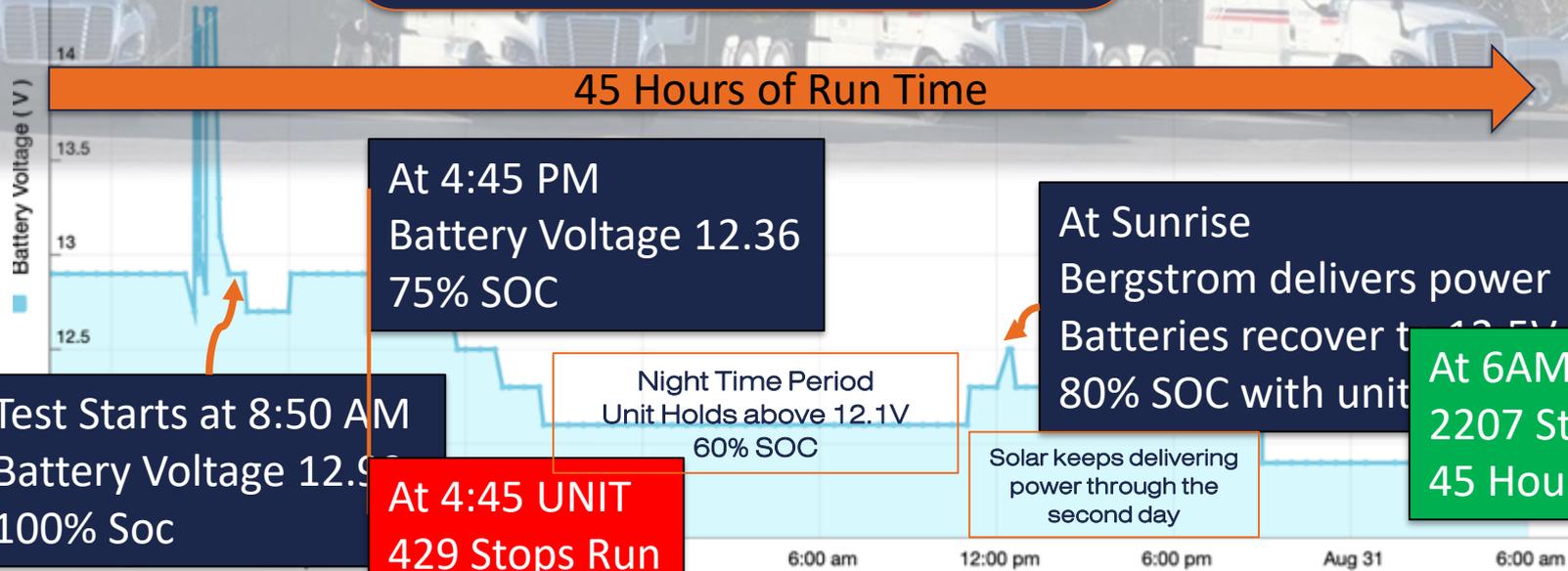


Consolidated Results Mid Roof 2207 vs Mid Roof 429

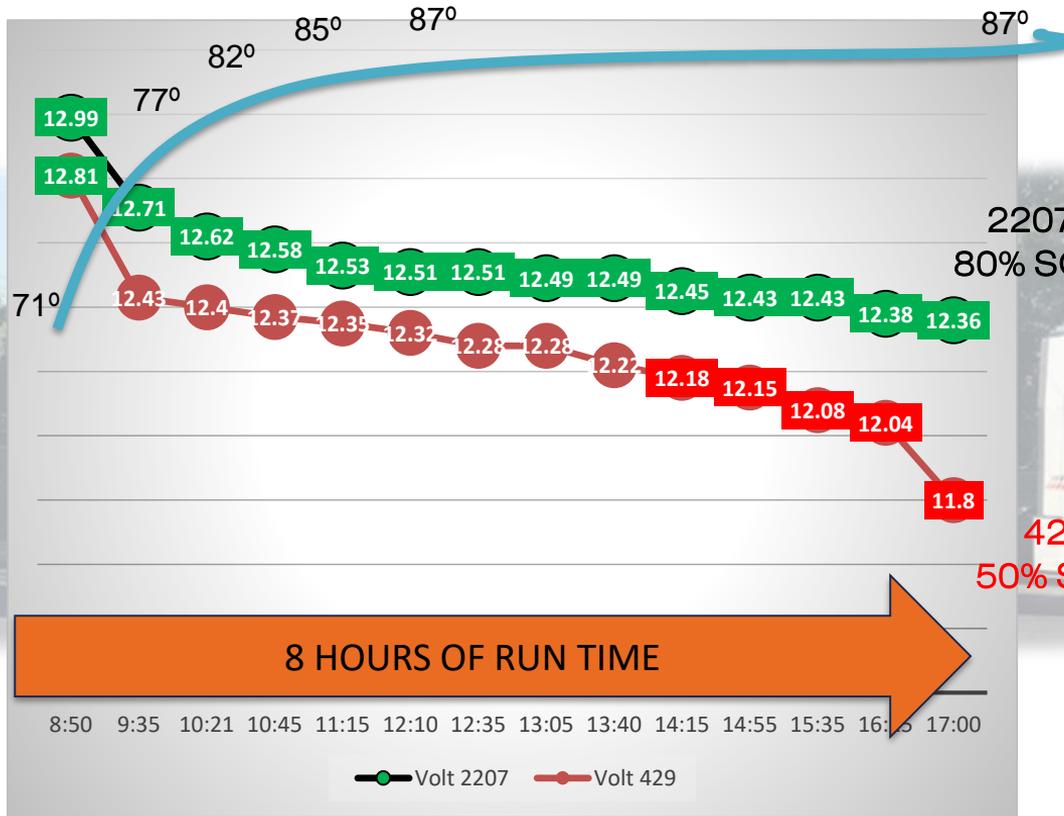
Unit 2207 – Cascadia MR
2x Bergstrom 165W (330W)
ParkSmart

UNIT 429 was able to Run for **8 hours**
Vs
UNIT 2207 was able to run for
45 Hours with Bergstrom Solar

Unit 429 – Cascadia MR
No Solar
ParkSmart



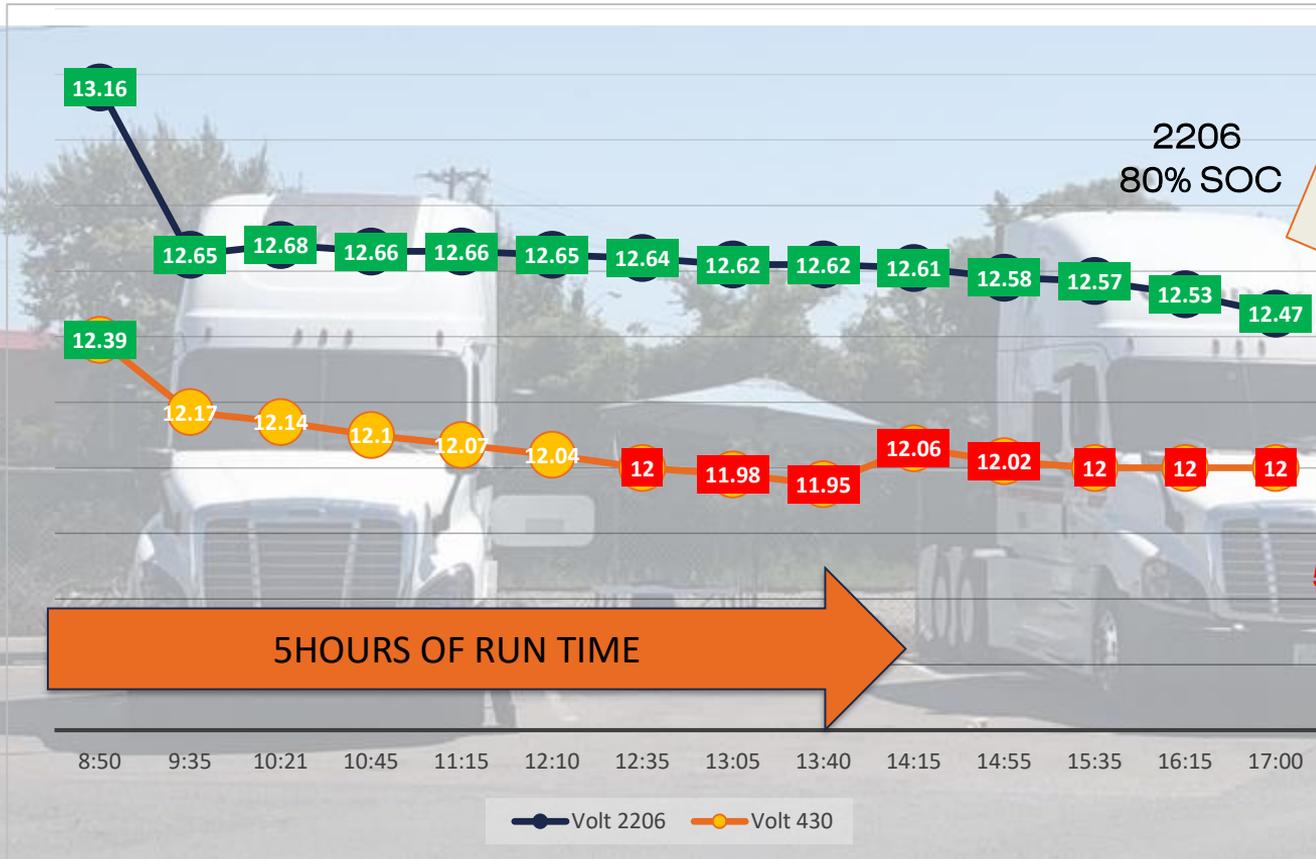
Voltage Comparison Mid Roof



60% SOC
IMPROVEMENT
WITH Bergstrom

429
50% SOC

Voltage Comparison High Roof



60% SOC
IMPROVEMENT
WITH Bergstrom

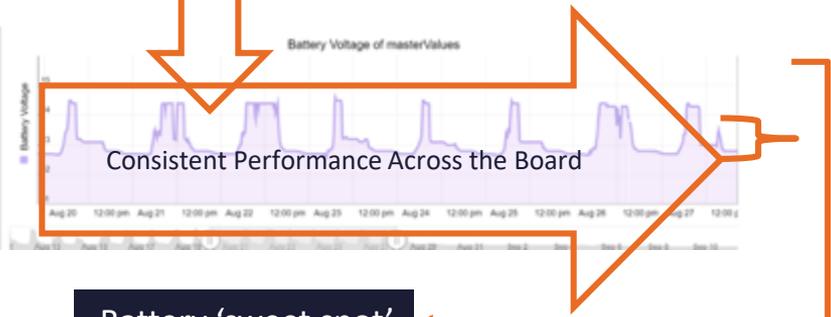
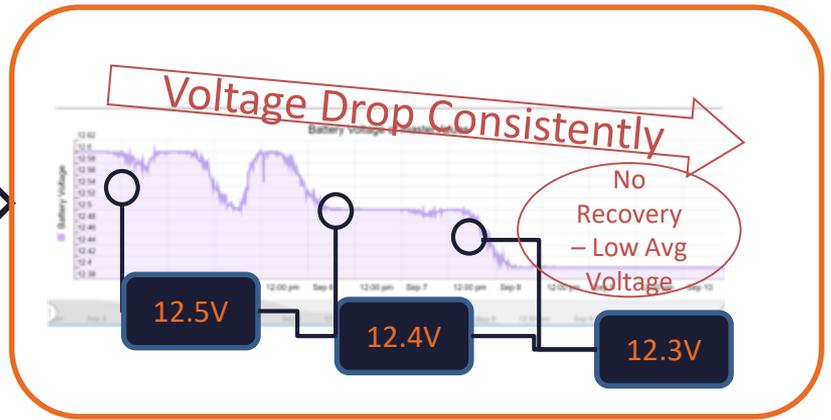
2206
80% SOC

430
50% SOC

5 HOURS OF RUN TIME

- Swift (JSA kits) – 10 Unit Pilot converted to 500 installations in 2019 + 1,000 2020 of Bergstrom 165W Jump Start Avoidance kits
- Nussbaum (JSA + hotel loads, HVAC) – Pilot converted to 180 installations + 100 starting June –f Bergstrom 440W Kits to eliminate Jump Starts and Increase run0-time
- Airgas (JSA + Lift-gate aux power) - 3 month trial converted to full implementation and installations of 14 trucks per month of Lift-gate Kits to eliminate Jump Starts and Increase number of deliveries per day
- Group Robert (JSA + hotel loads, HVAC) – Replaced incumbent competitor and provided adequate power 660W with Bergstrom vs ~400W with competitor

Airgas Battery Voltage Performance



Battery 'sweet spot'
AVG Voltage >13.2V

