



Optimizing the C&I Energy Storage Industry with Energy Toolbase & Sol-Ark

Training Webinar



Webinar Agenda

Partnership between Energy Toolbase and Sol-Ark

Benefits of Sol-Ark's energy storage systems and inverters

How to optimize ESS site performance using ETB Controller

Expert tips on deploying advanced optimization strategies

Workflow to using ETB and Sol-Ark

SPEAKERS



Jack Younan
Onboarding Manager
Energy Toolbase



John Cromer
Head of Training
Sol-Ark

Sol-Ark Commercial Outdoor Solutions

208V + 480V 3p service

About Sol-Ark

A global energy technology leader with over six generations of hybrid inverters

Deep engineering expertise in smart energy solutions

A track record of results. For over a decade, Sol-Ark has been solving complex energy challenges with innovation and technology

Powered by a vast ecosystem including thousands of distributors, installers, EPCs, integrators, and battery manufacturers

Trusted by global Fortune 50 companies in telecommunications, retail, Department of Defense, NASA



Tom Brennan, CEO and CTO of Sol-Ark, is a 2023 winner of the E&Y Entrepreneur of the Year®, the world's most prestigious business award for entrepreneurs

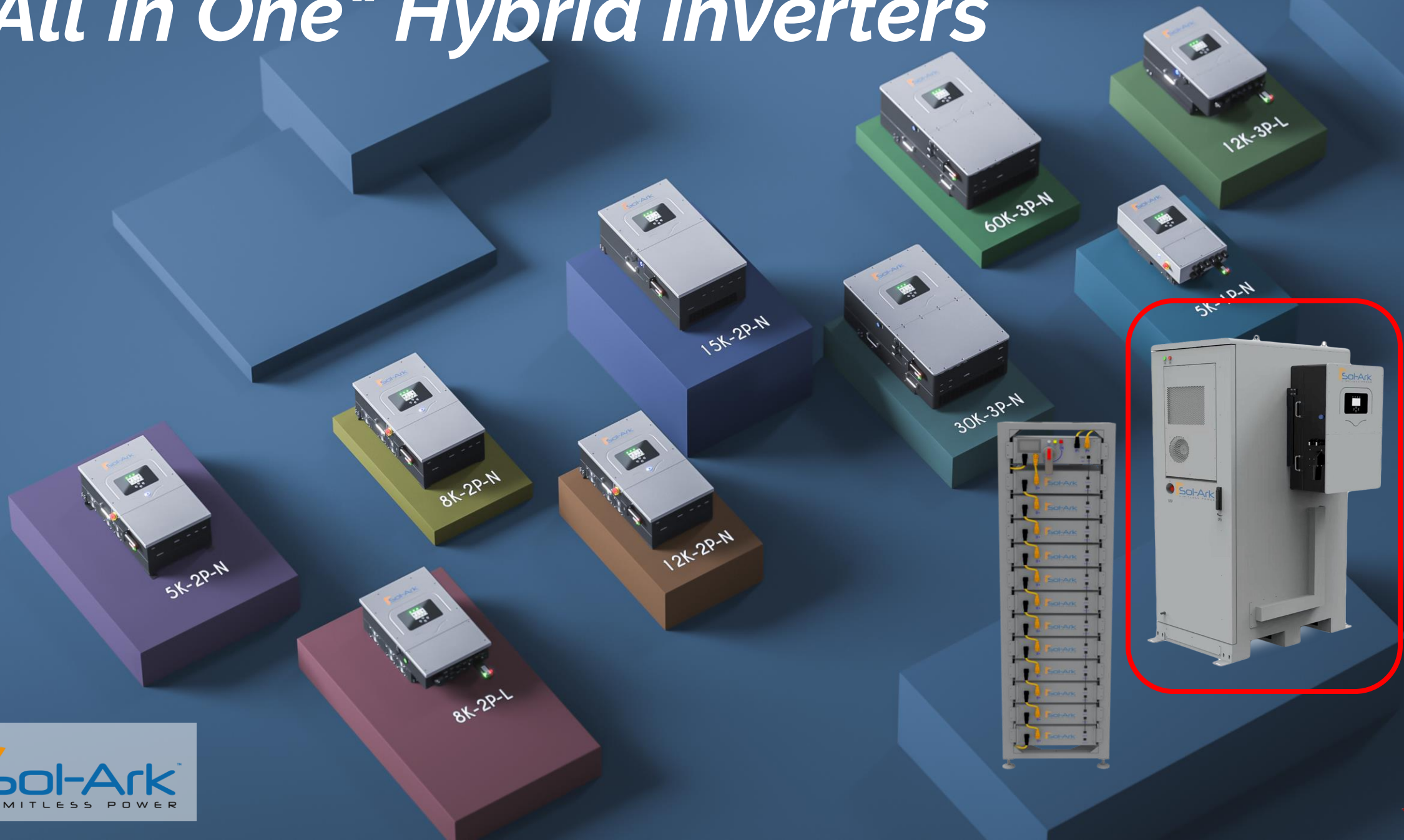
Future Proof Smart Energy Storage Systems

Thousands of industry leading companies are using Sol-Ark's Commercial Battery Energy Storage Solutions to:

- Reduce Energy Costs
- Build Energy Resilience
- Meet Decarbonization Goals

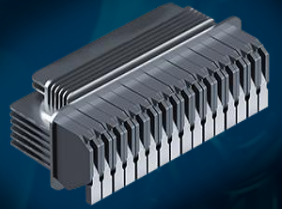


"All In One" Hybrid Inverters

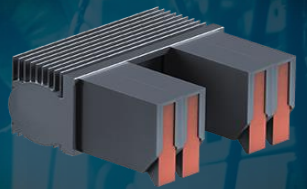


All-In-One Commercial Hybrid Inverters

30K – 208V
60K - 480V



DC Solar Ports x 8
• 4 MPPT x 36A
• 8 DC ports



DC Battery Ports x2
• 50A DC per port



Microgrid Controller

- Grid Relay (MID/SEL)
- Seasonal TOU Controllers
- Programs with LCD or App



Smart GEN Port
Generator Port
or AC Coupled
Or extra subpanel



Grid Pass-Through
200A



OUR HISTORY

2013

Portable Solar LLC founded
Incl. 2 US Veteran Investors



2018

Launch of Sol-Ark 8K-2p



2019

Sol-Ark 12K rollout successful
And 3rd party financing



2020

Strategic partnerships
with battery companies
& distribution



2022

Sol-Ark 15k + LATAM launch

2021

95,000 ft² engineering &
assembly facility - Plano, TX



2023

300,000 ft² headquarters
Allen, TX
Sol-Ark 30K + 60K launch



2024

L3 Series
commercial
batteries

Top 10 fastest
growing companies



Limitless Lithium: Outdoor HVR Models

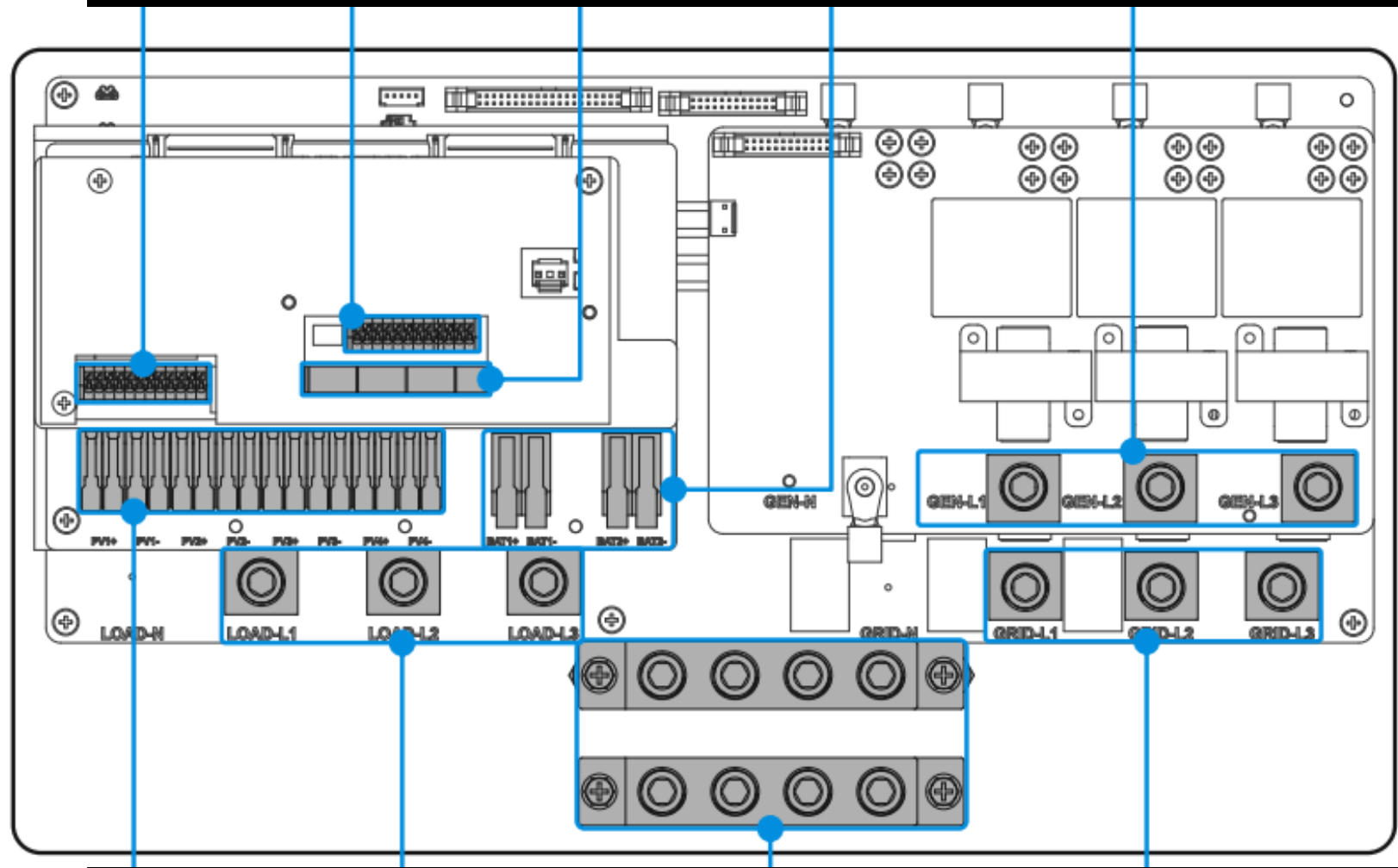
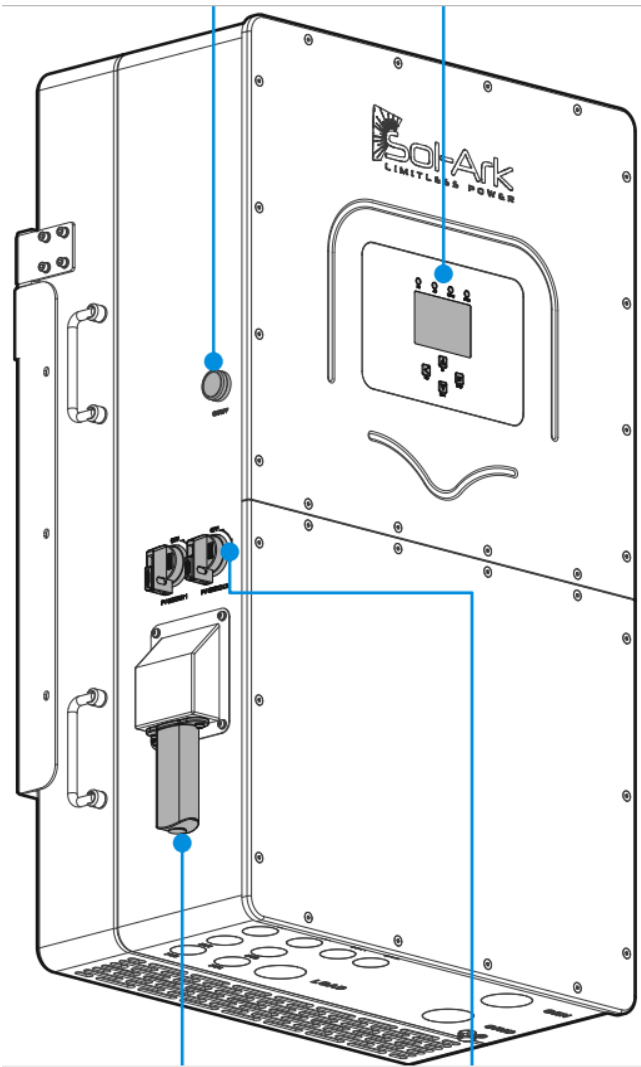
L3 HVR Outdoor: Up to 6 inverters / 36 battery cabinets
30k: 180kWac / 2.2MWh / 234kWdc – 346kWac PV
60k: 360kWac / 2.2MWh / 468kWdc – 720kWac PV

L3 HVR-60

Pairs with 30K-3P-208V Inverter
Or
60K-3P-480V Inverter



Integrated TOU controller
Built-in grid transfer ability
AC and DC solar coupling



Sol-Ark All-In-One

Market leading small commercial backup solution

Grid Pass Through

- Full grid power when available
- Backup is inverter nameplate
- Simplifies interconnection

AC or DC Solar Options

- 8X DC Solar Ports
- 4X Full Sized MPPT
- Use external RSD solution
- Frequency shifting for AC coupling
- AC coupling Requires GEN port

Generator Integration

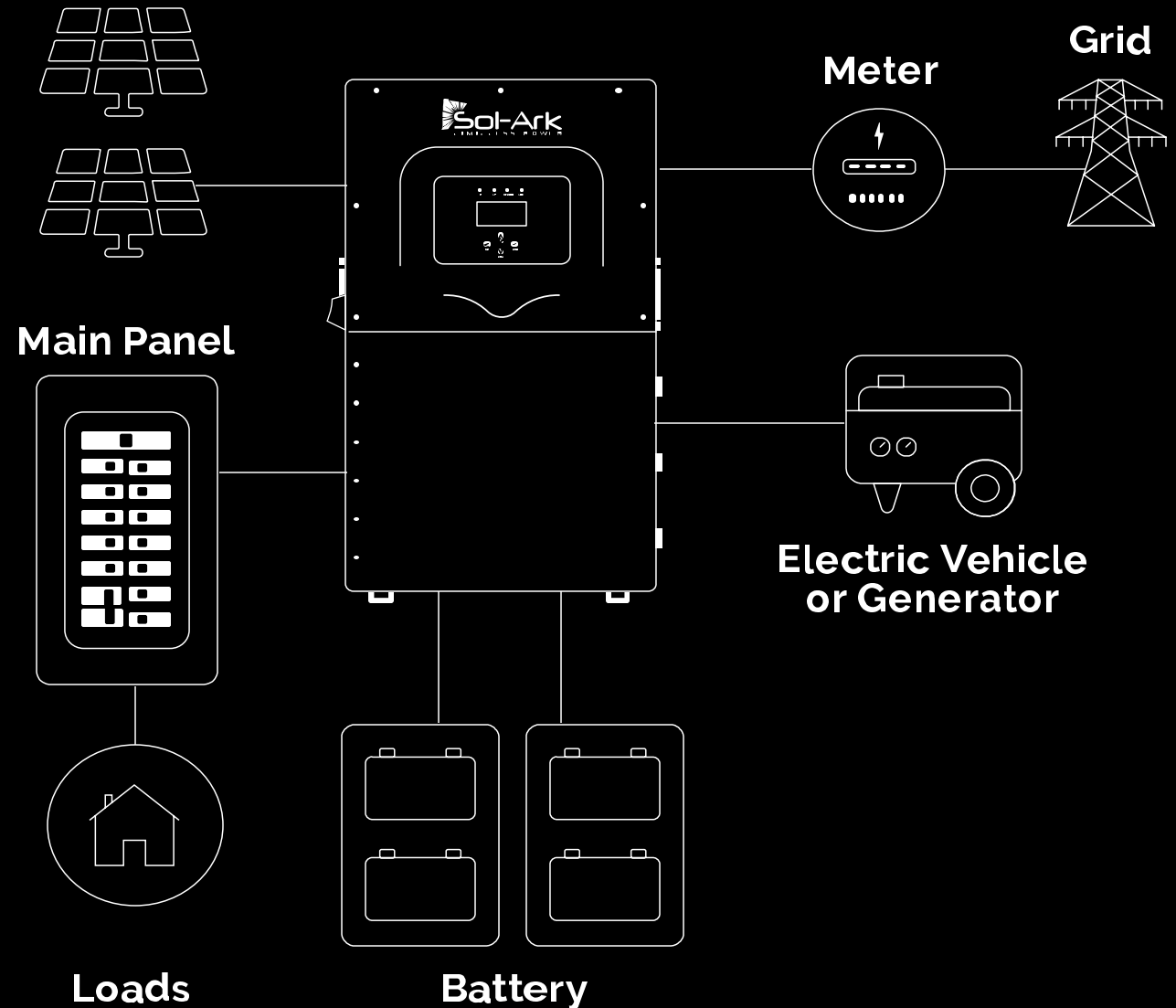
- GEN port or GRID port
- 2 wire autostart
- Advanced shaping controls

EV Integration*

- EV Backup
- Advanced EV options requires advanced design



Innovative. Simple. Secure.



Whole Building Backup: Up to 2000A passthrough...



400A – 208V Pass Through



600A – 208V Pass Through



800A – 208V Pass Through

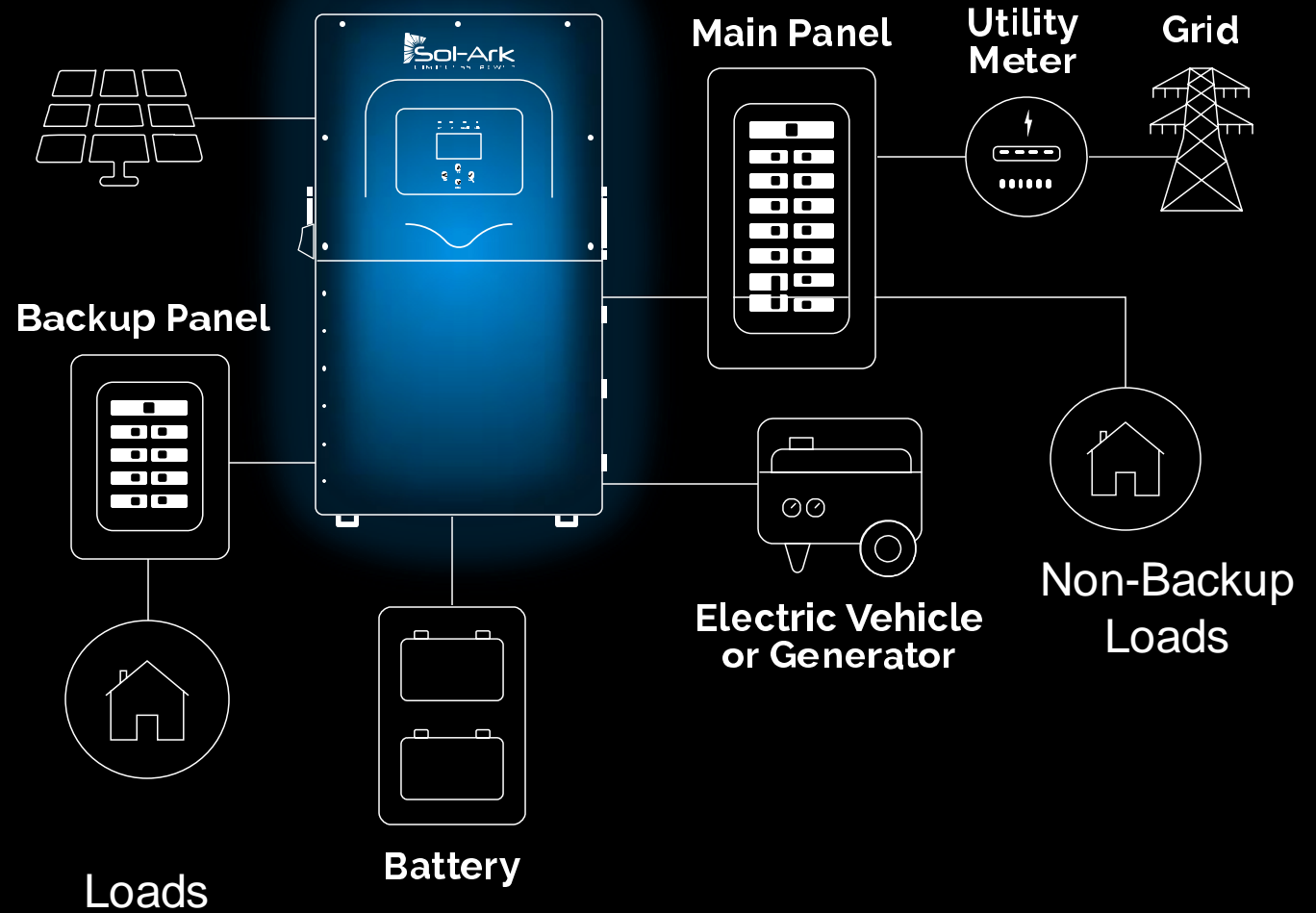
Seamless Backup

Whole Building

or

Essential Backup

UL1741CRD - PCS



L3 HVR Outdoor Overview

Features/Innovations



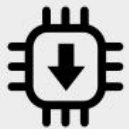
Prismatic cells offer maximum reliability, efficiency, and safety



Automatic configuration of batteries and BMS for quick commissioning



5kW battery modules include built-in aerosol fire suppression



High Voltage architecture built exclusively for Sol-Ark 30K and 60K inverters



Modular battery cabinets can be connected easily in parallel to increase capacity



10-Year Warranty



L3 HV 10 Year Fire Suppression

4.2 Fire Suppression System

Each L3 HV 5.1kWh battery module contains one thermally activated aerosol-based fire suppression canister designed to automatically deploy in response to high heat or fire within the module.

The suppression canisters have an estimated 10-year service life under normal conditions. However, it is important to avoid subjecting the battery module to external impacts or severe corrosive or wet environments which could damage the activation mechanism.

System Component	Standard Warranty Period	Operating Conditions (operation outside of these parameters is not covered by this Limited Warranty)
Battery Management System (BMS/BMU)	10 years from date of purchase	-40°C — 60°C (-40°F — 140°F)
Fire Suppression System	10 years from date of purchase	-40°C — 122°C (-40°F — 140°F)
Specified Territories Warranty Coverage Table Based on Original Location²		
United States and Territories, including Puerto Rico		
Canada		
Mexico		

Wye (default) vs Delta Setting - Important

- IT System – neutral is not GND

Unchecked -> Wye

Checked = Delta

Note **does NOT** support delta high leg.

3 Phase Supported:

- 30k: 120/208V, 115/200V, 133/220V
- 60k: 220/380V, 230/400V

The screenshot shows a dialog box titled "Grid Param" with several tabs: "Grid Selection", "Connect", "IP", "F(W)", "V(W)/V(Q)", and "P(Q)/P(F)". The "Grid Selection" tab is active. The dialog contains the following fields and controls:

- Grid Mode:** 3/3
- Grid Mode Selection:** SRD-UL-1741
- Grid Frequency:** 50Hz (unchecked), 60Hz (unchecked)
- Grid Reconnect Time:** 300s
- Power Factor:** 1.000
- Grid Level:** LN:120V/LL:208V(AC)
- Phase Type:** 0/240/120
- IT system-neutral is not GND:** (unchecked, highlighted with a red dashed border)

At the bottom of the dialog are "CANCEL" and "OK" buttons.

Retrofitting Solar With Batteries

Reduce Electricity Demand Charges



Improve Energy Resilience Both Behind and in Front of the Meter



Leverage Storage as a Competitive Advantage



Optimize Energy Use



Gain New Revenue by Selling Excess Energy Back to the Local Utility



Rooftop

Easy retrofit with including AC coupling interconnection port or DC-couple directly onto the inverter



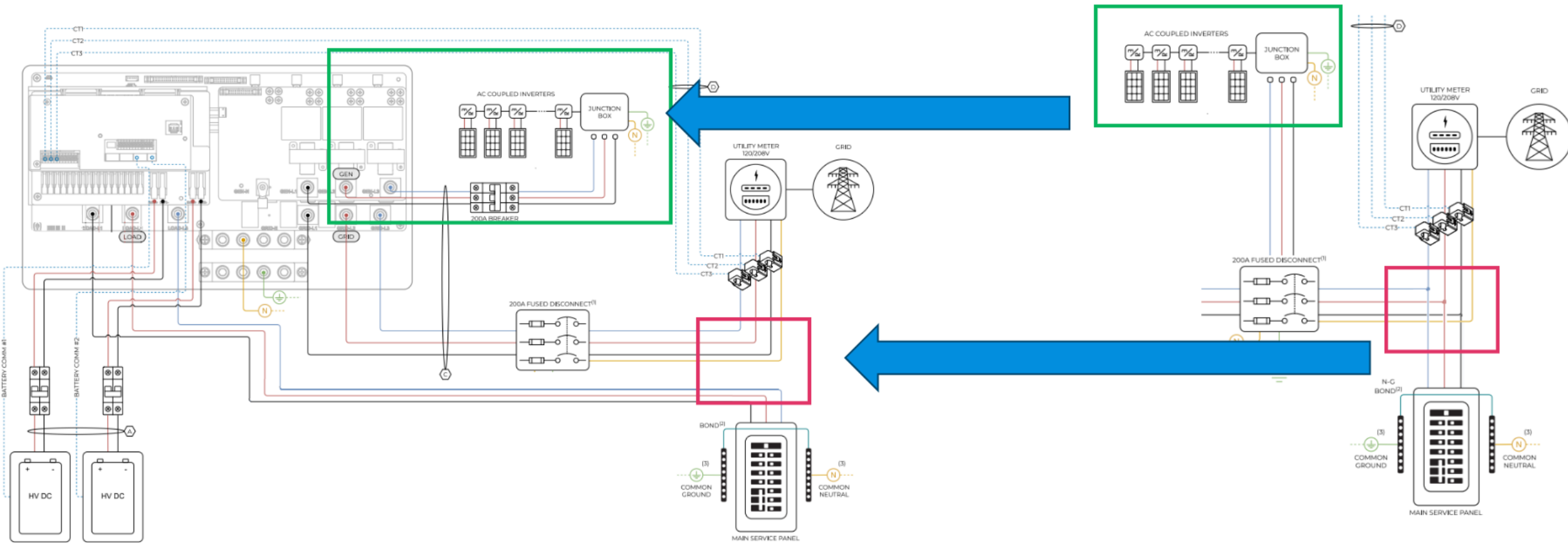
Ground Mount

Rugged and space efficient outdoor ratings to accommodate a wide variety of project environments with or without batteries

Retrofitting Solar With Batteries



Rooftop
Easy retrofit with including AC



Outdoor Installations Requirements

- The foundation should be constructed with proper drainage sloping away from the foundation to prevent pooling of water near the cabinet base.
- The foundation pad must extend at least 24 in beyond the footprint of the system on all sides.
- Must be located away from potential flood zones, drainage areas, or other areas prone to standing water.
- Shaded locations are preferable to reduce cooling load.
- The area should have adequate fencing and lighting as required by local building and mechanical code or other requirements for energy storage systems.

The foundation should extend beyond the battery cabinet for proper anchoring and long term application. Pour a nice foundation. You deserve it.

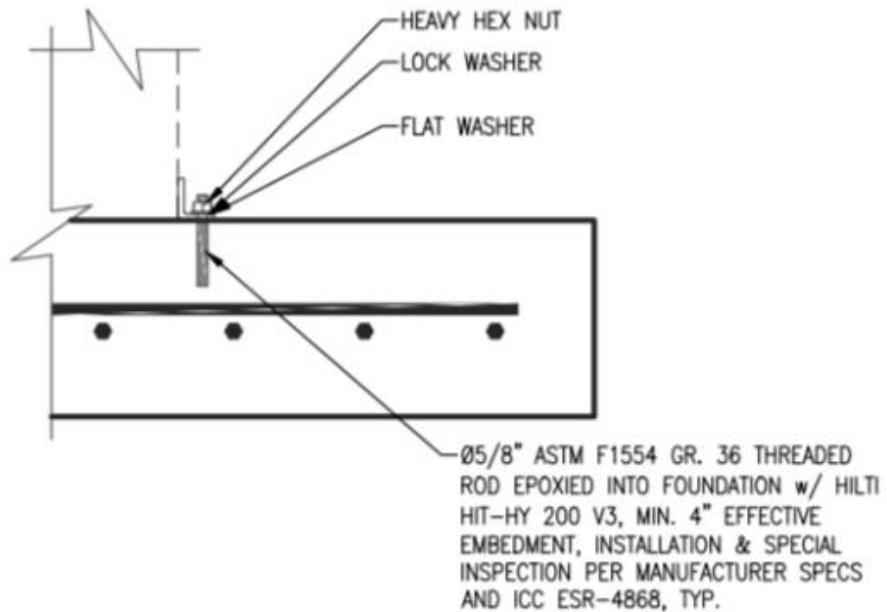


Anchoring the Cabinet

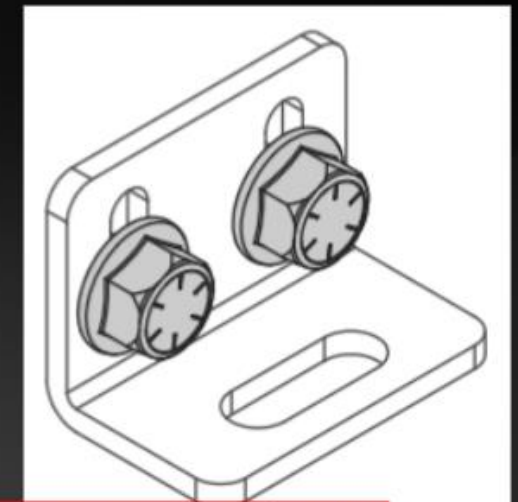
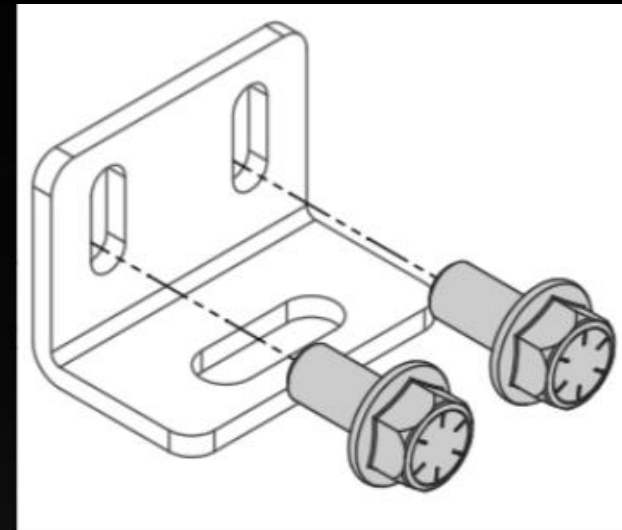
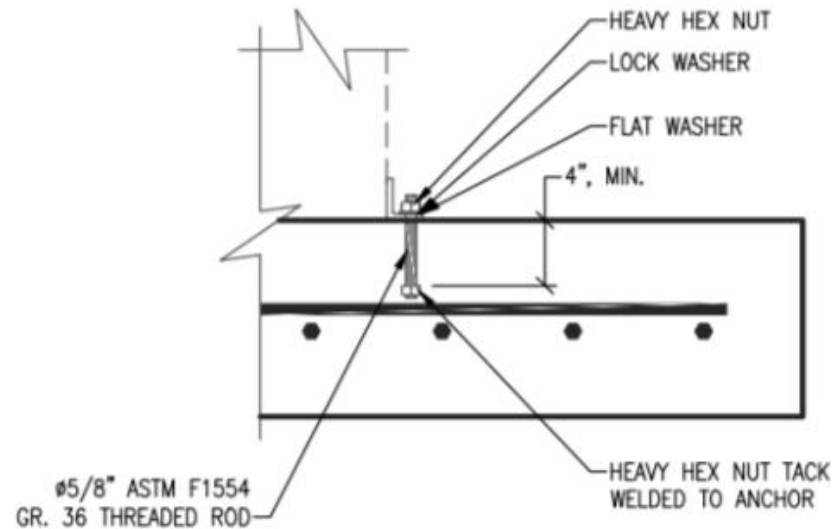
2. Anchor the Cabinet to the Foundation

The cabinet mounting feet should be secured to the concrete foundation using one of the two methods shown in the figures below or using a method with equivalent strength as determined by a licensed design professional.

① POST-INSTALLED ANCHORS



② CAST-IN PLACE ANCHORS



Install bracket to Foundation before securing to cabinet!

DO NOT USE concrete screws (e.g. Tapcon) or wedge/expanding anchors to attach the Sol-Ark cabinet to a concrete foundation. The supplied cabinet mounting feet must be secured to the foundation according to the installation methods in Section 2.3.

Foundation Detail

PE Stamps Available for standard foundation templates.

Custom foundations can be provided by Vector Engineering (incl. west coast seismic stamps)

2. Multi-Cabinet Foundation Detail (Option A)

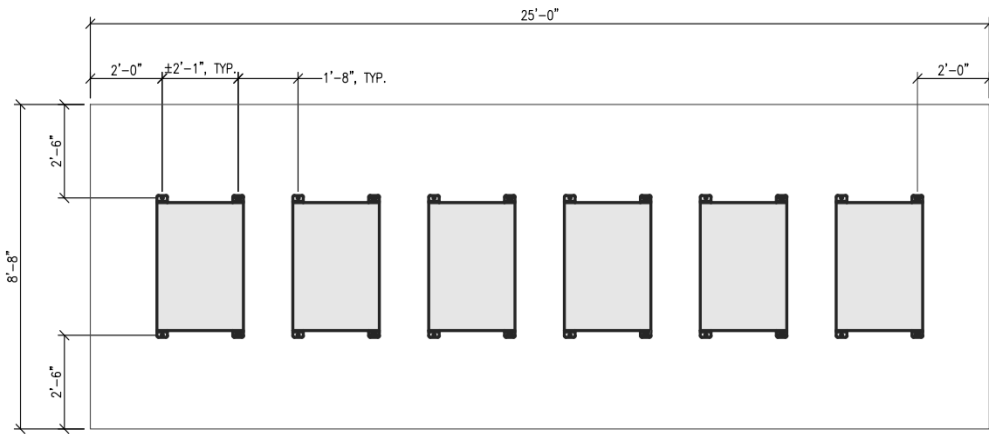


Figure 3 Six Cabinet - Foundation Overview (Option 1)

3. Multi-Cabinet Foundation Detail (Option B)

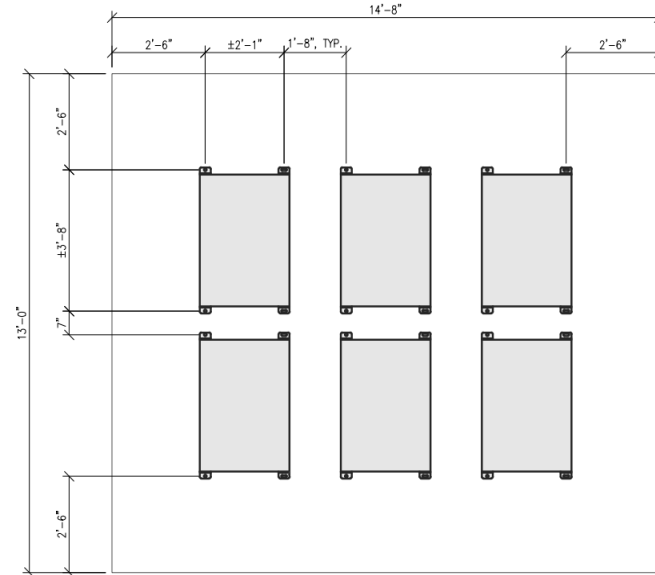


Figure 4 Six Cabinet - Overview Foundation (Option B)

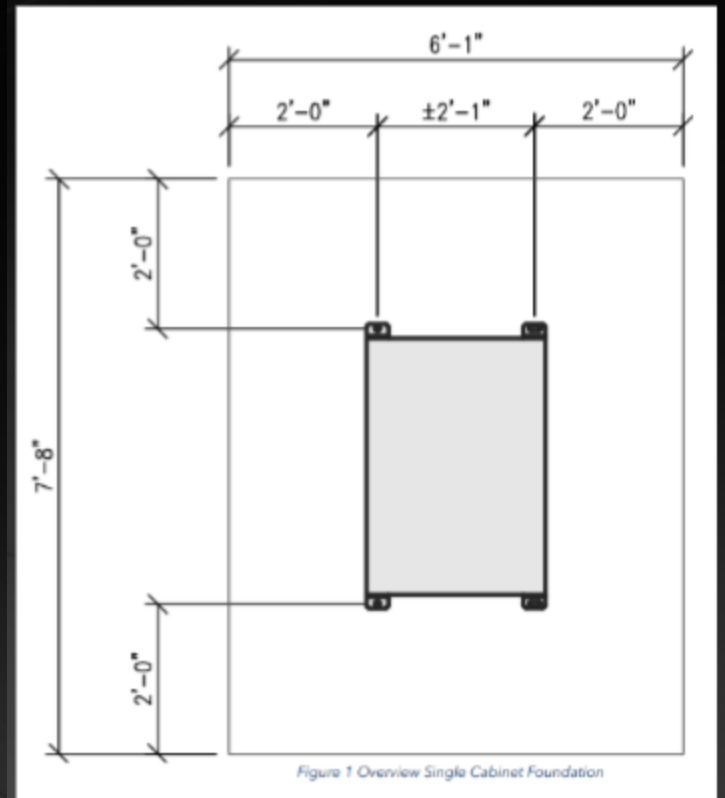


Figure 1 Overview Single Cabinet Foundation

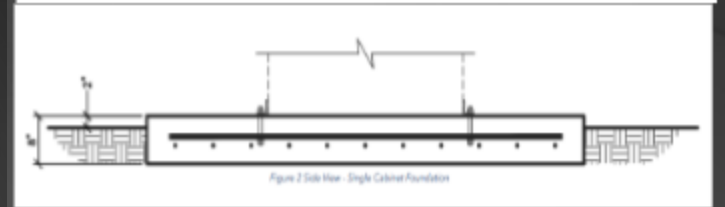


Figure 2 Side View - Single Cabinet Foundation

Outdoor HVR – Example Seismic Engineering

Master file applicable for most projects



STRUCTURAL CALCULATIONS
for
L3 HVR-60KWH MASTER FILE
in
SAN DIEGO, CA
for
SOL-ARK



BY: **JACOB PROCTOR, P.E.**
PROJECT ENGINEER

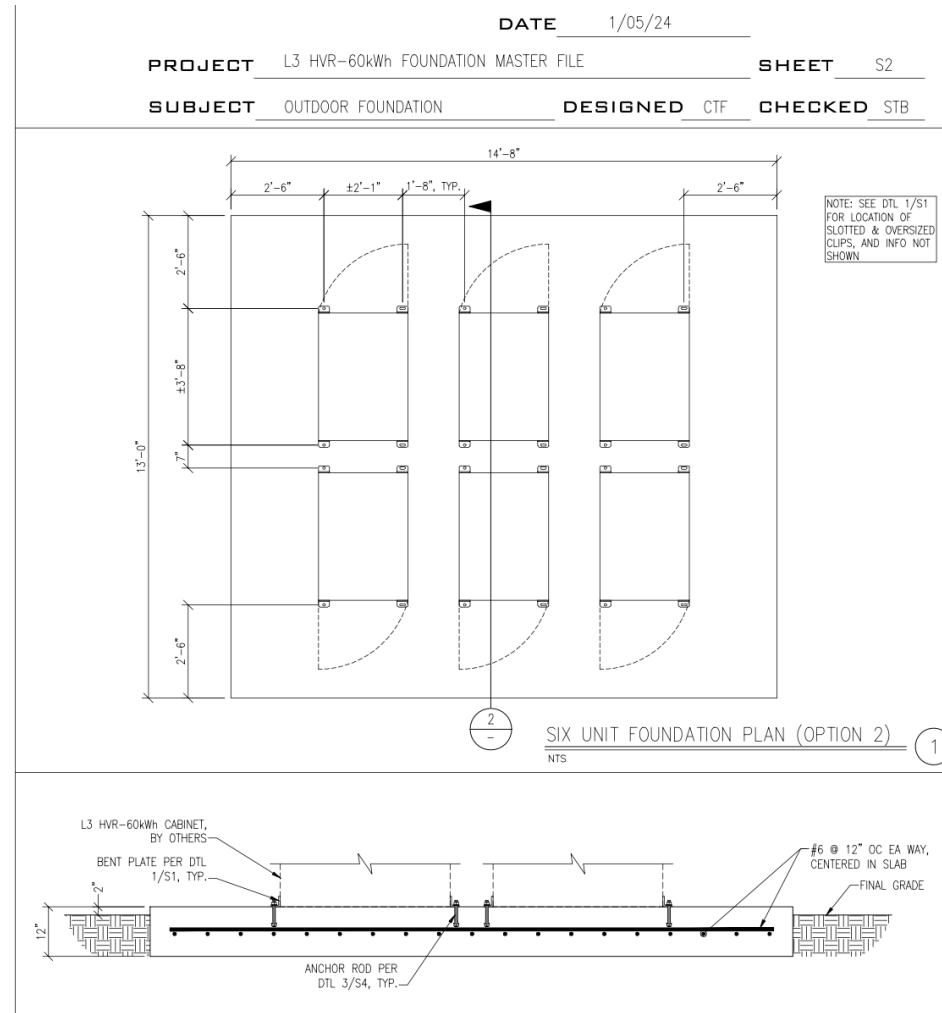
PROJECT #: **U6153.0001.231**

DATE: **January 8, 2024**

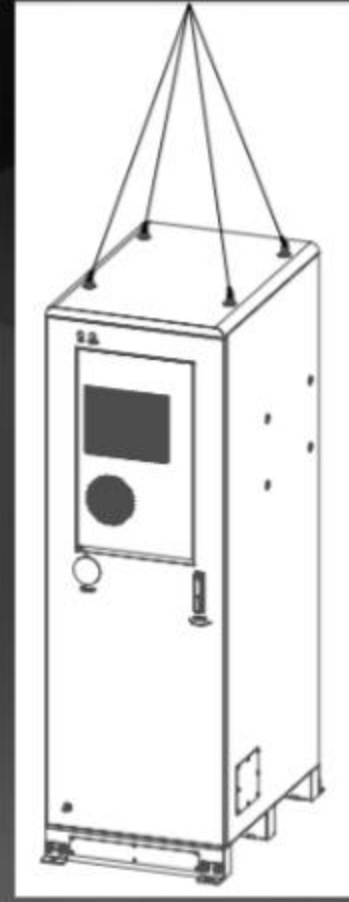
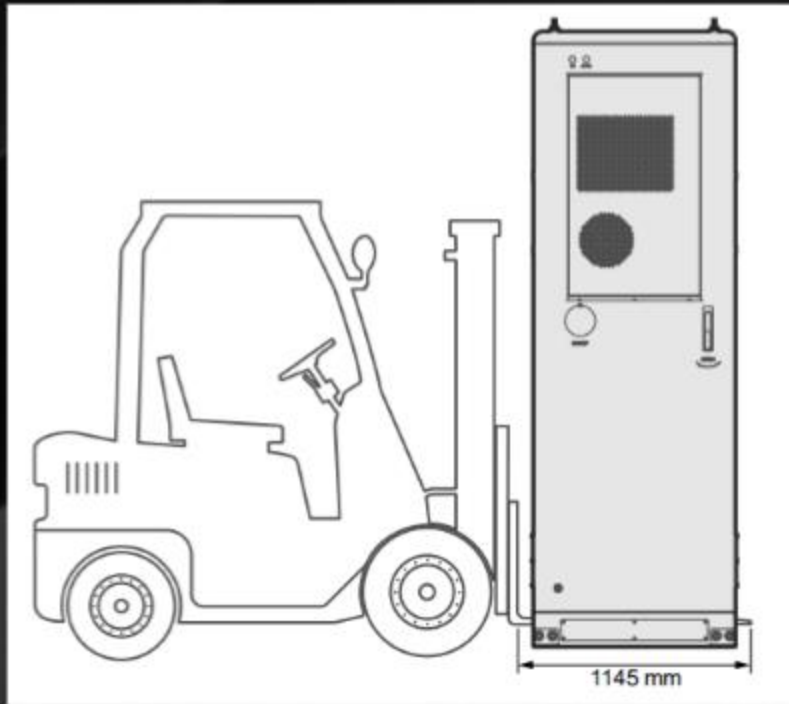
DESIGNED BY CTF; CHECKED BY STB

Note:
The calculations presented in this package are intended for a single use at the location indicated above, for the client listed above. These calculations shall not be reproduced, reused, "card filed", sold to a third party, or altered in any way without the written authorization of Vector Structural Engineering, LLC and Sol-Ark.

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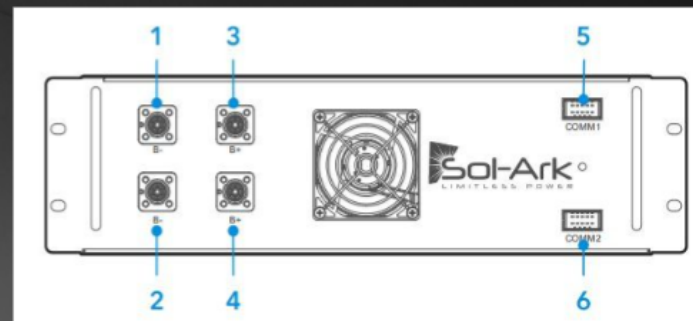
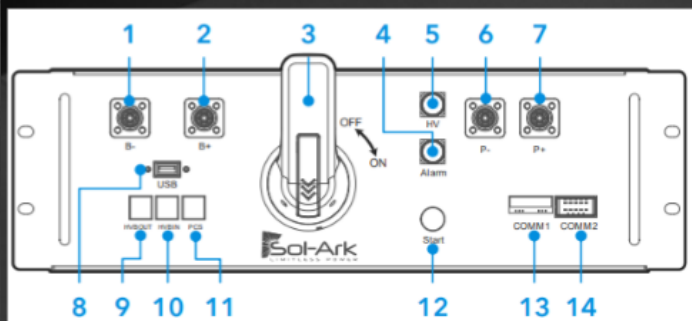


HVR Handling



HVR Outdoor BMS Head wired for 12s1p (480V) or 6s2p (208V)!

DATASHEET		L3-HVR-60	
L3 SERIES LIMITLESS LITHIUM™		L3-HVR-60	
Battery Energy Storage System			
Battery Model Name:	L3 HVR-60	L3 HVR-60	L3 HVR-60
ESS Model Name:	L3 HVR-60KWH-30K	L3 HVR-60KWH-60K	L3 HVR-60KWH-60K
Sol-Ark Product SKU:	L3-HVR-60KWH	L3-HVR-60KWH	L3-HVR-60KWH
System Data			
Battery Module Specifications			
Battery Module Configuration	6s2p	12s1p	
Battery Module Energy	5.12kWh		
Battery Module Nominal Voltage	51.2V		
Battery Module Nominal Capacity	100Ah		



HVR Cabinet to Inverter Wiring

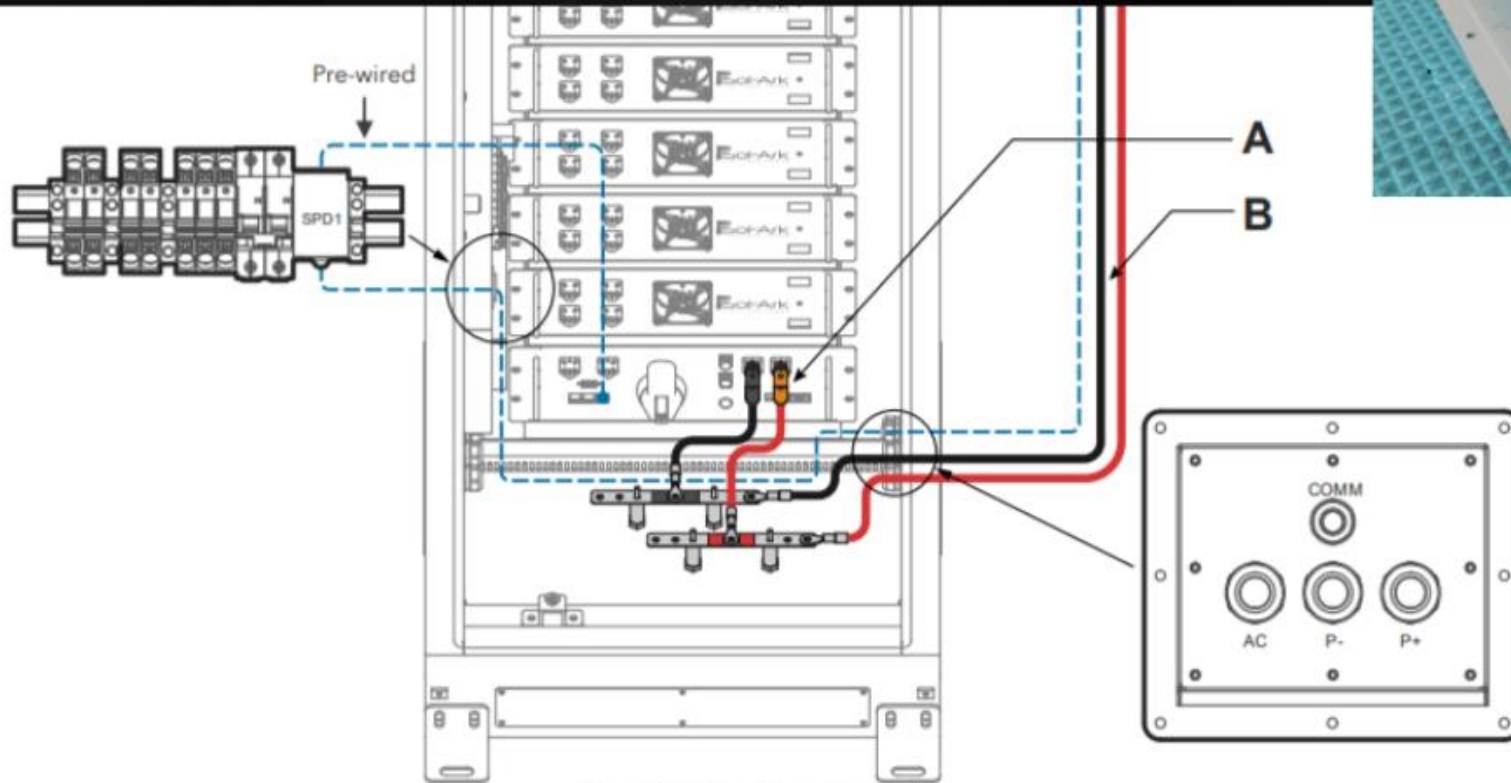
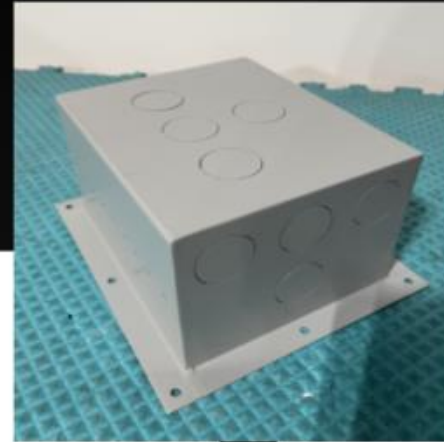


Figure 10 Wiring of the cabinet to the inverter

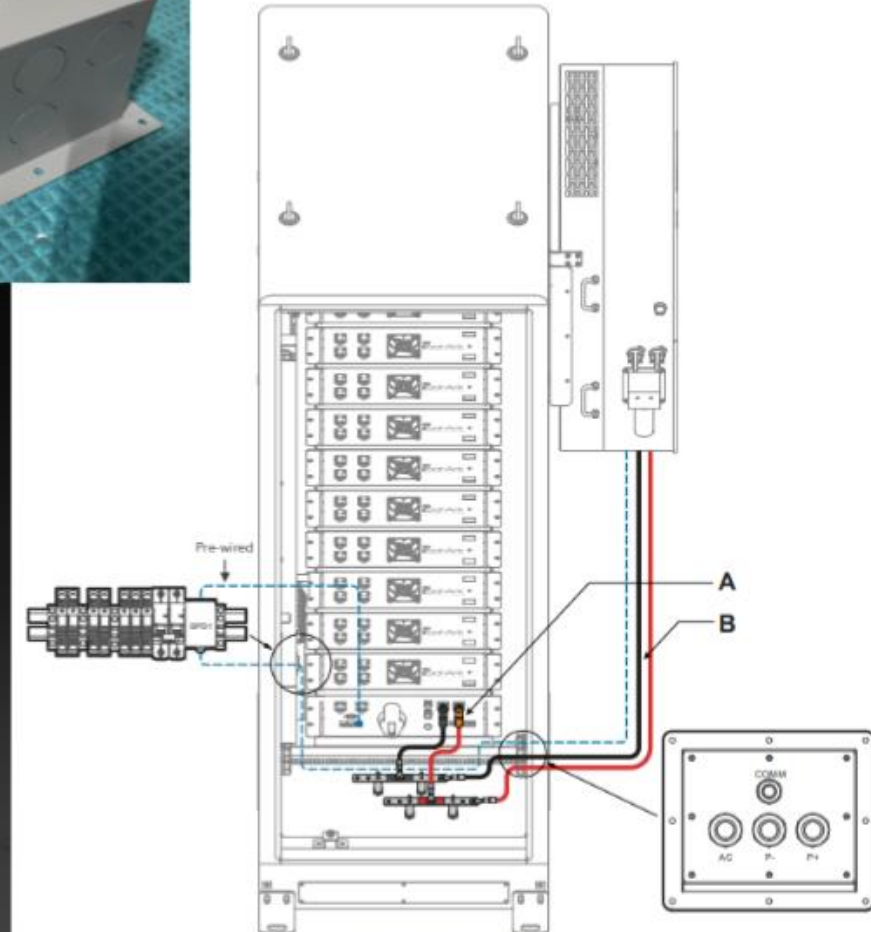


Figure 10 Wiring of the cabinet to the inverter

HVR Outdoor Multi-Cabinet Bussing

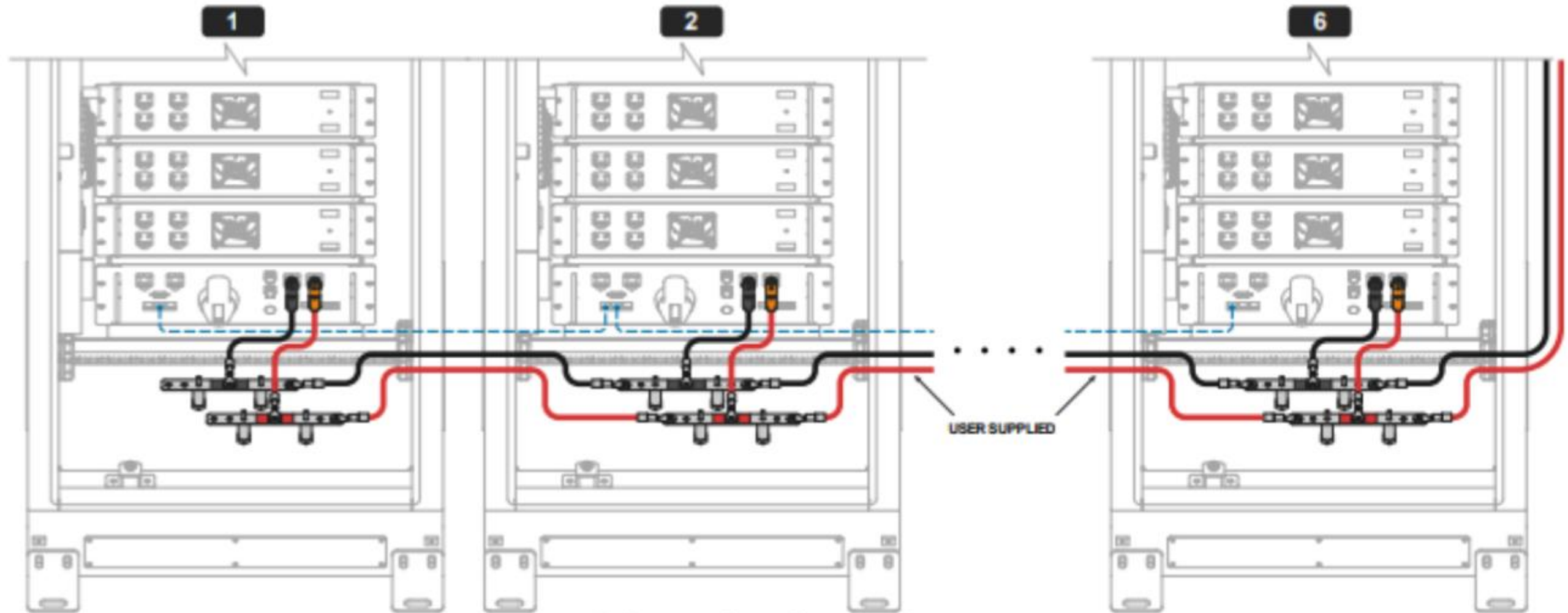
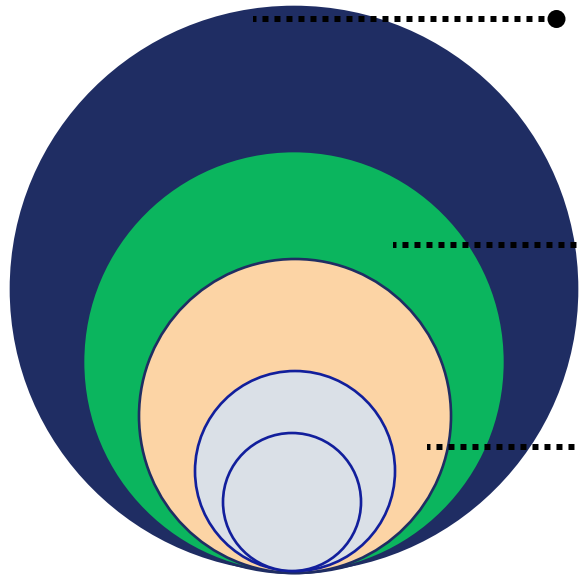


Figure 11 Illustration of wiring for a multi-cabinet system.

L3 Series: Rate Optimization



● **Arbitrage/TOU:** Charging the battery when electricity prices are low or when renewable production exceeds demand, then discharging when electricity prices are high

● **Peak Shaving:** Discharging a battery to reduce a facility's peak demand charges or during high cost on-peak hours

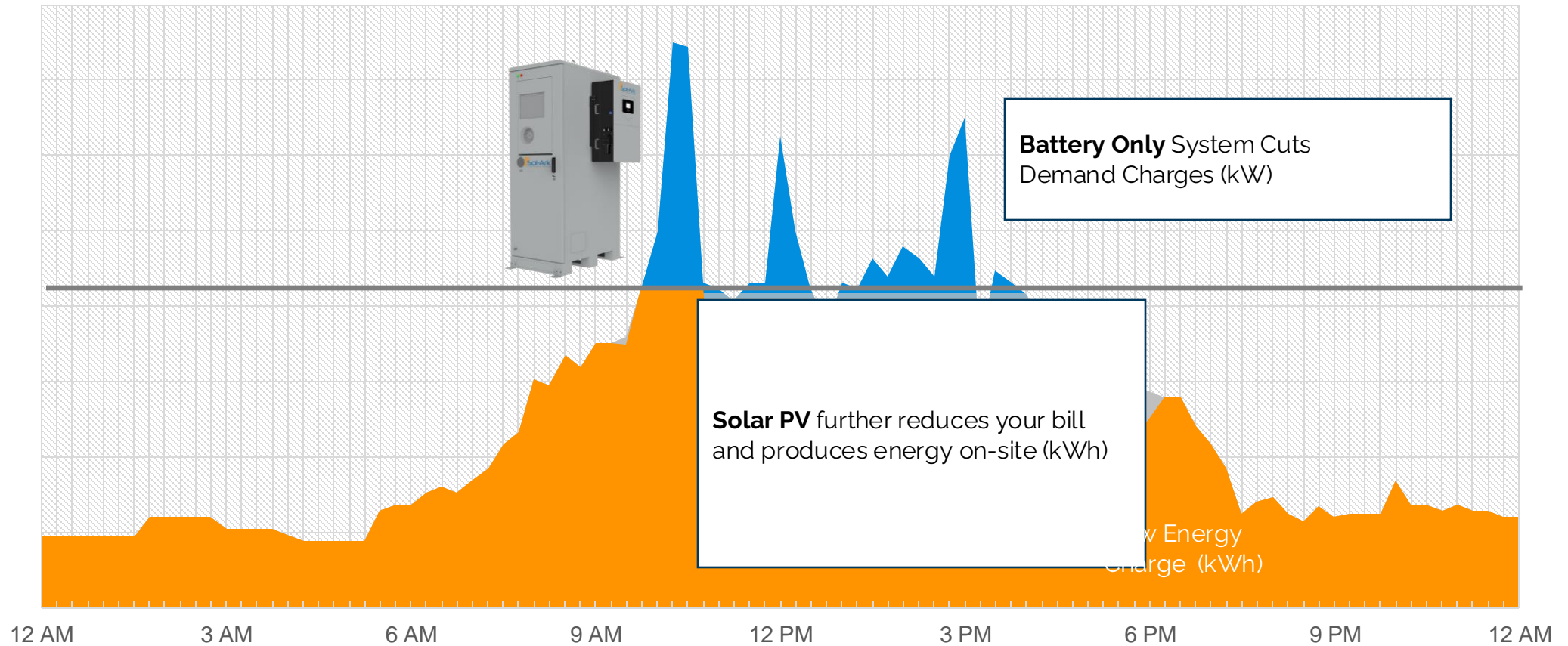
● **DERMS Response:** Utility provided incentives such as VPP programs where the utility pays an incentive for use of the battery



John-Ross Cromer • You
Head of Training
2mo • 🌐

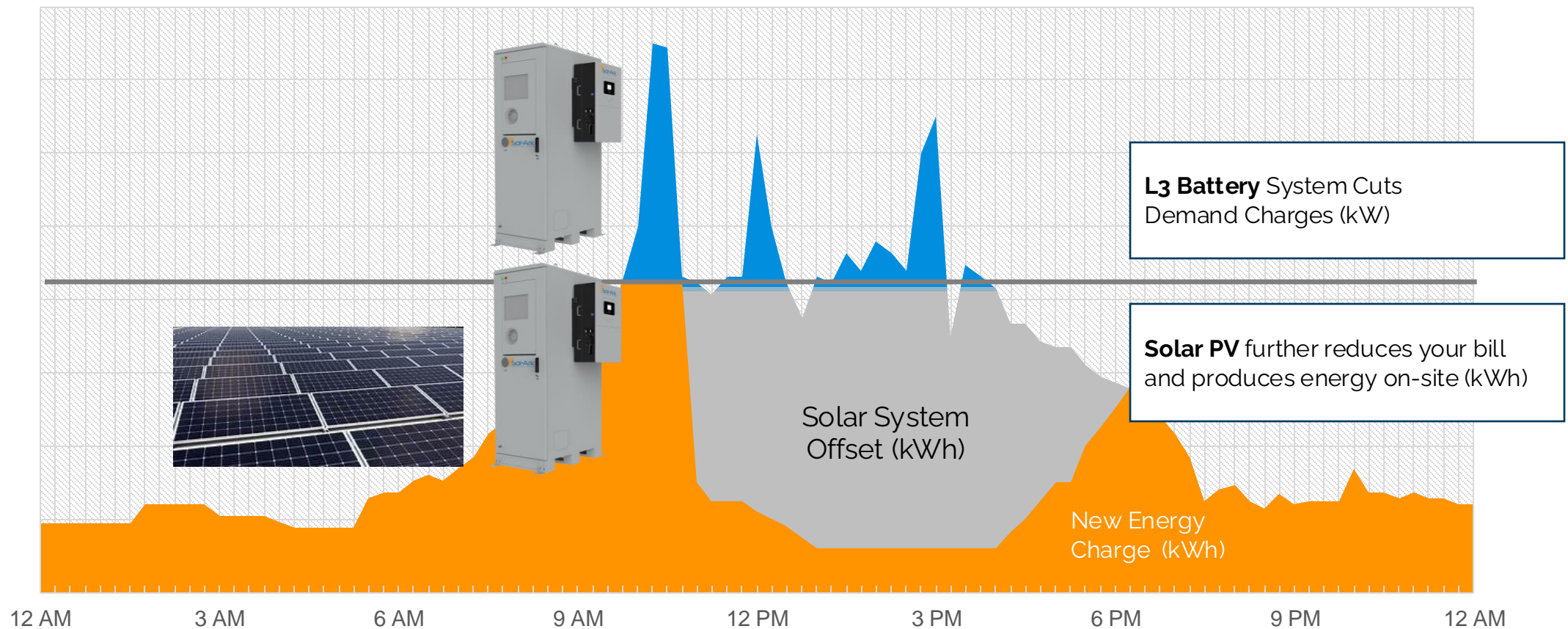
The resimercial solar battery market isn't shrinking... it's growing, fast.

Peak Shaving: Targeted load side connection for peak shaving and essential backup

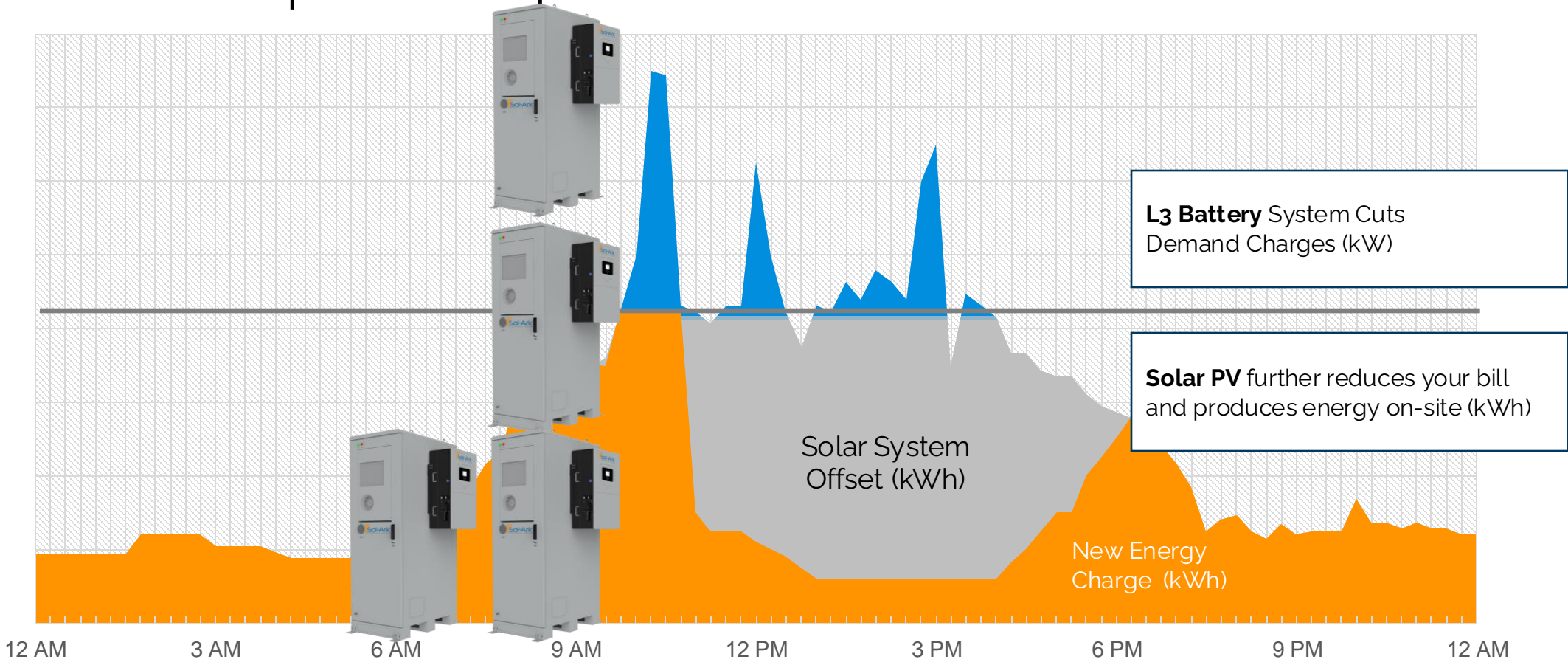


Solar + Storage:

For solar AC coupling, the battery inverter should be larger than the solar inverter. DC coupling is possible with UL3741 options on the roadmap



Whole Building Backup Absolutely possible – Suggest 1 inverter per 200A grid pass through +1 inverter for servicing + consider backup load requirements





Programming Seasonal Demand Management

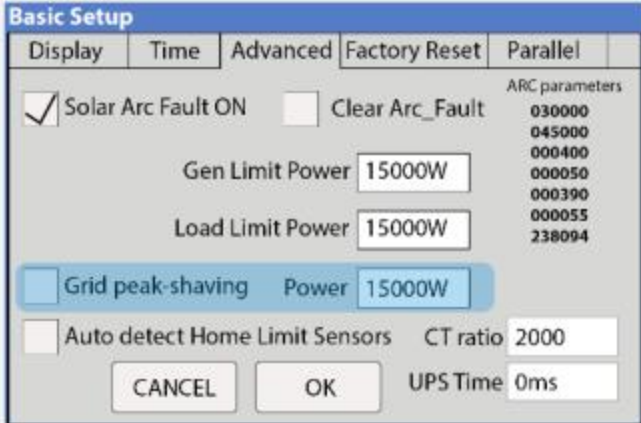
Basic Setup

Display	Time	Advanced	Factory Reset	Parallel	
<input checked="" type="checkbox"/> AM/PM		Year	Month	Day	
		2021	10	26	
<input checked="" type="checkbox"/> Time Sync	PM	Hour	Minute	Second	
		03	04	15	
<input checked="" type="checkbox"/> Seasons	Start M-D	Season 1	Season 2	Season 3	
		1 - 1	4 - 1	8 - 1	
<input type="button" value="CANCEL"/> <input type="button" value="OK"/>	End M-D	4 - 1	8 - 1	12 - 1	

Grid Peak Shaving

2.6 Grid Peak Shaving

1.  To use Peak-Shaving on a generator, the equipment **MUST** be connected to the "GRID" terminal of the inverter.
2. Peak-Shaving helps reduce grid consumption during peak demand by utilizing battery backup power. It can also be used to prevent generator overload above a specified power threshold.
3. Install the CT sensors on grid / generator lines L1, L2. The arrows on the CTs **MUST** point toward the grid / generator.
4. The Sol-Ark supplies power from the batteries whenever the "**Power**" threshold is met.
5. This mode will automatically adjust the "Grid Charge" amperage (**A**) to avoid generator overloads during battery charging.
6.  Grid Peak-Shaving will automatically enable "Time of Use" and **MUST** be configured.



The screenshot shows the 'Basic Setup' menu with the following settings:

Display	Time	Advanced	Factory Reset	Parallel
<input checked="" type="checkbox"/> Solar Arc Fault ON	<input type="checkbox"/> Clear Arc_Fault	ARC parameters		
	Gen Limit Power	15000W	030000	045000
	Load Limit Power	15000W	000400	000050
<input checked="" type="checkbox"/> Grid peak-shaving	Power	15000W	000390	000055
<input type="checkbox"/> Auto detect Home Limit Sensors	CT ratio	2000	238094	
CANCEL		OK	UPS Time	0ms

Grid peak-shaving setting

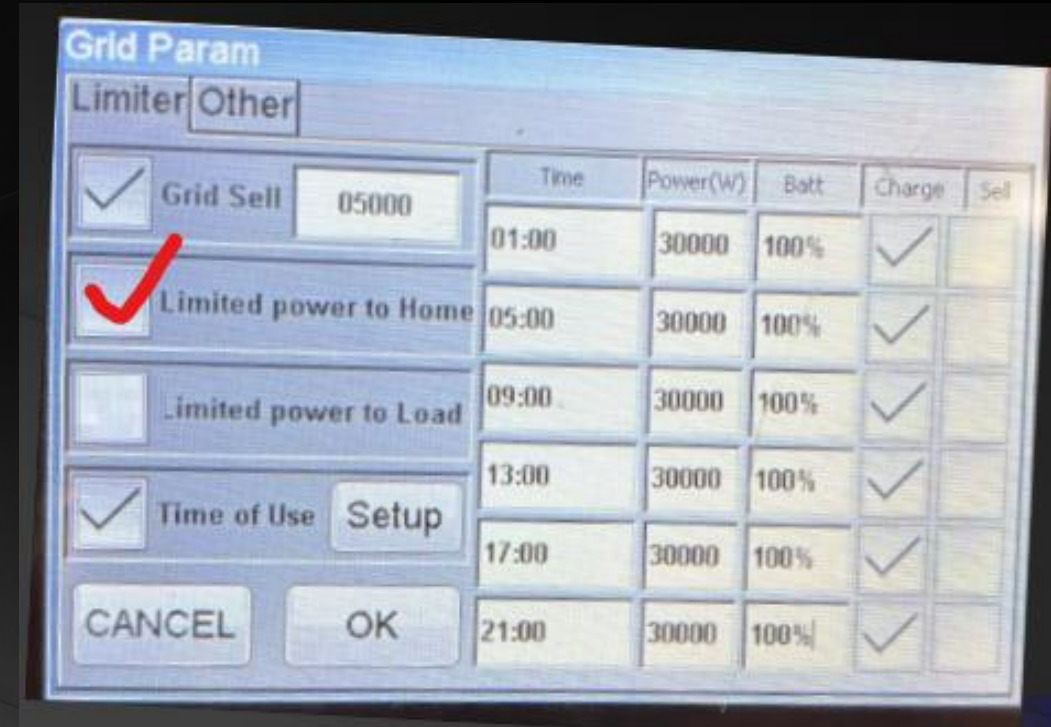
Daily Peak Shaving within C/2 Warranty Inverter Param Settings Example

1 x 30kW inverter

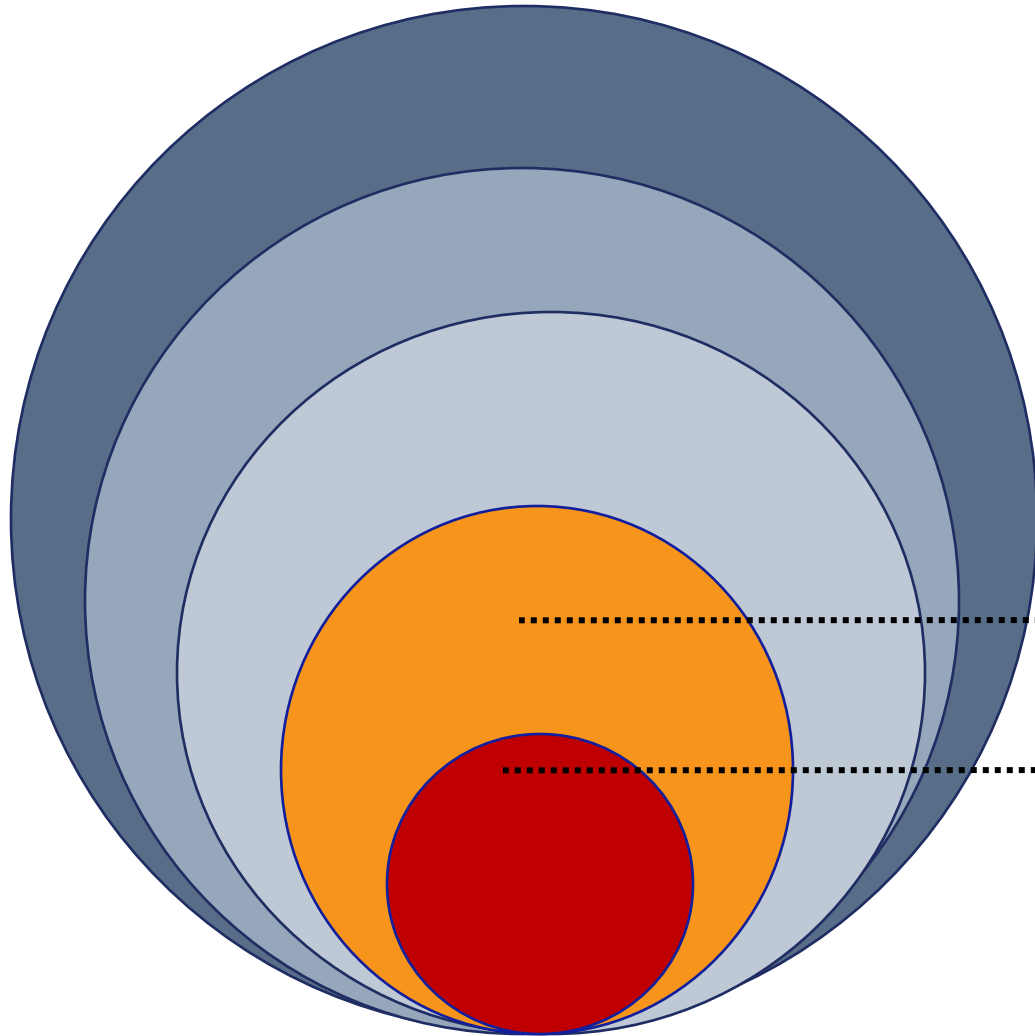
1 x 60 kwh outdoor battery cabinet

default grid sell = inverter nameplate

If Commercial AC coupling, ask Field Applications for Review.



L3 Series: Use Cases



- **4. Differed Grid Infrastructure:** Providing power to a site that does not have enough grid access
- **5. Backup Power:** Use a combination of battery + solar energy to keep building loads on during an outage.

Off-Grid EV Charging for Third-Largest Retailer in the World

Project Details

- **Location:** Mira Loma, California
- **Deployment Date:** January 2024
- **Inverters:** Sol-Ark 60K Hybrid
- **ESS Provider:** EndurEnergy
- **Combined System Size:** 240kWac/492kWh
- **PV System Size:** 75.6kWdc
- **Facility Type:** Warehouse/Distribution Facility
- **Project Application:** EV fleet charging for 88kW of 480V DC Fast chargers

Customer Feedback

"These off-grid electrified structures enable our fleet to meet and exceed our Climate Action Commitments during this energy transition. The partnership with Trinity [Structures] allowed for a solution that is creative, effective, operationally viable, and financially responsible."

-Shay Reed,
Assistant General Merchandising Manager Costco Wholesale



Solar Carport + Fleet EV Charging



Carports, EV Charging Stations

Use DC coupled solar + GEN port for easy EV interconnection eliminates underground wiring runs, with or without whole building backup

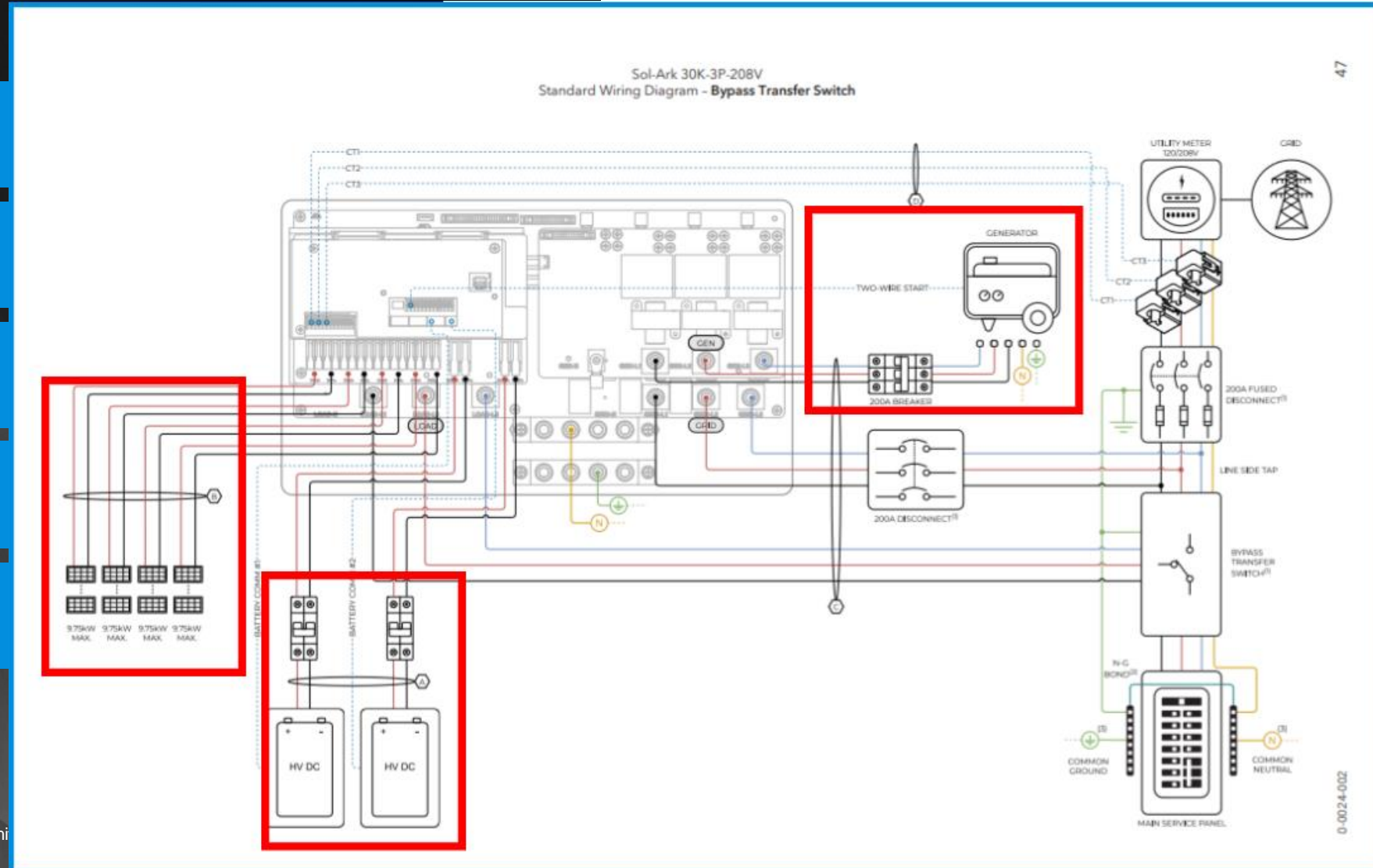
Reduce Electricity Demand Charges

Improve Energy Resilience Both Behind and in Front of the Meter

Leverage Storage as a Competitive Advantage

Optimize Energy Use

Gain New Revenue by Selling Excess Energy Back to the Local Utility



Service Upgrade Deferral



SF DPW Project Details

- **Location:** San Francisco, California
- **Deployment Date:** November, 2023
- **Inverters:** Sol-Ark 30k Hybrid
- **ESS Provider:** Deka Duration HV
- **Combined System Size:** 30kWac/64kWh
- **PV System Size:** 30kWdc
- **Facility Type:** Commercial building
- **Project Application:** Off-grid power for the nursery and training center.

Project Brief:

The Street Tree Nursery is a project by the Department of Public Works to grow San Francisco's urban forest, combat climate change and support career pathways for community members.

It's location in the City's urban core allows for the nursery reduce the transportation and environmental costs associated with delivering trees from commercial nurseries located in the far reaches of the Bay Area.





Commercial

Residential

Installers

About

Resources

Contact Us



Certifications



Knowledge Hub



MySol-Ark



Authorized Installers



Distributor Map



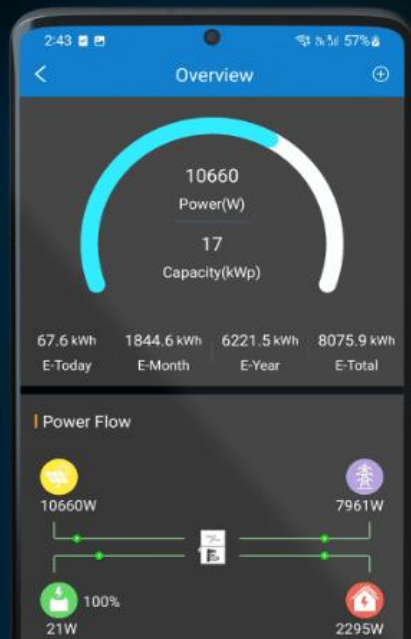
Battery Partners



Marketing Resources



Sol-Ark University



Accelerating Growth, Together

Partner With Us



Certifications

Knowledge Hub

MySol-Ark

Authorized Installers

Distributor Map

Battery Partners

Marketing Resources

Sol-Ark University

Topics

- Certifications (17)
- User Manual (6)
- Application Notes (5)
- CAD Files (5)
- Case Studies (5)
- Datasheet (4)
- Product Warranty (4)

Title	Version	Download
30K-3P UL1741 CRD Power Control System (PCS) Certification	V001	Download Preview
30K-3P-208V CAD	V001	Download
30K-3P-208V Datasheet	V005	Download Preview
30K-3P-208V HECO Compliance Verification Instructions	V001	Download Preview
30K-3P-208V Installation Manual	V002	Download Preview
30K-3P-208V UL1741SB and UL1699 Certificate	V001	Download Preview
60K-3P UL1741 CRD Power Control System (PCS) Certification	V001	Download Preview



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www.sol-arkuniversity.com

**Use Enrollment Key:
energytoolbase_network**



Residential Product Line

You must complete 7 of the following course(s).

7 of 7
Course(s)



Residential Product Overview

Completed

Design and Installation

Completed

Multiple Inverter Projects

Completed

Generators

Completed

MySolArk

Completed

Micro-Inverters + AC Solar

Completed

Subpanels on GEN port

Completed



Commercial Product

You must complete 1 of the following course(s).

3 of 1
Course(s)



Commercial Product Overview

Completed

Commercial L3 HV Indoor

Completed

Commercial L3 HVR Outdoor

Completed

www.sol-arkuniversity.com

Use Enrollment Key:
`energytoolbase_network`

Contact Us

Learn more about Sol-Ark® innovative solar energy systems and solutions Our dedicated sales team is here to help you discover the perfect products to meet your residential or commercial energy needs.

If you're already a Sol-Ark® customer and need assistance with your product, please use the form below to contact our technical support team.

Contact Sol-Ark® Sales

Sol-Ark® Technical Support Form

Contact Sol-Ark Sales Team

1

Page 1

2

Page 2

Customer Information

Name *

First Name

Last Name

Email *

For additional information on
Sol-Ark University courses

 sol-arkuniversity.com

To learn more about Sol-Ark's
Commercial Limitless Lithium Battery
Energy Storage Solutions

 sol-ark.com/batteries-commercial/

To learn more about Sol-Ark's
NEM 3.0 Solutions

 sol-ark.com/residential/



Q & A

contact@energytoolbase.com