

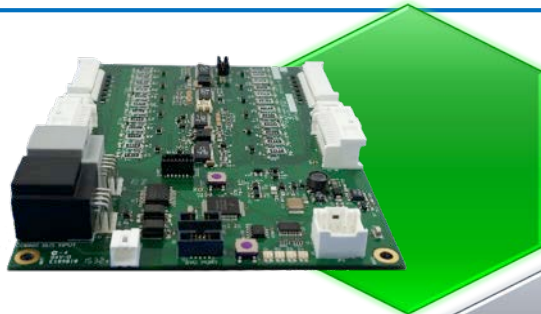


# Trident<sup>®</sup> Advanced Marine Battery Solutions

March 2018



# Spear Solutions



**SBMS**  
Battery  
Management  
System

All Lithium-ion Chemistries (LTO, LFP, NMC) to 5V/cell  
Modular – 3S to 24S Modules, 12 to 1250VDC Strings,  
Parallel Strings  
High Data Rates & Resolution (1mV, 0.1°C) – Accurate  
SOC, SOH algorithms  
Low Quiescent Current – Longer Shelf Life

Low Resistance, Laser Welded Bus Connections  
High Cell to Packaging Weight & Volume Ratio  
Compression Enhances Cycle Life  
Air & Liquid Cooling  
Managed Cell Venting  
Cell Group to Group Propagation Protection

**SMOD**  
Prismatic Cell  
Modules



**Standard  
ESS**

Trident® Modules Focus on Marine Market  
Uses SMOD & SBMS  
Air & Liquid Cooling Options Available  
Highest Energy Density in Marine Industry

High Density Packaging  
Quick Design Cycle due to SBMS & SMOD  
Custom Thermal Management  
Application Specific Enclosures

**Custom  
ESS**

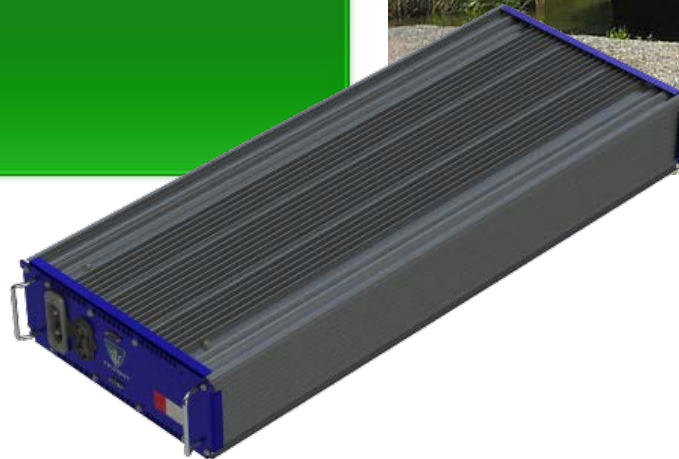


# 1<sup>st</sup> US All-Electric LI Ferry



## Gee's Bend, AL

- 4 Strings of 6 Trident SMAR-11N Modules
- 271 kWh, air-cooled
- 505-580 VDC
- Trident delivery Q1 2018
- Commissioning Q2 2018



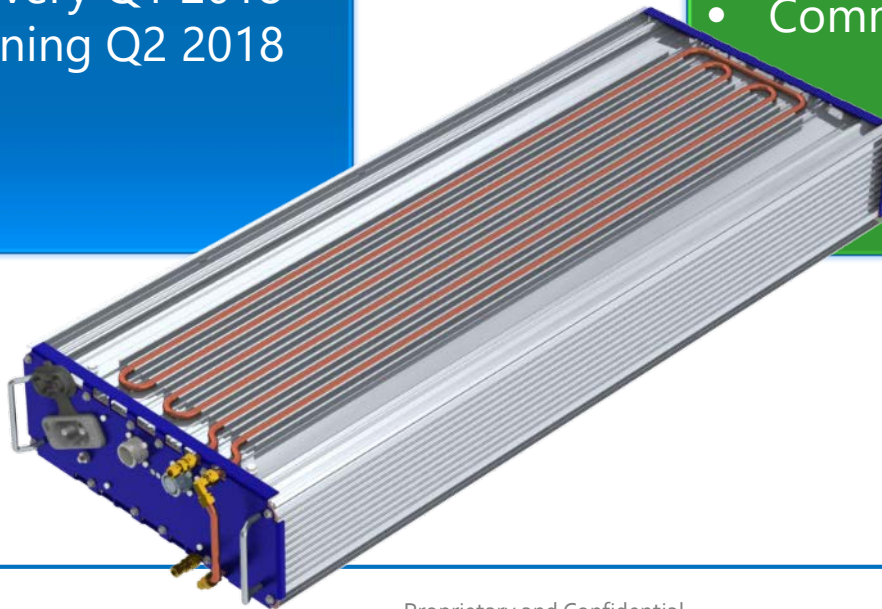
# Further References

## East Coast US

- 6 Strings of 6 Trident SMAR-11N Modules
- 406 kWh, liquid cooled
- 505-580 VDC
- Trident delivery Q1 2018
- Commissioning Q2 2018

## West Coast US

- 2 Strings of 7 Trident SMAR-11N Modules
- 79 kWh, liquid cooled
- 505-705 VDC
- Trident delivery Q2 2018
- Commissioning Q3 2018



# Trident<sup>®</sup> Specifications



Trident <sup>®</sup> Module	SMAR-11N	SMAR-2T	SMAR-4A
<b>Defining Features</b>	Industry-Leading Energy Density	Industry-Leading Cycle Life	High Power Density / High Cycle Life
<b>Cell Chemistry</b>	NMC	LTO	Nano
<b>Embedded Energy</b>	11.3 kWh	2.2 kWh	8.2 kWh
<b>Nominal Capacity</b>	128 Ah	40 Ah	92 Ah
<b>Maximum Continuous Discharge Rate</b>	3.0 C	5.0 C	12.0 C
<b>Pulse Discharge Rate</b>	6.0 C	10.0 C	15.0 C
<b>Maximum Continuous Charge Rate</b>	3.0 C	5.0 C	3.0 C
<b>Energy Density</b> ( <i>system-level</i> )	98 Wh/L	52 Wh/L	70 Wh/L
<b>Specific Energy</b> ( <i>system-level</i> )	111 Wh/kg	39 Wh/kg	88 Wh/kg
<b>Specific Power</b> ( <i>system-level</i> )	333 W/kg	195 W/kg	1057 W/kg
<b>System Scalability</b>	2.0 kWh — 10 MWh+		
<b>System Voltage Range</b>	48 VDC — 1250 VDC		
<b>Battery Management System</b>	Spear Scalable Battery Management System (SBMS)		
<b>Cooling Method</b>	Forced Air / Liquid Cooling		



We look forward to  
working with you!



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