



OCP OPENEDGE BBU FOR 5G / IOT / EDGE PROPOSAL

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February 2020



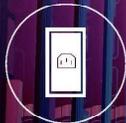
OPEN
COMMUNITY®



Battery
Packs



Chargers &
Docking Stations



Power
Supplies

DEPENDABLE & EFFICIENT

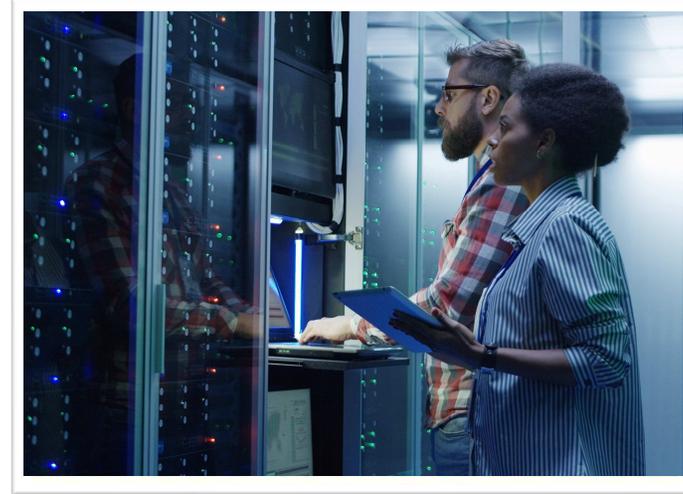
Battery Backup Solutions for
Critical Power Applications

CRITICAL POWER SOLUTIONS

Telecom



Data Storage



Energy Storage



UPS / Battery Backup



CRITICAL POWER PORTFOLIO

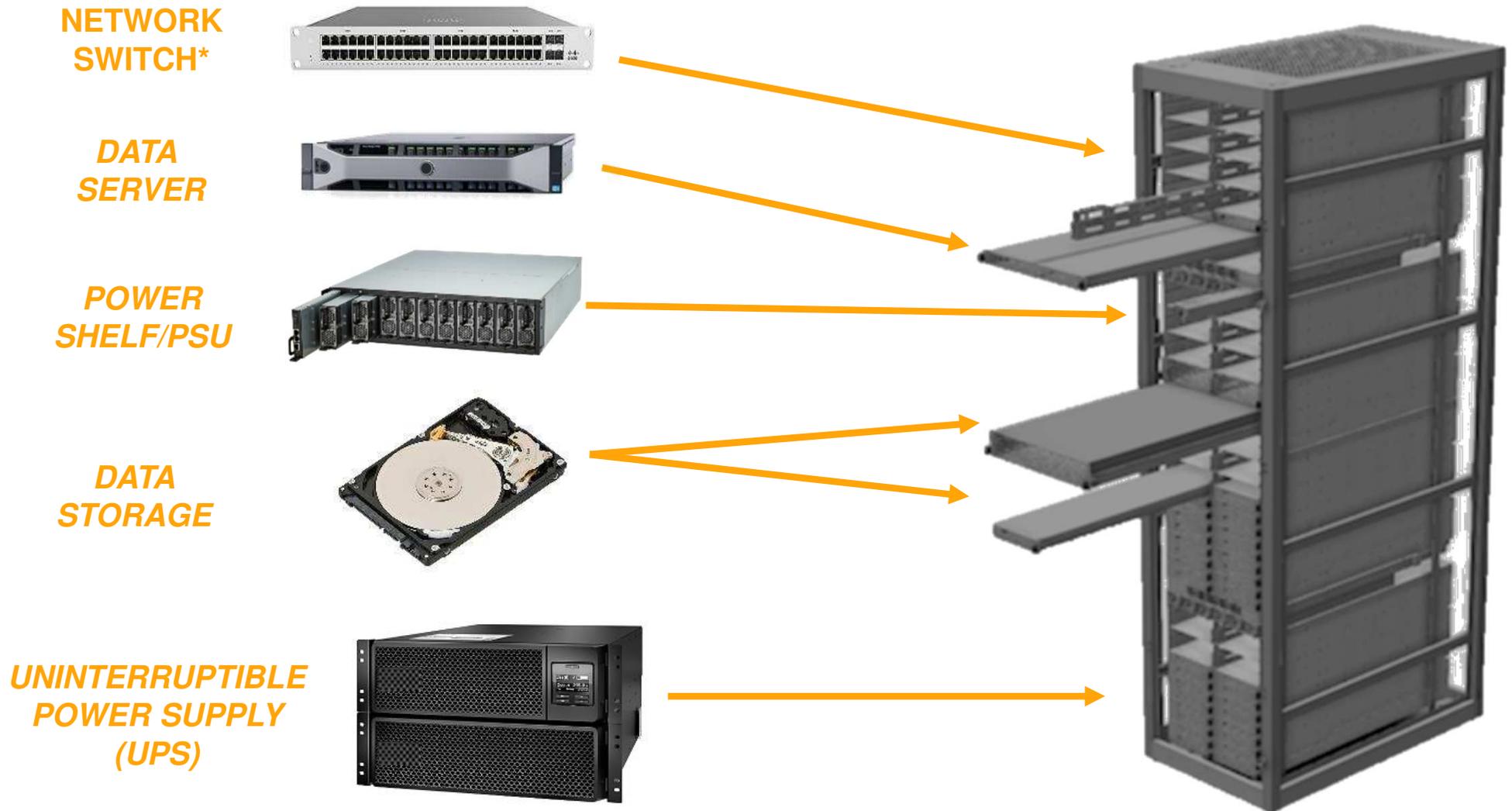
SMALL TO MEDIUM FORMAT, HIGH RELIABILITY

- Typical Applications
 - BBU (Battery Backup – Onboard)
 - PSU (Power Shelf Units – In Chassis)
 - BBU/PS (Battery Backup/Power Supply)
 - UPS Battery (System Component of UPS System)
- Over 20 programs in production today
 - Builds mostly in China, Malaysia & Mexico
- Voltages from 4V to 48V (Nominal)
- Power range 100 - 5kW (3kW in production today)
- Current production configurations from 1S1P to 14S6P (Larger configurations in development)
- Predominant construction – metal sleds & full metal enclosures
- Volume Ranges (Per SKU) – 2.5K to 50K+



TYPICAL VIRTUALIZED SYSTEM

***BATTERY BACKUP OPTIONS IN ALL EXCEPT THE NETWORK SWITCH**



OPENEDGE BBU

MARKET OPPORTUNITY AND DETAILS

MARKET INSIGHTS FOR 5G / EDGE / IOT

\$700 BILLION BY 2030 (ANNUAL TSP 5G REVENUE)

(ERICSSON AND ARTHUR D. LITTLE REPORT)

| Industry | MRKT % | CAGR % | Primary Application | Other Applications |
|--------------------|--------|--------|---------------------|--------------------|
| Healthcare | 21% | 75% | Telemedicine | Hospitals |
| Manufacturing | 19% | 76% | Automation, A/R | Robotics |
| Energy / Utilities | 12% | 67% | Power Generation | Smart Buildings |
| Automotive | 12% | 71% | Autonomous Cars | In-Car Entertain |
| Public Safety | 10% | 78% | Surveillance | Public Safety |
| Media / Entertain | 10% | 86% | Gaming | Advertising |
| Financial Services | 5% | 76% | Banking | Securities |
| Public Transport | 5% | 65% | Mass Transit | Goods Delivery |
| Retail | 4% | 76% | E-Commerce | Stores |
| Agriculture | 2% | 85% | Farming, Livestock | Fishing, Hunting |

OPTIMIZED APPLICATIONS FOR BBU

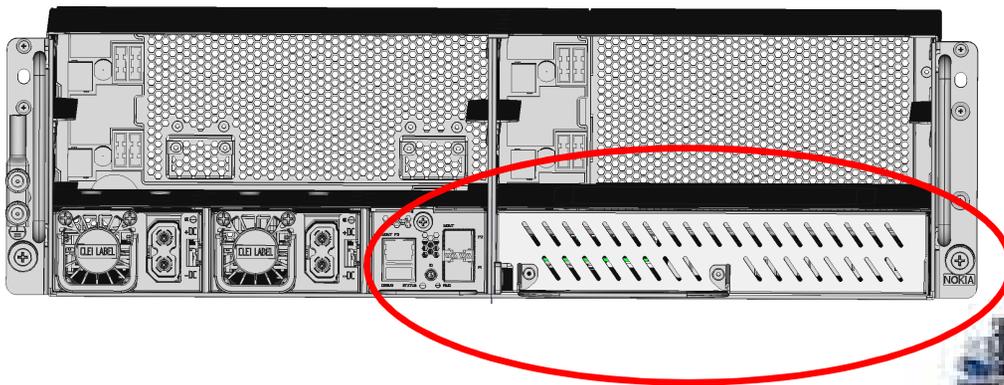
FAR EDGE / MISSION CRITICAL / UNRELIABLE POWER

- Minimal Power infrastructure
- Minimal space availability
- Frequent power interruptions
 - Developing Nations
- Challenged Environments
 - Geophysical
 - Nautical
 - Weather
- Graceful Shutdown needs
 - Communication
 - System Auto-Reboot capability
- Multi-Prong deployments
 - Factories, Warehouses, Healthcare/Hospital
- Tower/Pole Mounted Applications



SYSTEM DETAILS

- Systems are physically 3U (5.25”) high 19” wide and designed with “sleds” that are 1U or 2U (1.75” or 3.5”) high x 8.5” wide and 17.5” deep
- There are effectively 6 sleds in the system, with 1 sled location for the twin (redundant) power supplies (PSU) and a rack management controller (RMC)
- The proposed BBU sled will be 8.45”w x 1.7”h x 17.5” deep
- If incorporated – the BBU will reside in the lower right sled location.



OPEN EDGE - CHASSIS

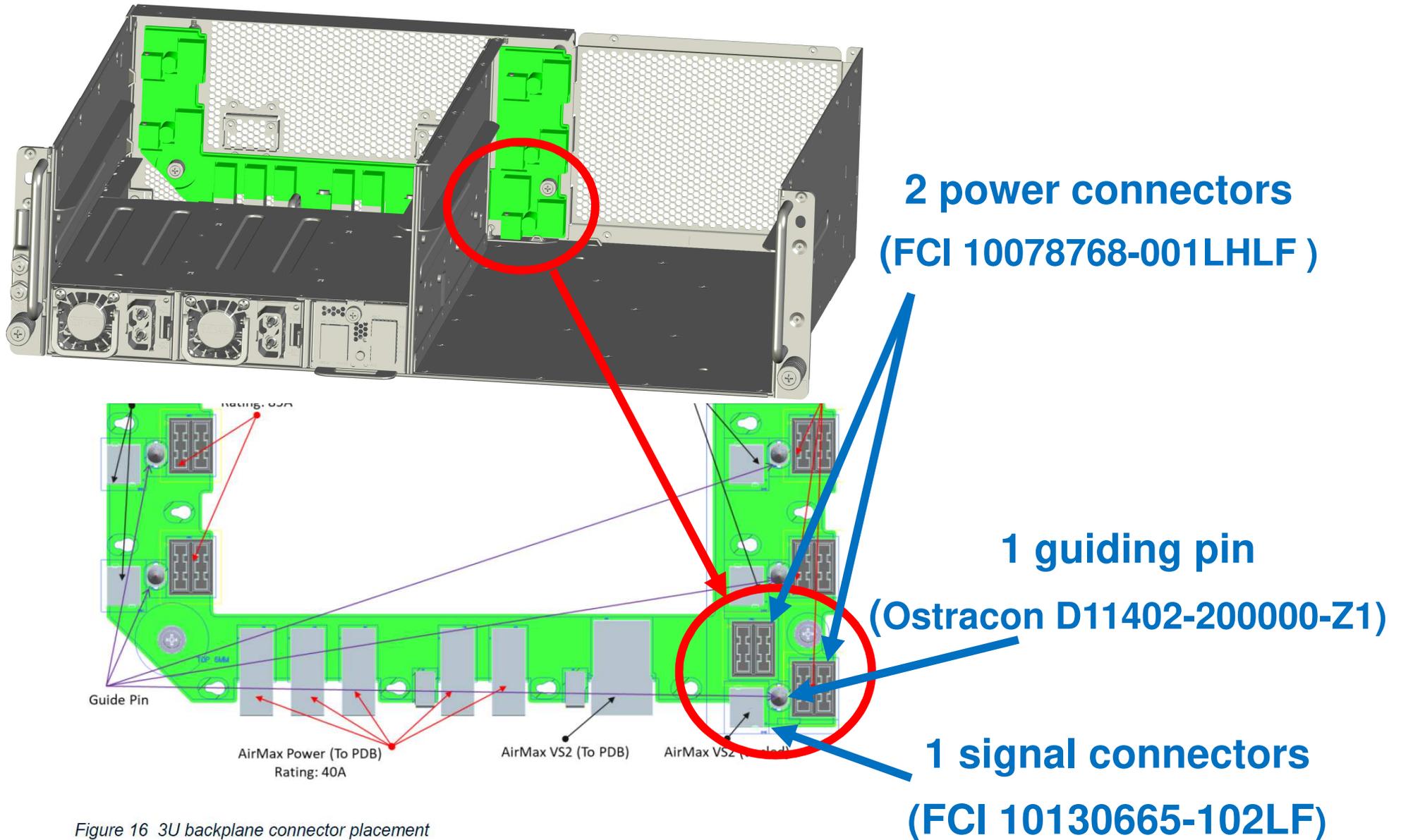
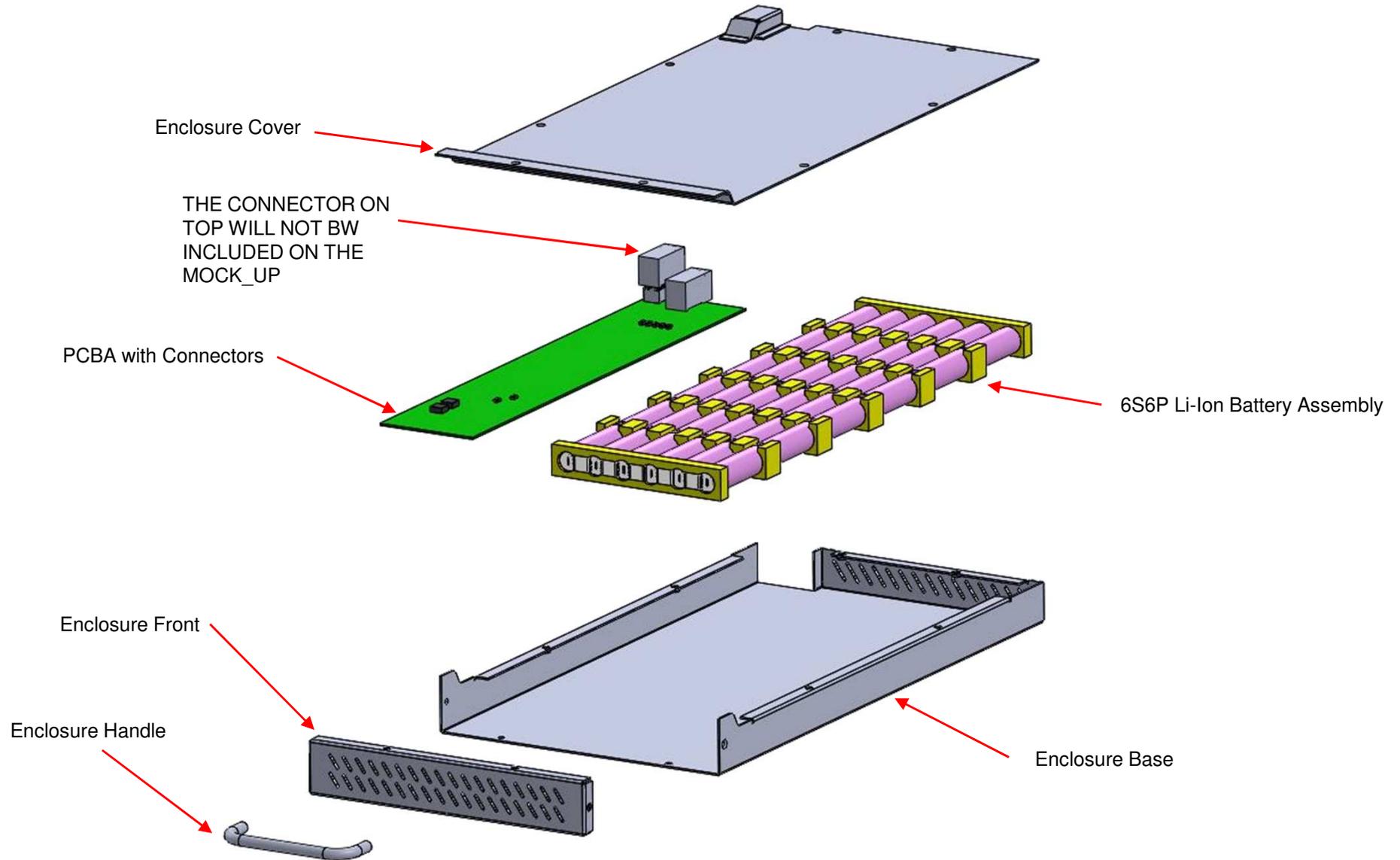


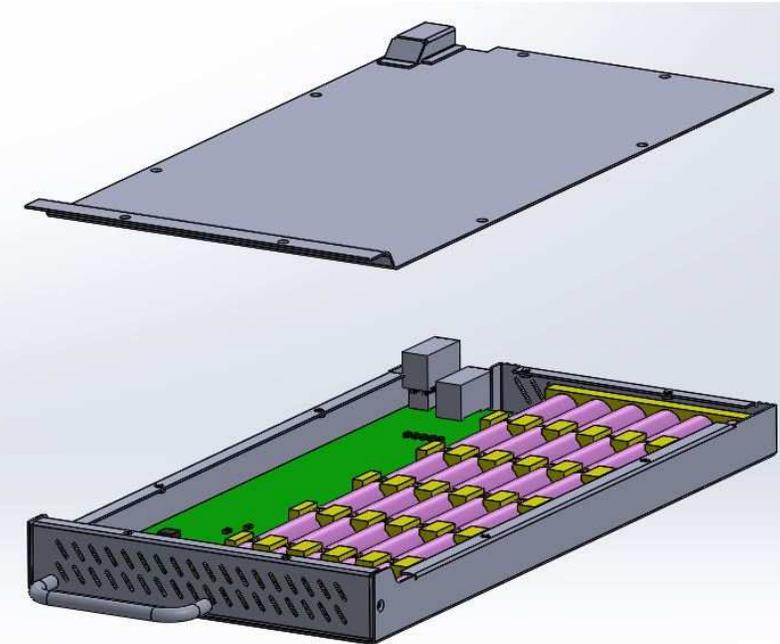
Figure 16 3U backplane connector placement

OPEN EDGE MOCK-UP



OPEN EDGE BATTERY BACKUP UNIT SPECS (REV 1.0)

| ELECTRICAL | |
|-------------------------|--|
| Cell Chemistry | NMC/NCA |
| Voltage (Nom/Max) | 12.0V +/- 0.1V |
| Energy (Total/Usable) | 260 / 220 Whr |
| Contin. Power / Current | 1.6kW / 133A |
| Peak Power | TBD |
| Run Time | 8 Minutes @ 1600W (Initial – 5 Years = 5 minutes) |
| Communication Protocol | SMBus |
| Cycle Life (@25°C) | 750 @ 70% of Initial Capacity 5 Year Est'd Life |
| Scalability | N/A |
| BMS | Intelligent Microprocessor, Pre-charge, Cell Balancing, Over Voltage, Under Voltage, Over-current, Short circuit, Temperature Monitoring, Data Logging |



| MECHANICAL | |
|---------------------------------|---|
| Dimensions (LxWxH) mm / (in) | 427.5(D) x 215(W) x 44.45(H) mm (16.83 x 8.46 x 1.75 in) |
| Weight (kg / lbs) | TBD |
| Interface | Amphenol ICC (FCI) Airmax VS2 Power/Signal |
| Enclosure | Steel |
| Shipping Classification | UN3480, Class 9, UN38.3 |
| Cooling | Fanless Design |
| Contact | Howie Granat – hgranat@inventuspower.com |

| OPERATIONAL TEMPERATURE RANGE | |
|-------------------------------|-------------------------------|
| Charge | 32°F to 113°F (0°C to 45°C) |
| Discharge | 23°F to 140°F (-5°C to 60°C) |
| Storage | -4°F to 140°F (-20°C to 60°C) |

| CERTIFICATIONS (Planned) | |
|--------------------------|--------------------|
| North America | UN38.3, UL1973 |
| EMEA | IEC62619 |
| Global | UL1642, RoHS, WEEE |

TIMELINE

PROTOTYPE / PILOT / PRODUCTION

- July 2019
 - Preliminary Specifications presented to OCP community
- September 2019
 - Proto Zero / Physical mockup presented at OCP Regional Summit in Amsterdam
 - Preliminary Specifications presented to Open Network Foundation summit
- October 2019
 - Preliminary Quotes presented to Nokia/Asus/Wiwynn
- November 2019
 - Proto Zero / Physical mockup presented at Telecom Network Foundation in Amsterdam
- March 2020
 - OCP Global Summit – Request to have a working Proto-One to be able to power an OpenEDGE system (2-3 Units)
- September 2020
 - OCP Regional Summit – Prague – Proto-One to power an openEDGE system (3 Units)
- January 2021 – Agency Certifications in process – Pilot Builds
- Q2 2021 Production Ready

ADDITIONAL INFORMATION

- Nokia Airframe application for Smart City - Norway
 - <https://www.thefastmode.com/technology-solutions/14129-norways-miris-selects-nokia-airframe-open-edge-data-center-for-delivery-of-smart-city-services>
- Wiwynn releases EP100 System
 - <http://www.wiwynn.com/english/company/newsinfo/2078>
- Asus description of their OpenEDGE server offering
 - <https://www.youtube.com/watch?v=40X7Vdl1Ko8>
- Microsoft Nokia collaboration on 5G and IoT
 - <https://www.thefastmode.com/technology-solutions/15829-microsoft-nokia-collaborate-on-cloud-ai-and-iot-solutions-for-csps-and-enterprises>
- Nokia presentation of OpenEDGE Ecosystem to Open Network Foundation
 - <https://www.opennetworking.org/wp-content/uploads/2019/09/2pm-Mike-Moore-openEDGE-Ecosystem-Opportunities.pdf>
- Ericsson report on 5G – Growth Business segments
 - <..\Open Compute\OpenEdge\the-5g-for-business-a-2030-compass-report-2019.pdf>



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