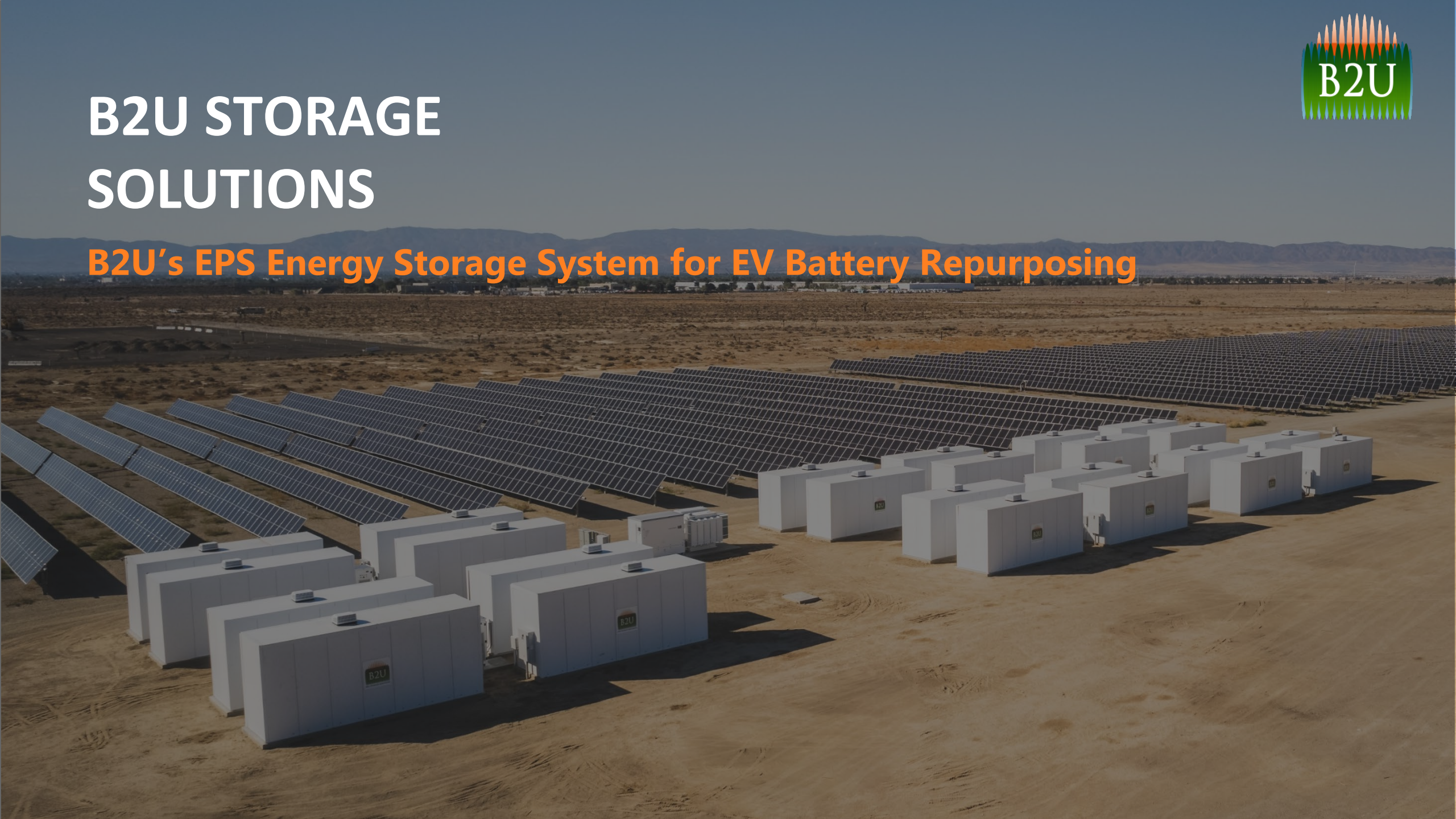
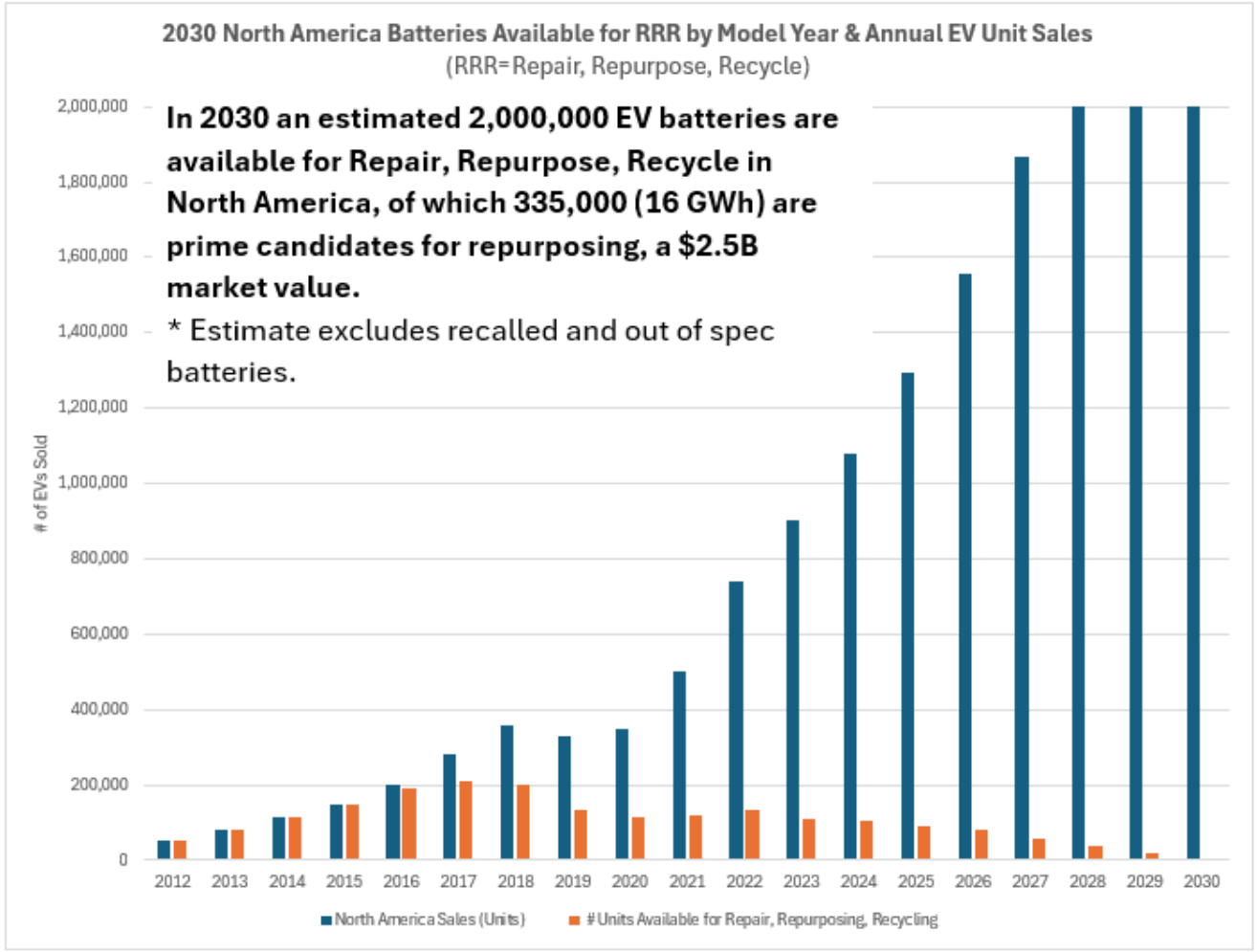
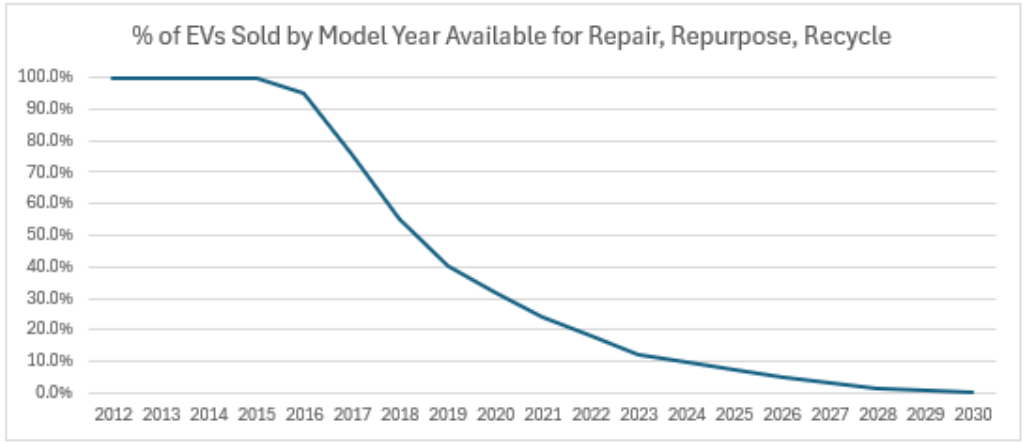
B2U STORAGE SOLUTIONS

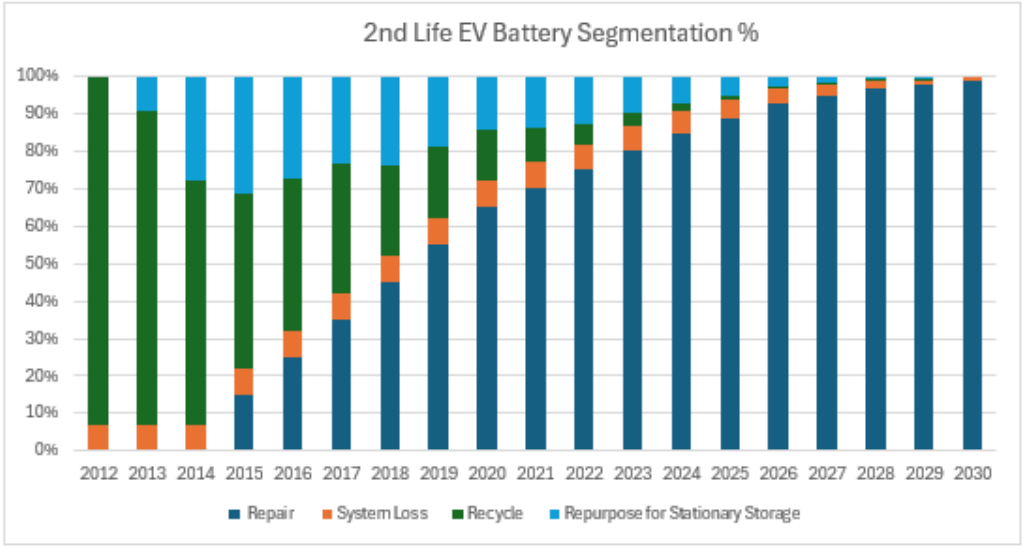
B2U's EPS Energy Storage System for EV Battery Repurposing



In 2030, 2M post-automotive EV batteries available for repair, recycling or repurposing, excluding recalled and out of spec batteries.



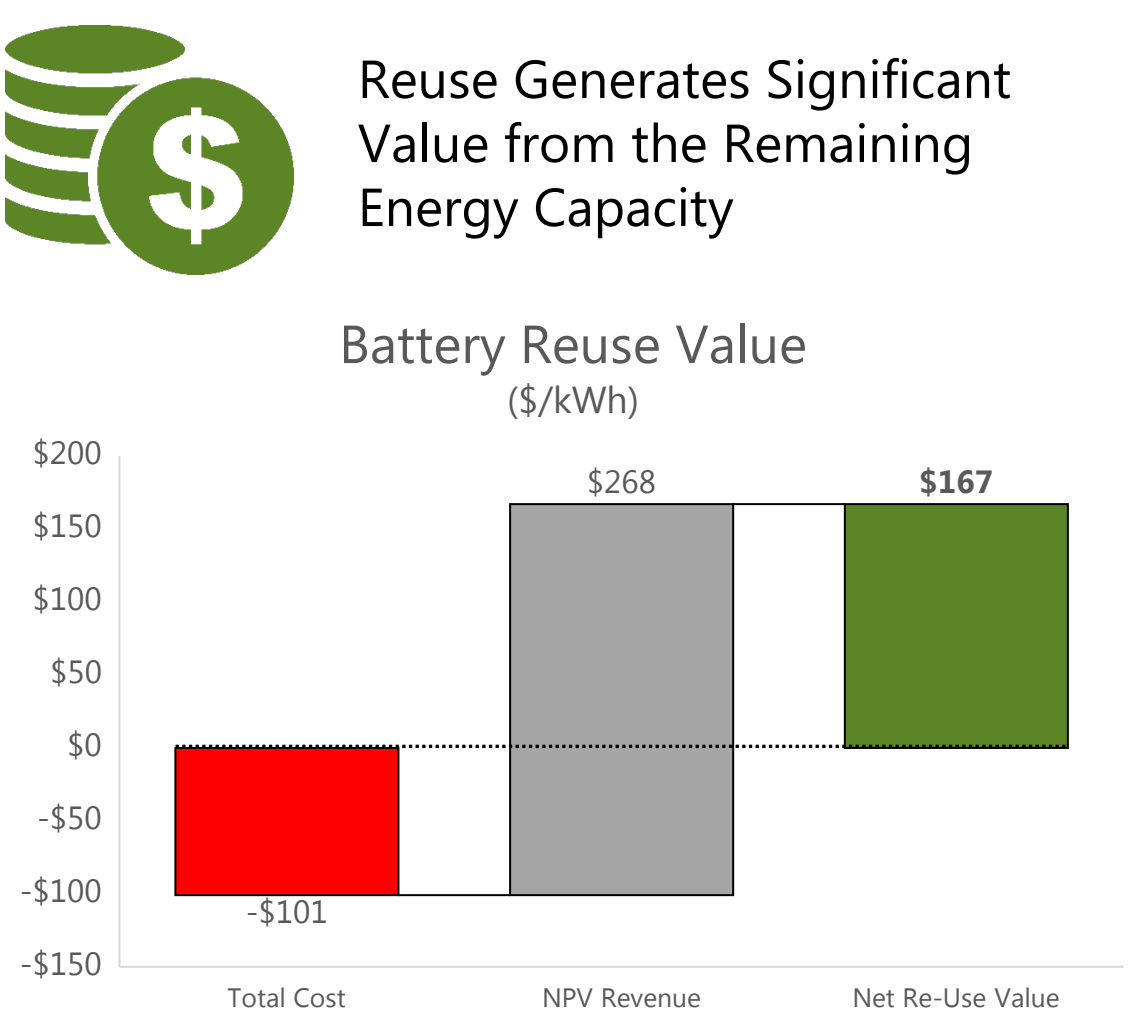




Source: B2U internal analysis

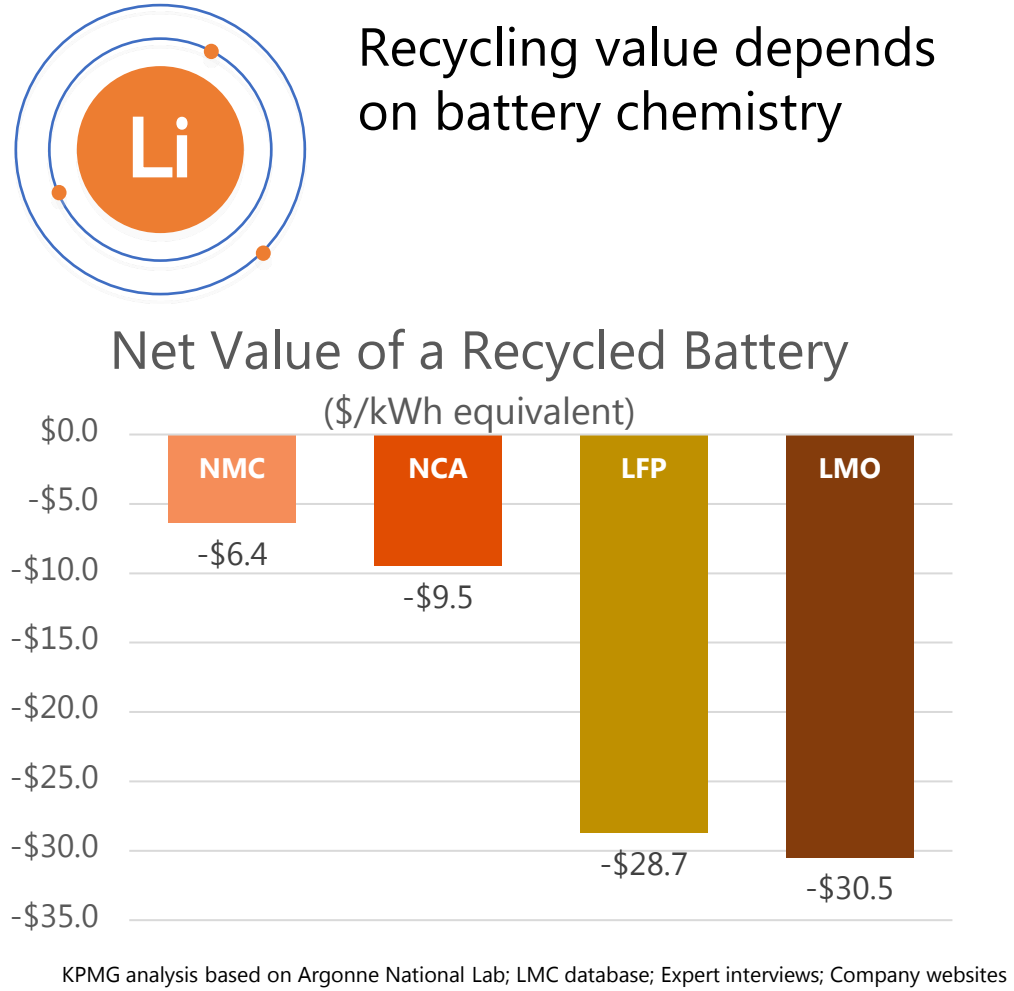
Reuse before recycling generates substantially more value than direct recycling which is often a net cost depending on commodity prices of recycled materials.

Reuse Generates Significant Value from the Remaining Energy Capacity



Source: KPMG analysis based B2U and CAISO data

Recycling value depends on battery chemistry



KPMG analysis based on Argonne National Lab; LMC database; Expert interviews; Company websites

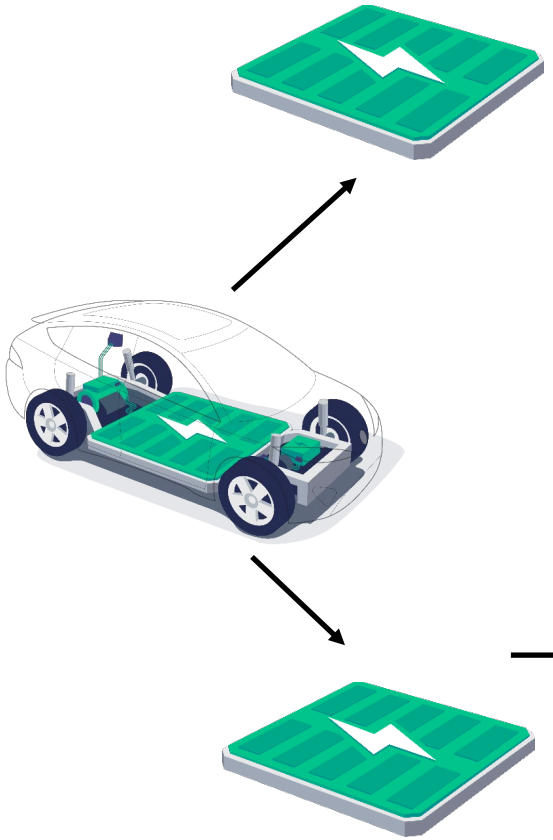
Using patented EPS technology, B2U is commercializing a proprietary energy storage system (ESS) engineered to utilize EV batteries in large-scale storage applications.[1]

B2U's energy storage facility in Lancaster, CA

- B2U's patented EV Pack Storage (EPS) System deploys 2nd life batteries from EVs, reusing the entire battery pack, eliminating repurposing costs
- Uniquely engineered to achieve effective yields despite variance in capacity from large volumes of batteries
- Delivers a superior CapEx and Levelized Cost of Storage (LCOS) advantage
- EPS System is configurable for any EV battery; Nissan, Honda, Ford, GM, Tesla batteries operating at Lancaster facility
- 28 MWh capacity; operations began in May 2020, selling into CAISO wholesale market as a merchant resource

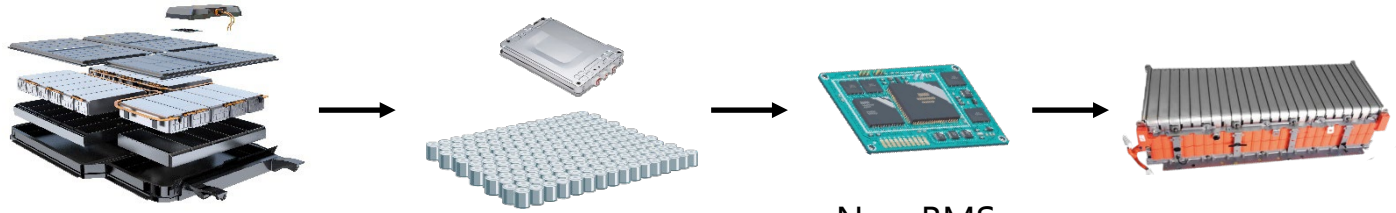
[1]B2U-Battery 2nd Use; EPS-EV Pack Storage

B2U's EPS technology enables EV pack reuse that AVOIDS expensive repurposing costs.



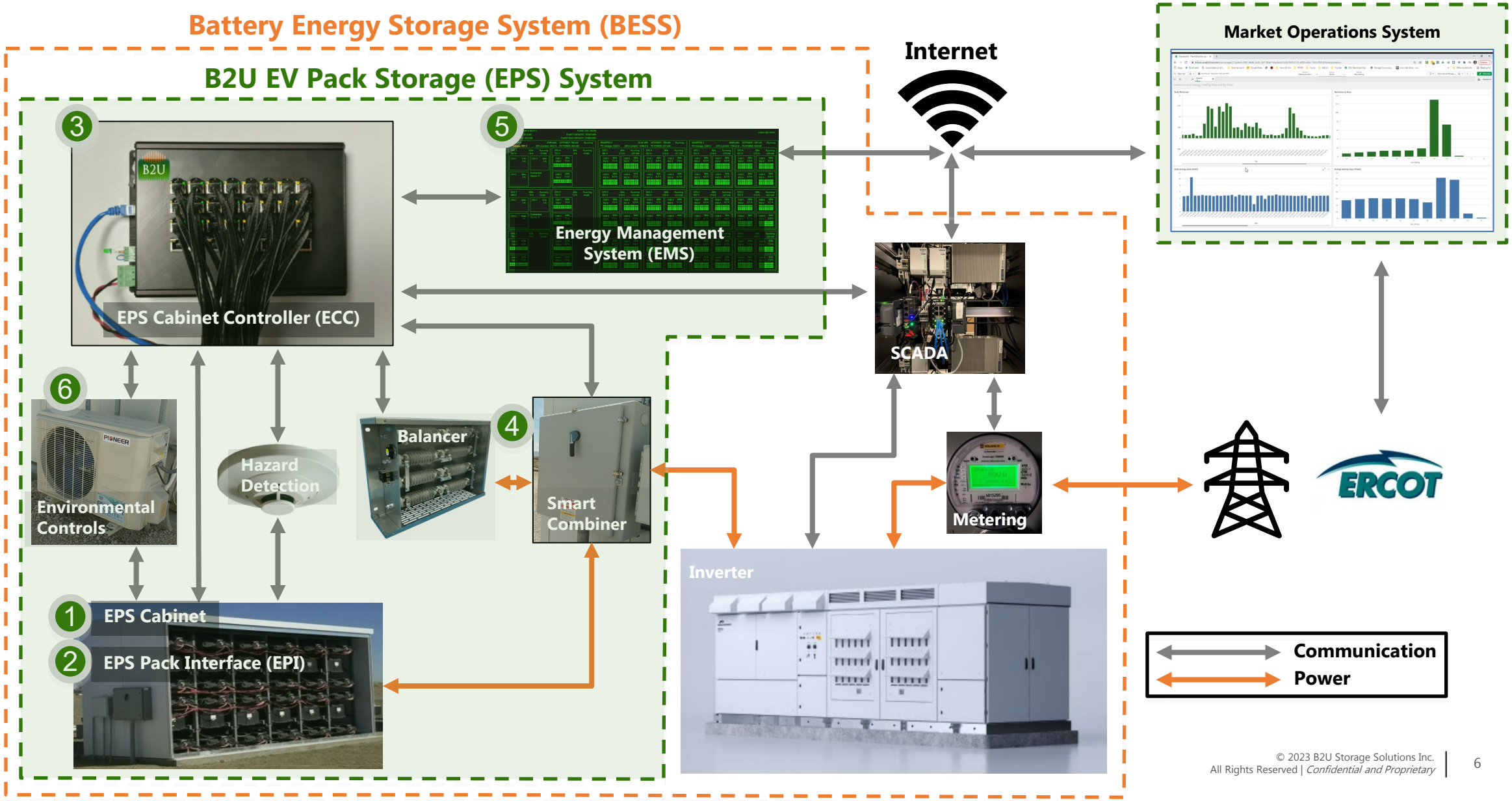
EPS Enables Reuse of the EV Pack Avoiding Repurposing Costs

1. **Re-Use of:**
   - **Native BMS**
   - **Road-rated Enclosure**
   - **Sensors & Wiring**
2. **Scalable with low O&M**
3. **Reduces risk from OEM perspective**
4. **Avoids assembly & disassembly costs and risks**
5. **Speeds deployment & servicing**
6. **Provides superior tracking and logistics**



Pack Disassembly		Module Testing/Sorting		New BMS, Sensors, Wiring		Reassembly & Testing	
$6.8	+	$5.1	+	$36.1	+	$24.8	= $72.6 / kWh

B2U's EPS system has numerous safety features to mitigate risk in battery deployment.



B2U EPS System Safety Features and Procedures: Pack and Cabinet Level Safety

EV Pack Level

B2U's patented EV Pack Storage (EPS) System deploys 2nd life batteries from EVs, reusing the entire battery pack, eliminating repurposing costs and risks.

Preserving the built-in BMS and safety features of the pack provides an extra layer of safety and control. Furthermore, the structural attributes of battery pack enclosures provide inherent fire risk mitigation, isolation, and separation characteristics.

Enclosed Cabinet Level

Each enclosed cabinet is climate controlled with an HVAC system as well as a smoke detector / hazardous gas detector, deflagration panels and external ventilation.

Given low current charge/discharge usage patterns, cabinet climate controls, and our monitoring, we operate packs well below their temperature limits with only passive cooling. We have been operating the liquid-controlled Honda Clarity battery in this way for years.

Open Mesh Cabinet Level

Each cabinet is greater than 50% open ventilation porosity, mitigating deflagration risks, with site level IR/heat detectors overlooking the cabinets.

Given low current charge/discharge usage patterns, cabinet climate controls, and our monitoring, we operate packs well below their temperature limits with minimal liquid cooling.

B2U EPS System Safety Features and Procedures: Project Design & Operation

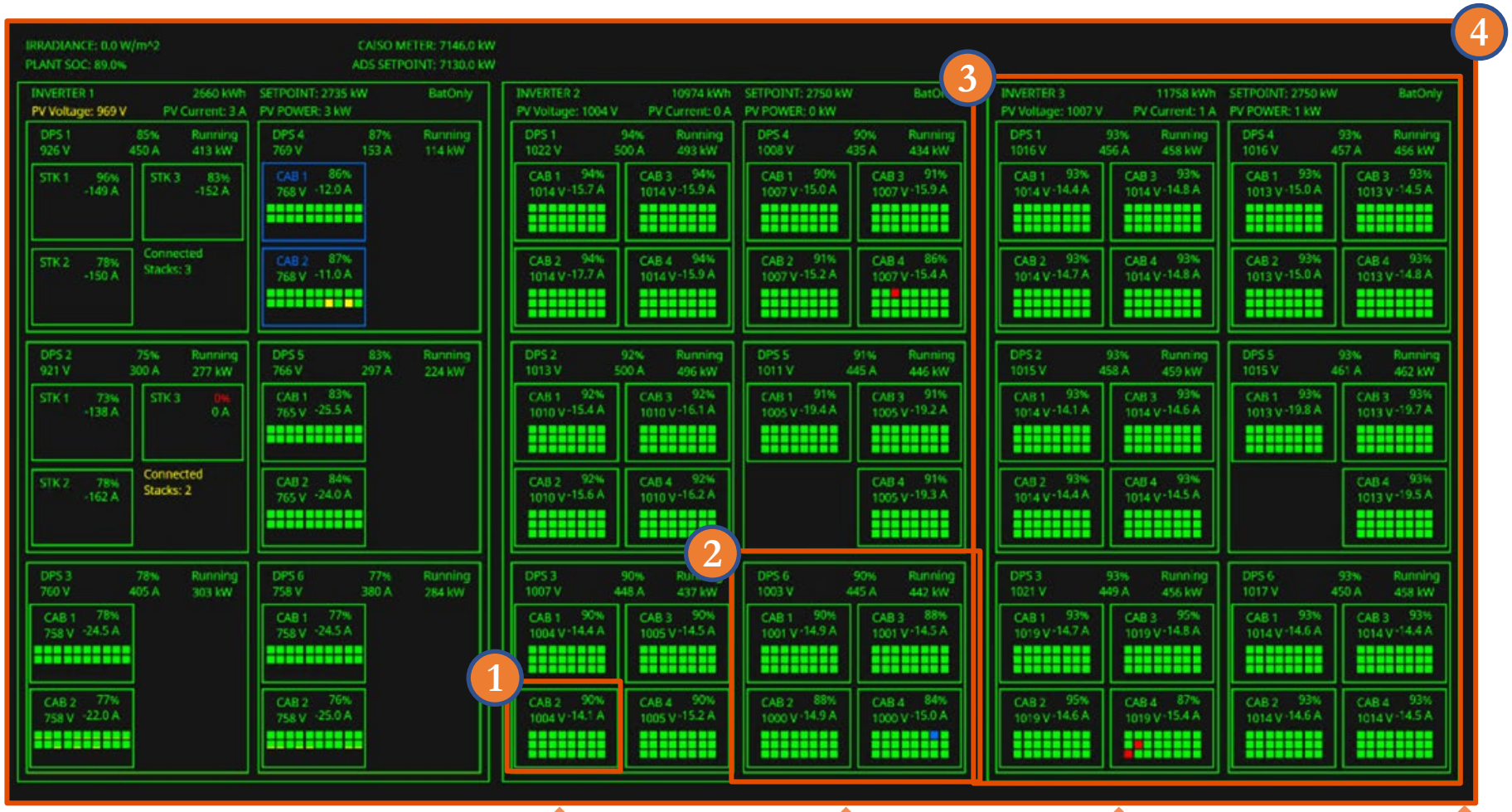
B2U's SEPV Sierra facility in Lancaster, CA (Operational since April 2020)

B2U's SEPV Cuyama facility in Santa Barbara County, CA (Operational since Nov 2023)

B2U has the most operational expertise and experience repurposing EV batteries, and is the only company with grid-deployed systems

- Zero safety incidents since initiating repurposing operations in 2020, with 2,000 EV batteries (40MWh) from Honda, Nissan, Ford, Tesla, and GM now in use.
- In addition to B2U's operational expertise, B2U's team has a long history of project design and development and understands the importance of proper project design, siting, permitting, and certification
- All projects are permitted through appropriate AHJs achieving UL9540 certification required for Energy Storage Systems, and all components of EPS ESS receive UL certification conducted by a Nationally Recognized Testing Lab (NRTL)
- UL9540 certification includes UL9540A fire testing

B2U EPS System Safety Features and Procedures: Real Time Battery Monitoring



B2U's EPS software monitors real time data of each battery's cell voltages, module temperatures, and pack current. Guardrails are set at levels within each battery's operational specifications.

If a guardrail parameter is exceeded, the EPS software automatically disconnects the battery from the system.

Solid square in each cabinet represent an EV battery; green (■) indicates the battery is connected; red (■) indicates an error

Alerts built into system notify users of faults exceeded settings; most faults are cleared automatically

1 **24 packs per Cabinet**

2 **4 Cabinets per DC-DC Converter**

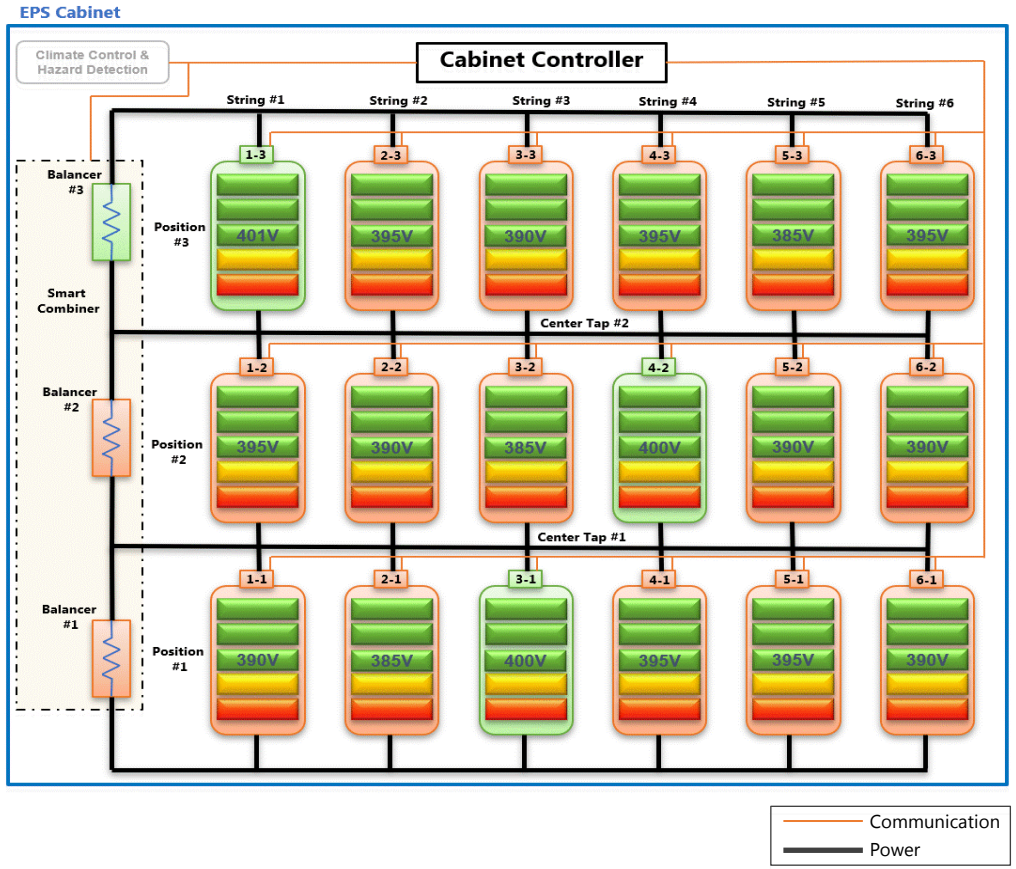
3 **6 DC-DC Converters per Inverter**

4 **3 Inverters in operation**

B2U EPS System Safety Features and Procedures: Real Time Battery Monitoring

- Real time Battery Monitoring
  - B2U's EPS software monitors each battery pack's cell voltage, SOC, temperature, and current in real time, with guardrails for each parameter. If a guardrail parameter is exceeded, the battery is automatically disconnected from the system without significantly impacting cabinet or system performance.

Illustrative EPS Cabinet with 3 batteries in series, 6 strings in parallel



EPS Cabinet Controller Functionality Enabled by Real Time Monitoring

- Packs reaching the maximum cell voltage, cell temp or SOC guardrail parameters will be disconnected, allowing the other packs in the system to fully charge
- Before disconnecting packs, charge current is reduced as needed to stay below the maximum programmed pack current
- Packs disconnect when reaching low end voltage parameters, down to a programmed minimum number of connected strings
- Enables packs with different capacities to charge and discharge efficiently, where weaker or non-performing batteries don't restrict performance of stronger batteries

B2U's EPS energy storage system mitigates the risks of repurposing EV batteries.

- **B2U's approach to EV battery repurposing mitigates risk through our large-scale storage system operations and permitting**
  - **Operational Expertise and Safety Focus:** B2U has the most experience repurposing EV batteries with the only grid-connected large-scale facilities in operation
  - **Zero safety incidents** in four years of operation with ~ 2,000 EV batteries deployed
  - **Project Siting:** Batteries are deployed at sites which are controlled and operated by B2U personnel, not in buildings where people live or work, mitigating risks to health & safety
  - **Permitting and Certification:**
    - All projects are permitted through AHJs with UL9540 certification for Energy Storage Systems among many standards required by permitting authorities
    - Fire testing under UL9540A included in UL9540 test protocol
    - All EPS ESS components within the UL9540 certified system must receive UL certification, which is conducted by a Nationally Recognized Testing Lab (NRTL)
    - NFPA 855 requirements applied
- **EV Pack Level – B2U's technology preserves and utilizes the built-in safety features of the EV pack**
  - **EV pack Deployment:** Full pack deployment avoids the risks associated with disassembling and reassembling EV packs
  - **Structural Safety:** the structural attributes of EV battery pack road-rated enclosures provide inherent fire risk mitigation, isolation, and separation characteristics
  - **Real Time Monitoring and Control:** The built-in BMS provides a first level of monitoring and control of cell voltages, current and temperatures and shuts down any of these components that exceed safety parameters
- **Cabinet Level – Each cabinet isolates, monitors, and controls each individual EV pack in a climate-controlled environment**
  - **Enclosed or Open Cabinet Design based on Battery and System Specs:**
    - Enclosed Climate Control Each cabinet is climate controlled with an HVAC system as well as a smoke detector / hazardous gas detector
    - Open Mesh Climate Control: Each cabinet is climate controlled with a small water chiller as Heat (IR) site level overwatch
  - **Full Isolation:** EPS system isolates each pack; packs can safely be connected or disconnected
  - **Real Time Battery Monitoring:** B2U's EPS software monitors real time data of each battery's cell voltages, module temperatures, pack current, SOC, and DTCs
  - **Strict Safety Guardrails:** guardrails for voltage, current, and temperature are set tighter at each level than the battery's operational specifications – any battery that exceeds those parameters is disconnected that battery from the system if those guardrails are exceeded
- **Plant Level -- Redundant monitoring and control is provided at the plant level**
  - **Plant Operational Guardrails:** performance parameters are monitored at the plant level and if any parameter is exceeded at any level (Inverter, DC-DC converter, Cabinet, Pack Interface or Pack BMS) the EPS software automatically shuts down that component
  - **Failsafe Communication:** communication between the battery packs, pack interfaces, cabinet controllers, power electronics and SCADA are all monitored -- if communications are lost, the upstream systems will time out and begin a failsafe shutdown