

## Open Technology Standard – Extendable Battery Framework™ (EBF)

- Comprehensive suite of technologies
  - Charge Node™ self-contained intelligent module with internal BMS and isolation
  - Charge Mesh™ resilient, on-demand configurable power system architecture
  - Secure device-linked digital twin NFTs with enforceable control authority

## EBF High Voltage Charge Node™ Module Specification – OPEN STANDARD, ROYALTY FREE

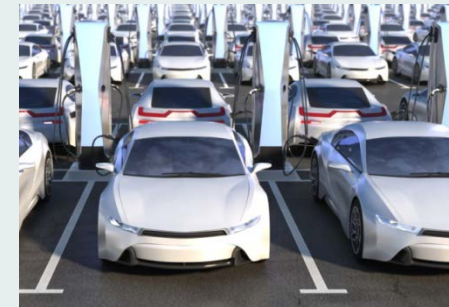
- Several sizes and voltages
- Safety – internal relays, series-only connections, precise SOC/SOH - **prevents thermal runaway**
- Security – use control and authentication through digital twin NFTs

## EBF Diversified Ledger Architecture

- Multiple ledgers in separate cross-referenced domains
- Use Control – digital twin NFTs linked with modules and vehicles

## ModBatt business model – ModBatt is a technology and transactions company, NOT a manufacturer

- Convenience fees on transactions (ModBatt System)



## Open Standard based on ModBatt proprietary IP

- **Royalty free** to manufacturers of certified batteries and vehicles
- Administered by **Safe Battery Alliance** – 501(c)(6) Nonprofit

## Charge Mesh™ on-demand configurable resilient modularity

- Charge Node™ Module Physical Specification
- Charge Node™ Module Electrical Specification – isolation, BMS, communications, security, use control through digital twin NFTs
- Supports dissimilar Charge Nodes™ in parallel

## Full ecosystem support

- Open hardware and software standard – Extendable Battery Framework™
- Use control – Diversified Ledger Architecture, digital twin NFTs
- Full lifecycle management with integrated regulatory oversight and reporting
- ModBatt (direct and licensed) IT infrastructure for transactions

Example  
Charge Node™

800V

3KWh

40KW peak

200 x 21700 cells

3" x 9" x 15"

35 lbs

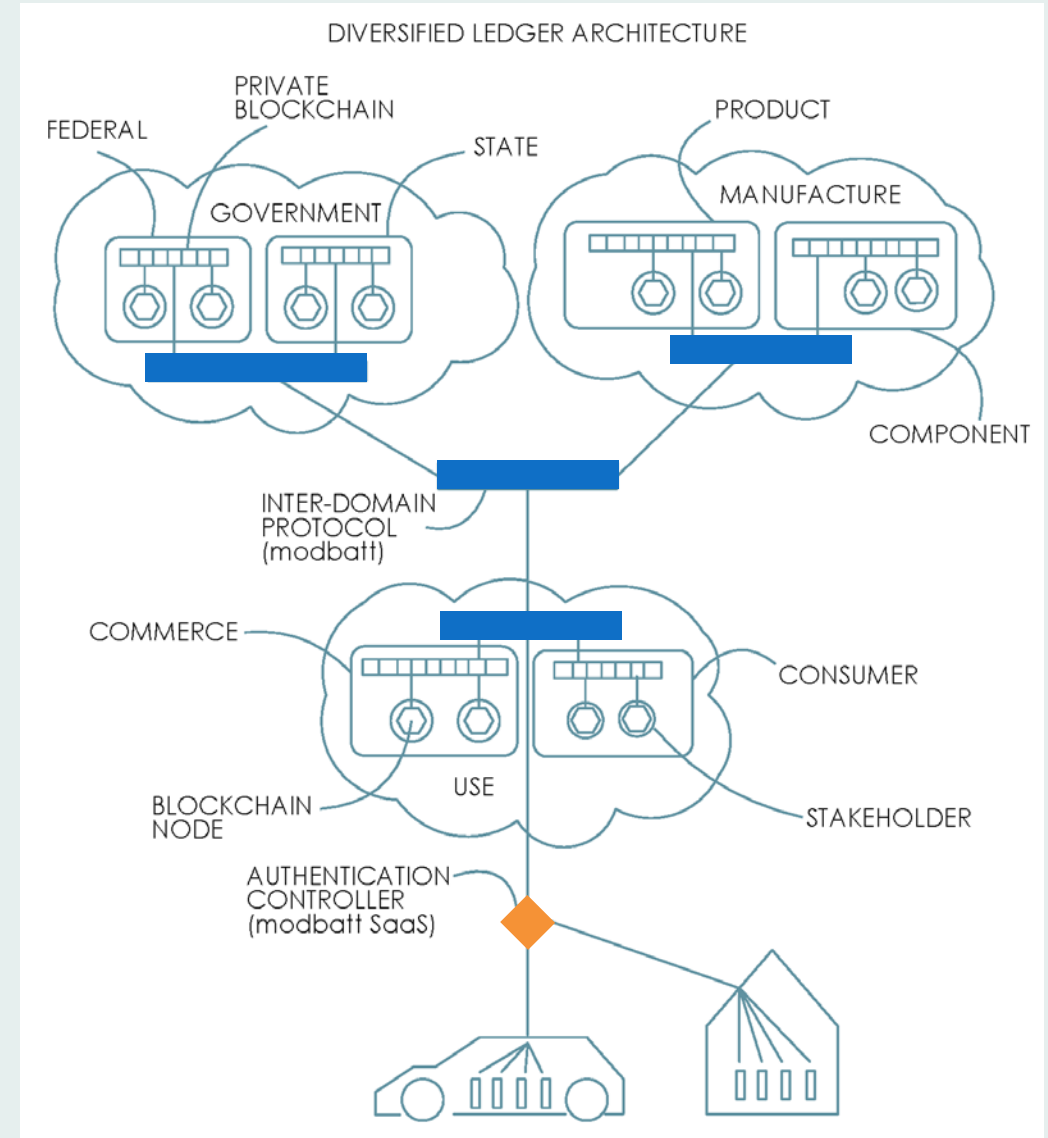
Motorcycle: 1-5

Car: 5-30

Truck: 50-100+

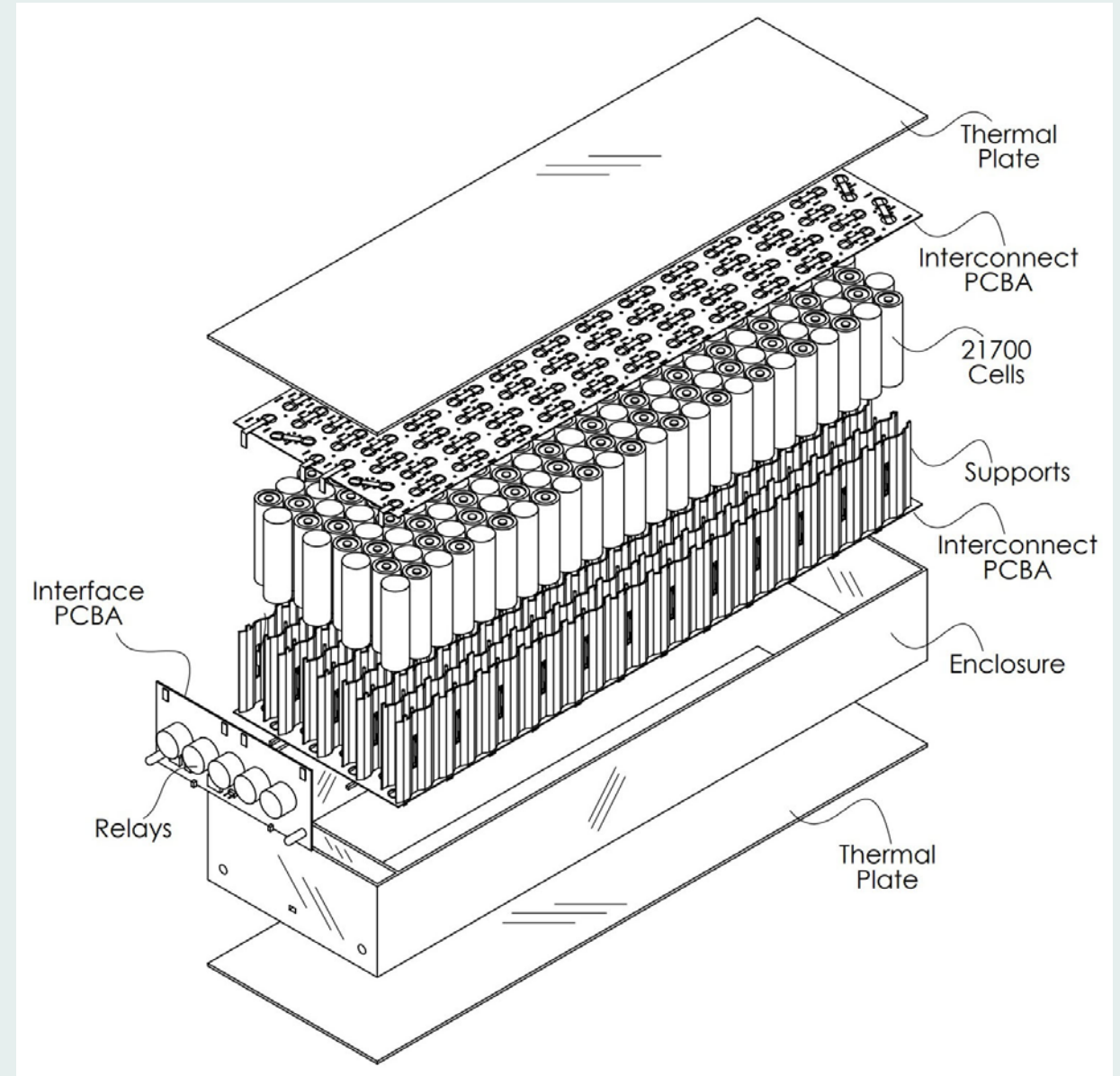
- **ModBatt IT infrastructure for battery transactions**
- Multiple Proof of Stake private blockchains
- Cross-referenced domains with secure protocols ■
- Digital twin NFTs securely linked with modules and vehicles (patents pending)
- Active use event enforcement mechanisms through authentication controllers ◆
- Open source based with proprietary layers
- Integration with existing systems
- Gradual transition
- Multi-domain chain of custody enforcement

## Diversified Ledger Architecture



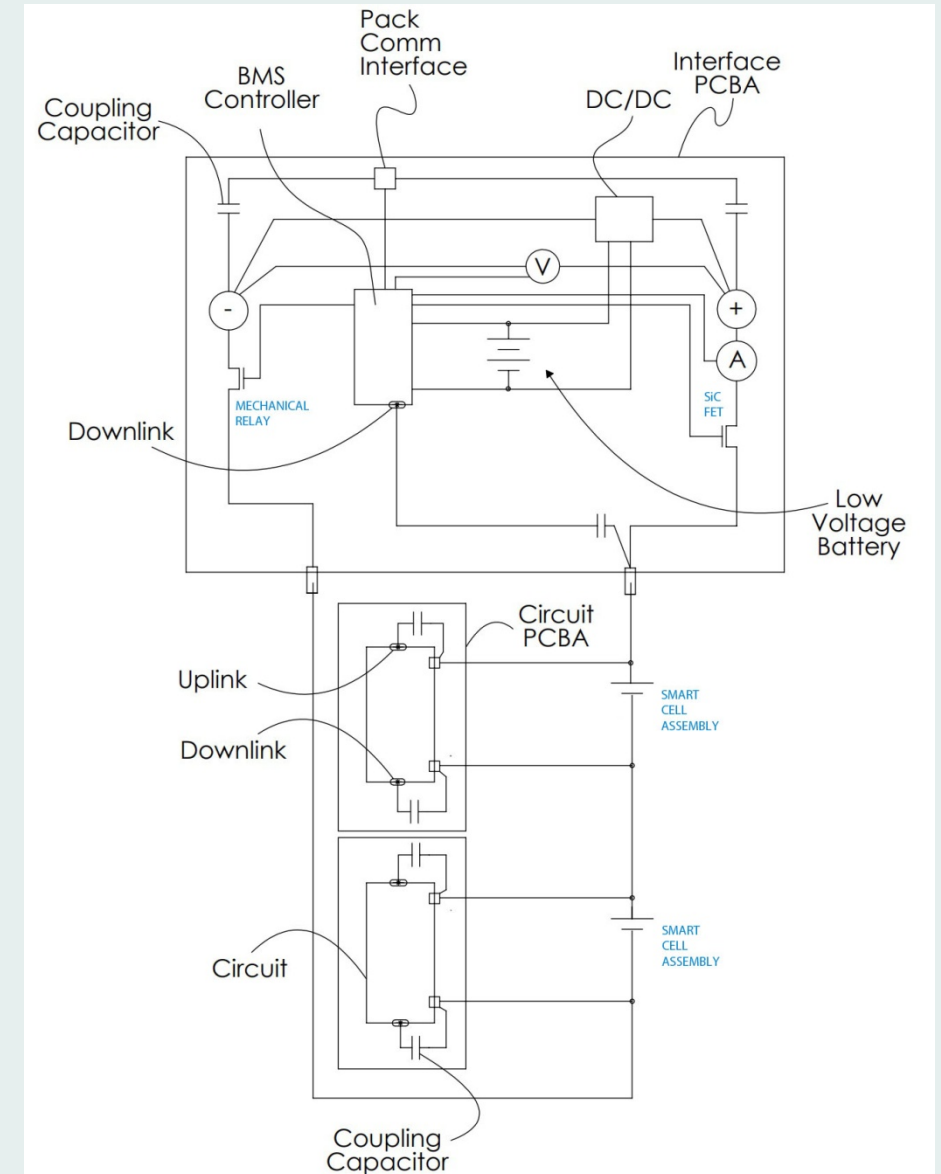
## Charge Node™ Mechanical Specification

- Series connections only – **no uncontrolled or unmonitored current** prevents thermal runaway
- Low impedance interconnect – no need for fusible links
- Thermally conductive encapsulation
- Structurally robust
- Environmentally sealed
- All cells equally coupled to both thermal plates
- Facilitates external liquid cooling
- Multiple form factors/voltages



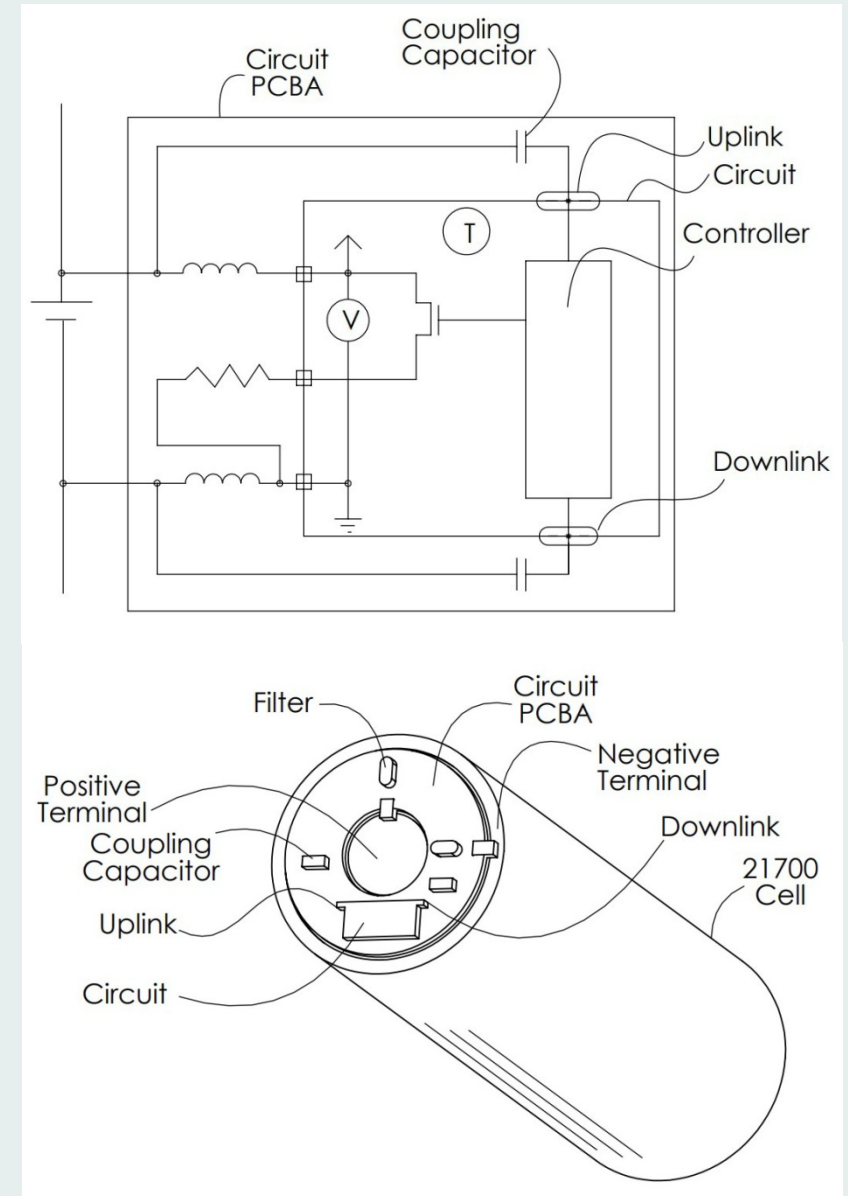
## Charge Node™ Electrical Specification

- Series connections only – no uncontrolled or unmonitored current
- Relays on both terminals
- Mechanical relay on one terminal – galvanic isolation
- SiCFET on other terminal – fast response
- Smart cell assemblies – V and T monitoring each cell, integrated balancing and heating
- Powerline Communications (PLC) between cells and BMS controller
- Powerline Communications (PLC) between modules and pack controller
- Secure protocols, unique module ID



## Charge Node™ Smart Cell Circuit

- Compatible with all cell types and chemistries
- Temperature and voltage monitoring at each cell
- AC coupled transverse mode Powerline Communications (PLC) – BTLE transceivers
- Integrated balancing and heating (transistor in linear mode or resistor, heatsink to cell)
- Robust communications protocols
- Low cost IC using common IP blocks
- Unique ID for full lifecycle tracking and authentication



# Appendix A

## List of Filed IP

1. US17/086,865 PCT/US21/50518 **HIGH VOLTAGE BATTERY MODULE WITH SERIES CONNECTED CELLS AND INTERNAL RELAYS** Filed 02-NOV-2020 \*module with series connected cells and relays\* - **ALLOWED 5/19/22**
2. US17/141,125 PCT/US21/53798 **BATTERY MODULE WITH SERIES CONNECTED CELLS, INTERNAL RELAYS AND INTERNAL BATTERY MANAGEMENT SYSTEM** Filed 04-JAN-2021 \*cell monitoring/conditioning circuit, PCBAs, methods\*
3. US17/172,613 **APPARATUS AND METHODS FOR REMOVABLE BATTERY MODULE WITH INTERNAL RELAY AND INTERNAL CONTROLLER** Filed 10-FEB-2021 \*authentication methods and circuits\*
4. US17/182,072 PCT/US21/55047 **BATTERY MODULE WITH SERIES CONNECTED CELLS, INTERNAL RELAYS AND INTERNAL BATTERY MANAGEMENT SYSTEM** Filed 22-FEB-2021 (CIP) \*AC coupled comms and methods\*
5. US17/218,854 PCT/US21/54434 **APPARATUS AND METHODS FOR REMOVABLE BATTERY MODULE WITH INTERNAL RELAY AND INTERNAL CONTROLLER** Filed 31-MAR-2021 \*system, pack and module controllers, blockchain\*
6. US17/317,403 PCT/US21/55813 **APPARATUS AND METHODS FOR MANAGEMENT OF CONTROLLED OBJECTS** Filed 11-MAY-2021 \*multi-domain management of controlled objects, NFT/blockchain\*
7. US17/528,903 PCT/US21/60860 **ELECTRICAL POWER SYSTEM WITH REMOVABLE BATTERY MODULES** Filed 17-NOV-2021 \*dissimilar modules in parallel\*
8. US17/710,759 PCT/US22/24797 **APPARATUS AND METHODS FOR MANAGEMENT OF CONTROLLED OBJECTS** Filed 31-MAR-2022 \*linking of identifiable records, authorizer device pairings\*
9. US17/828989 PCT/US22/xxx **HIGH VOLTAGE BATTERY MODULE WITH SERIES CONNECTED CELLS AND INTERNAL RELAYS** Filed 31-May-2022 \*dissimilar relays, PLC control bus, linear and pwm modes\*