BUILDING AMERICA'S ELECTRIFICATION CAPABILITIES

OUR DIFFERENTIATED APPROACH

Re:Build Manufacturing offers a unique combination of vertical integration, U.S.-based manufacturing, and technical depth that addresses the most critical challenges facing electrification programs.

END-TO-END VERTICAL INTEGRATION

- Single-source accountability from concept validation through full-rate production
- Vertically integrated capabilities: battery packs, BMS, power electronics, wire harnesses, thermal systems
- Fewer handoffs, faster decisions, and reduced integration risks

DOMESTIC ENERGY SOLUTIONS

- U.S.-based battery pack design, manufacturing, and BMS development
- ITAR-compliant, AS9100-certified, and cyber-secure manufacturing capabilities
- Domestic supply chain with vetted battery cell partners

RAPID DEVELOPMENT TO PRODUCTION SCALE

- Manufacturability for Design™ (MFD) embedded from concept to production release
- Flexible production infrastructure supporting prototype through high-volume manufacturing
- Integrated engineering and manufacturing under one roof for faster production readiness

MULTI-INDUSTRY EXPERTISE

- Data center and backup power
- Industrial and consumer EVs
- Energy storage and grid-scale systems
- Industrial equipment electrification
- Charging infrastructure
- Marine and aerospace electrification

EARLY-STAGE CONCEPT DEVELOPMENT & SYSTEM ENGINEERING

PROGRAM DEVELOPMENT & SYSTEM ARCHITECTURE

TECHNOLOGY ROADMAPPING & FEASIBILITY

- Product strategy and technology roadmapping
- Electrification system concept development studies
- Performance requirements, risk, and trade-off evaluation
- Economic feasibility and production cost modeling
- Competitive benchmarking and electrified market analysis
- Technology gap identification and assessment

PROOF-OF-CONCEPT DEVELOPMENT

- Rapid prototyping and concept validation
- Proof-of-concept prototype builds
- Trade studies: cell, chemistry, cooling, architecture
- Cross-functional requirements validation workshops
- Functional demonstrations and testing

SYSTEM ARCHITECTURE DESIGN

- Systems engineering and electrification architecture development
- Battery architecture: configuration, topology, pack design
- Requirements analysis and specification development
- High-voltage power distribution and electronics architecture
- Charging system design and infrastructure planning
- Thermal management strategies: liquid, air, passive
- CAN, Ethernet, and communication network architecture
- Interface control documentation and subsystem specification

INTEGRATION PLANNING

- Make-vs-buy analysis using in-house capabilities
- Supply chain architecture, risk, and sourcing strategy
- Manufacturing strategy aligned with volume targets
- Production cost modeling and design-to-cost analysis
- Preliminary design reviews with integrated teams

CUSTOM ENERGY STORAGE & POWER CONVERSION SOLUTIONS

POWER ELECTRONICS & BATTERY SYSTEMS

BATTERY PACK DESIGN & ENGINEERING

- Lithium-ion battery pack mechanical and structural design
- Cell selection and configuration optimization
- Energy density and power-to-weight optimization
- Structural design for crash, vibration, shock
- IP-rated enclosure design and environmental sealing
- High-voltage electrical architecture and power distribution
- Battery pack and thermal management integration

BATTERY MANAGEMENT SYSTEMS (BMS)

- U.S.-based BMS design and development
- Real-time SOC and SOH estimation
- Cell balancing: passive and active strategies
- BMS design documentation and specifications
- Safety monitoring, fault detection, protection logic
- Communication protocols: CAN, Modbus, Ethernet
- Functional safety compliance (ISO 26262)
- Configurable BMS architectures for diverse chemistries

ENERGY STORAGE SYSTEMS

- Stationary energy storage for commercial, utility-scale
- Grid-scale battery system engineering and integration
- Microgrid and renewable energy storage system design
- Peak shaving, demand response, load management

POWER ELECTRONICS DESIGN

- High-voltage power distribution architecture and design
- DC-DC converter design and optimization
- Inverter and motor drive system development
- On-board charger design and integration
- AC/DC battery charging system design
- Motor drive systems integration and optimization
- High-voltage power distribution circuit design
- EMI/EMC-compliant power electronics layout and shielding

CHARGING INFRASTRUCTURE

- Level 2 and DC fast charging integration
- Charging system connectivity and smart grid enablement
- Wireless charging system design and integration
- Vehicle-to-grid (V2G) capabilities
- Charging infrastructure planning

ADVANCED COOLING & PROTECTION SYSTEMS

THERMAL MANAGEMENT & SAFETY ENGINEERING

THERMAL SYSTEM DESIGN

- Thermal management and cooling system design
- Battery thermal management architecture and design
- Active cooling: cold plates, channels, air
- Passive cooling using thermal interface materials
- Heat exchanger design and system integration
- Thermal interface materials optimization
- Phase-change materials for peak thermal buffering

THERMAL ANALYSIS & SIMULATION

- Multi-physics simulation: thermal, electrical, structural modeling
- Computational fluid dynamics (CFD) analysis
- Transient thermal analysis under real-world conditions
- Thermal runaway modeling and mitigation strategies
- Hot spot identification and mitigation
- Thermal validation testing and simulation correlation

SAFETY SYSTEMS ENGINEERING

- High-voltage safety system design
- Isolation monitoring and ground fault detection
- Overcurrent and short-circuit protection
- Thermal runaway detection and suppression
- Fire suppression integration and venting design
- High-voltage safety system validation
- Emergency disconnect system design

ENVIRONMENTAL PROTECTION

- IP67/IP68 environmental sealing design and validation
- Vibration isolation and shock protection
- Corrosion protection strategies
- Humidity and moisture management
- Dust and particle ingress prevention

INTELLIGENT CONTROL & CONNECTIVITY

ELECTRONICS, EMBEDDED SYSTEMS & SOFTWARE

EMBEDDED SOFTWARE DEVELOPMENT

- RTOS and embedded operating system development
- Battery management algorithms: SOC, SOH, balancing
- Motor control software development
- Energy management system software development
- Diagnostic and fault management systems
- Software calibration, commissioning, OTA updates

CONTROL SYSTEMS

- Safety-critical control system design and integration
- Power management controller design and development
- Motor and inverter control system development
- Thermal management and closed-loop system simulation
- Charging control system design and integration
- Battery management and control strategy verification

PRINTED CIRCUIT BOARD (PCB) DESIGN

- High-current, high-voltage PCB design for power electronics
- Power electronics PCB design and conversion expertise
- 2–24+ layer PCBs with controlled impedance
- High-speed, FPGA, impedance-matched PCB designs
- Flex and rigid-flex circuit design
- Advanced PCB features: vias, HDI, microvias

COMMUNICATION & CONNECTIVITY

- CAN bus architecture, diagnostics, and protocols
- Automotive and industrial Ethernet integration
- Wireless communication: WiFi, Bluetooth, cellular
- Communication and system network architecture
- Cloud-connected IoT for telemetry and analytics
- Diagnostic and monitoring system integration
- Embedded security and cybersecurity for electrification systems

SENSOR INTEGRATION & MONITORING

- High-voltage sensor integration and calibration
- Temperature monitoring system design
- Pressure and flow sensing for thermal optimization
- Torque and speed measurement systems
- Current and voltage monitoring and testing
- Data acquisition and logging systems

USER INTERFACES

- Industrial HMI design for mobility systems
- Display systems and touchscreen interface design
- Full-stack mobile and web app development
- Custom dashboards and telemetry systems
- UX design for industrial mobility products

SCALABLE ELECTRIFICATION MANUFACTURING

ADVANCED MANUFACTURING & PRODUCTION

PROCESS DEVELOPMENT

- Manufacturing process flow development
- Battery assembly and cell integration procedures
- Custom equipment and fixture fabrication
- Assembly and integration procedures
- Testing, hi-pot, and functional test protocols
- Critical process parameter definition
- Process capability and validation studies
- Quality control plan development

BATTERY PACK MANUFACTURING

- Cell-to-module assembly and electrical interconnection
- Module-to-pack mechanical and electrical integration
- Laser welding, ultrasonic, and wire bonding
- Wire bonding for electrical connections
- Busbar installation and torque-controlled fastening
- Battery handling and material flow systems
- Cleanroom battery assembly capabilities
- Automated assembly with robotics and conveyors

POWER ELECTRONICS ASSEMBLY

- Inverter and converter production
- Active and passive thermal management integration
- Conformal coating application
- Power electronics and battery system validation

WIRE HARNESS MANUFACTURING

- Custom wire harness design and manufacturing
- High-voltage cable design and assembly
- Automated wire cutting and stripping
- Crimping and terminal insertion processes
- Continuity and hi-pot testing
- Overmolding and connector assembly
- Diverse harness types and configurations

PRECISION MACHINING & FABRICATION

- CNC machining for enclosures and structures
- Sheet metal fabrication: forming, punching, bending
- Aluminum, steel welding: MIG, TIG, robotic
- Waterjet and laser cutting for complex geometries
- Custom component and subsystem fabrication

PRODUCTION INFRASTRUCTURE

- Custom assembly equipment and tooling design
- MES implementation for scheduling and data capture
- Lot traceability and digital thread integration
- Electrical testing and end-of-line equipment
- Pressure testing up to 45,000 PSIG
- Custom equipment procurement and supplier management
- End-to-end facility layout using Lean methodologies

COMPREHENSIVE VERIFICATION & VALIDATION

TESTING, VALIDATION & COMPLIANCE

DESIGN VERIFICATION TESTING

- Prototype builds and first-article testing
- Performance analysis and efficiency optimization
- Simulation and thermal validation testing
- System load, efficiency, and range testing
- Electrical testing: charge, impedance, protection, lifecycle
- Mechanical testing: vibration, shock, impact, environment

SYSTEM-LEVEL VALIDATION

- Factory acceptance testing (FAT)
- Site acceptance testing (SAT)
- Performance validation in operational conditions
- System functional and performance testing
- System reliability and durability testing
- Environmental testing (temperature, humidity, vibration)

SAFETY & COMPLIANCE TESTING

- High-voltage safety testing
- Insulation resistance and dielectric strength testing
- Ground continuity verification
- Safety, electromagnetic compatibility, and compliance verification
- Automotive/industry standards compliance verification
- Thermal abuse testing
- Mechanical abuse testing (crush, penetration, drop)

ENVIRONMENTAL TESTING

- Temperature cycling and thermal shock
- Vibration testing per automotive standards
- Mechanical shock testing
- Salt spray and corrosion testing
- Ingress protection (IP) testing
- Altitude and pressure testing

ELECTROMAGNETIC COMPATIBILITY (EMC)

- Radiated and conducted emissions testing
- Immunity testing
- Electrostatic discharge (ESD) testing
- EMC-compliant design verification

STANDARDS COMPLIANCE

- ISO 9001, IATF 16949 compliance
- UL, CE, FCC certifications
- Automotive standards (ISO 26262, J2929, etc.)
- Battery safety standards (UL 2580, UN 38.3)
- Charging standards (SAE J1772, CCS, CHAdeMO)

OPERATIONAL EXCELLENCE THROUGHOUT PRODUCTION

QUALITY SYSTEMS & CONTINUOUS IMPROVEMENT

FULL-RATE PRODUCTION

- Target production volume execution
- Customer delivery schedules and JIT requirements
- Supply chain coordination and battery cell sourcing
- Quality control and high-voltage safety monitoring
- Preventive maintenance and calibration programs

CONTINUOUS IMPROVEMENT

- Real-time performance and efficiency monitoring
- Data-driven process analytics and statistical process control
- Predictive maintenance and equipment uptime implementation
- Automated process adjustments and closed-loop control
- Root cause analysis feedback loops
- Lean manufacturing and Six Sigma tools
- Manufacturing system optimization initiatives
- Best practice implementation
- Customer support and field performance analysis

TRACEABILITY & DOCUMENTATION

- Component and cell lot traceability
- Serial number tracking and genealogy
- Manufacturing execution system (MES)
- Electronic batch records
- Material certifications and certificates of conformance
- Production readiness and design transfer

PRODUCTION RAMP & SCALING

- Incremental production scaling
- Workforce training and certification expansion
- Process cycle time optimization
- Quality yield stabilization and defect reduction
- Automated testing and inspection implementation
- Target production rate achievement

QUALITY MANAGEMENT SYSTEMS

- ISO 9001:2015 certified operations
- IATF 16949 automotive quality
- Quality system and safety program implementation
- Statistical process control (SPC)
- First-article inspection (FAI)
- Quality assurance validation

PRODUCTION CONTROL

- Standard operating procedures (SOPs)
- Work instructions and visual aids
- Operator training and certification
- Quality control plan execution
- In-process inspection and testing
- Final inspection and acceptance criteria