Electric Vehicle Test Solutions

NHR from ni

AC Grid
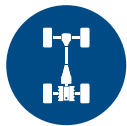*V2G, EV Load Testing, Peak Shaving, Grid Utility Test*

EV Charging
DC Fast Charging, Onboard Charger, EVSE

Battery
Drive Cycle, Life Cycle Performance, Charge/ Discharge, BMS Development

Powertrain
Battery Emulation, Motor Driver, Dynamometer, Alternator, Start-stop

Power Electronics
APM/DC-DC Converter, Inverter, In-vehicle Electronics

NH Research (NHR) provides Electric Vehicle (EV) test equipment and software for testing individual components and systems including battery modules/packs, electric powertrain, DC fast charging and power electronics (EVSE, APM, V2G and on-board chargers, etc.). NHR's EV test solutions include battery test systems, battery emulators, grid-simulators, AC/DC loads, AC/DC sources and test management software.

With the accelerated growth of transportation electrification, engineers must address new testing challenges. Voltage and power levels are transitioning from a traditional nominal 300/400VDC to 800/1000VDC and transients up to 1200V. Higher voltages permit faster charging and increase power transfer while reducing vehicle weight. These factors are driving development for higher performing batteries, drive-trains, power converters, inverters and faster chargers.
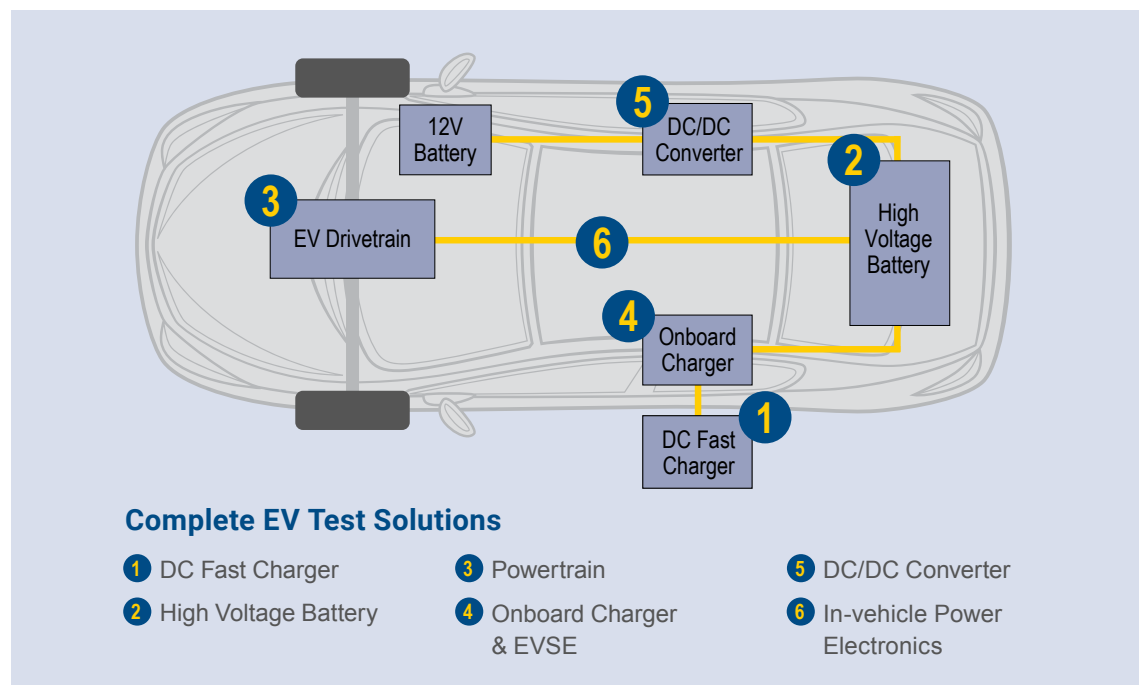
Today, customers desire test solutions with modular configurations, expandable power, integrated safety, wider operating envelopes, built-in measurements, and faster transient response-times for today's and tomorrow's products. NHR's advanced test solutions substantially reduce development and test time, reduce cost and increases energy efficiency.

"The NHR Advantage is scalability & flexibility. It's not an engineered solution; it's a COTS solution that allows for more use cases and makes a strong business case to purchase. When you factor in the value and excellent support from the company, it's an easy choice. We use the 9300 Series for testing in our powertrain application."
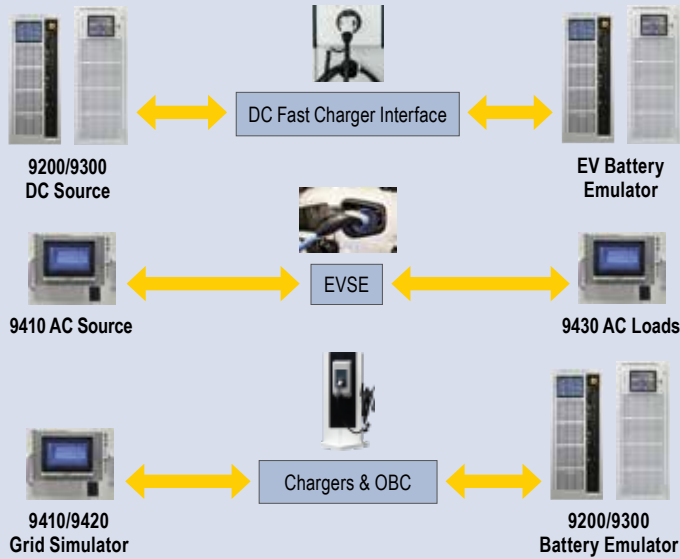
- E-mobility Subject Matter Expert, EV Industry

Figure 1: *Diagram of a typical EV electrical system.*

Complete EV Test Solutions

1. DC Fast Charger
2. High Voltage Battery
3. Powertrain
4. Onboard Charger & EVSE
5. DC/DC Converter
6. In-vehicle Power Electronics

NHR Electric Vehicle Test Equipment

EV CHARGING & UTILITY GRID

9200/9300 DC Source ↔ DC Fast Charger Interface ↔ **EV Battery Emulator**

9410 AC Source ↔ EVSE ↔ **9430 AC Loads**

9410/9420 Grid Simulator ↔ Chargers & OBC ↔ **9200/9300 Battery Emulator**

Fast Charger

NHR's bi-directional sources can emulate a fast charger or a high voltage battery that can accept fast charging with layered, built-in safety features.

- Battery emulation: sinks & sources to maintain voltage regulation
- Source mode (charge) emulates level 3DC chargers
- Regenerative DC load mode (discharge) > 90% energy efficiency

Bi-directional DC Source & Battery Emulation

- **9300 Series** - 100kW modules up to 2.4 MW, Dual range (600 V, 1200V)
- **9200 Series** - 12kW modules parallel up to 21 channels

Charger, V2G, ESS & Grid Tied Products

NHR's AC/DC Sources & Loads are ideal for testing EV chargers & the grid.

AC Source for testing inverters, V2G, ESS & grid-tied products

- **9410 Grid Sim/ 9420 AC Source** – 4 to 96 kW, programmable 1, 2, 3 phase

AC/DC Load to simulate any inductive, capacitive, resistive load

- **9430 Regenerative 4 Quadrant Load** - 4 to 96 kW, 2 x reactive power
- **9200/9300** - Bi-directional DC Power to simulate load & battery emulation

BATTERY MODULE/PACK

**9200/9300 Battery Test System** ↔ High Voltage Battery
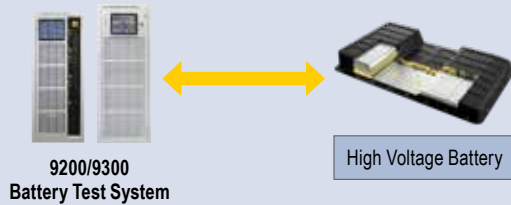
NHR's battery test systems are ideal for life/drive cycle & performance testing.

- Modular power configuration for traditional & modern EVs
- Fast transient capabilities
- Easy third-party integration & data management., optional software

High Performance Battery Cycler with fast transient speed

- **9300 Series** - 100kW modules up to 2.4 MW, Dual range (600 V, 1200V)
- **9200 Series** - 12kW modules parallel up to 21 channels

ELECTRIC POWERTRAIN – DRIVETRAIN, MOTOR, ALTERNATOR
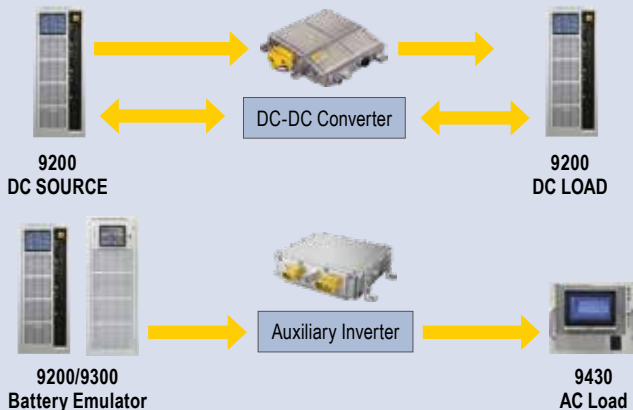

9200/9300 Battery Emulator ↔ Powertrain
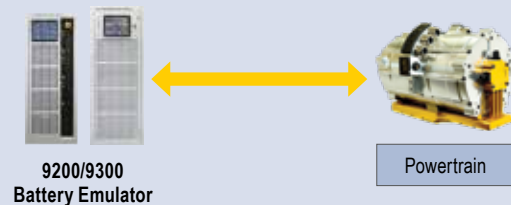
NHR's bi-directional approach provides speed to emulate real world conditions.

- Battery emulation sinks & sources to maintain voltage regulation
- Accepts back EMF and prevents safety hazards
- Isolated input and output paths eliminates single points of failure

Scalable Bi-directional DC Source with fast transient speed

- **9300 Series** - 100kW modules up to 2.4 MW, Dual range (600 V, 1200V)
- **9200 Series** - 12kW modules, parallel up to 21 channels

IN-VEHICLE POWER ELECTRONICS

9200 DC SOURCE ↔ DC-DC Converter ↔ **9200 DC LOAD**

9200/9300 Battery Emulator → Auxiliary Inverter → **9430 AC Load**

NHR offers AC-DC, DC-DC products for testing in-vehicle power electronics.

Bi-directional DC Source for Battery Emulation

- **9300 Series** - 100kW modules up to 2.4 MW, Dual range (600 V, 1200V)
- **9200 Series** - 12kW modules, parallel up to 21 channels

DC Load for transient & accessory load inrush simulation

- **9200/9300** Series - Regenerative DC load mode (discharge) > 90%

DC Power Source to provide high power with fast transient speed

- **9300 Series** - 100kW modules up to 2.4 MW, Dual range (600 V, 1200V)
- **9200 Series** - 12kW modules, parallel up to 21 channels

AC 4 Quadrant Load to simulate any inductive, capacitve or resistive load

- **9430 Regenerative 4 Quadrant Load** - 4 to 96 kW, 2 x reactive power

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