



**CAR Technologies LLC** is an industrial-scale, commercial testing, modeling, and engineering partner focused on the effective assessment, calibration, and implementation of vehicle electrification technologies and advanced energy storage applications.

### Capabilities:

CAR Tech provides a broad set of advanced battery testing and engineering services for hybrid and electric vehicles and stationary and motive energy storage applications. Capabilities include: testing, data analysis, and modeling services for:

- high-accuracy battery characterization,
- battery aging/life prediction,
- battery state estimation,
- battery management systems (BMS),
- warranty analysis/fault prediction,
- secondary use analysis,
- hybrid architectures/systems engineering  
other advanced modeling/calibration for EVs, PHEVs, HEVs, and grid-connected storage

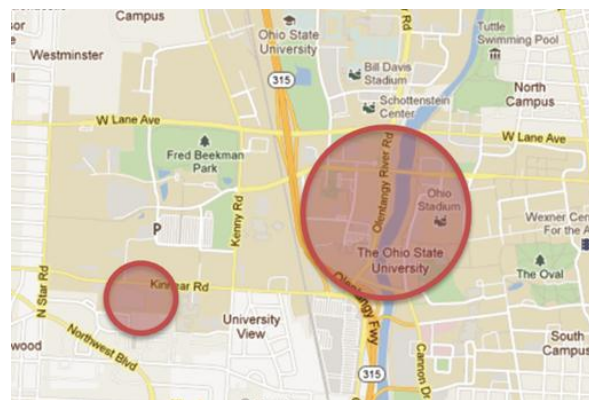


### Capacity/Facilities:

In 2011, CAR Technologies moved into new facilities at 1305 Kinnear Road, Columbus, OH

### Well Located


- down the street from the Ohio State University-Center for Automotive Research,
- across the street from the Ohio Supercomputing Center,
- next to the Ohio Nanotechnology and Advanced Materials Centers, and
- just ½ mile from the Edison Welding Institute



CAR Tech's unique location close to Ohio State University also offers preferred access to passenger and commercial vehicle dynamometers, the Ohio Supercomputing Center (for advanced modeling and simulation), the largest independent proving ground in the mid-west, and other unique testing and engineering resources.

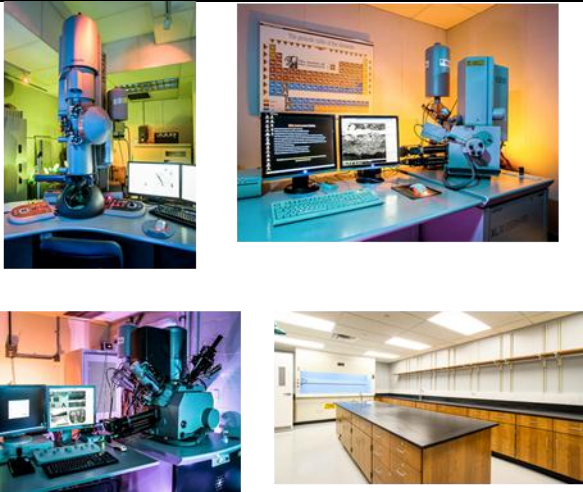
Target users of this space include passenger and commercial vehicle OEMs, advanced battery OEMs, hybrid and electric vehicle engineering services firms, utilities/stationary energy storage systems integrators, strategic vehicle and battery system component suppliers, and other vehicle electrification industry players.

### Battery Cell, Module and Pack Testing Facilities

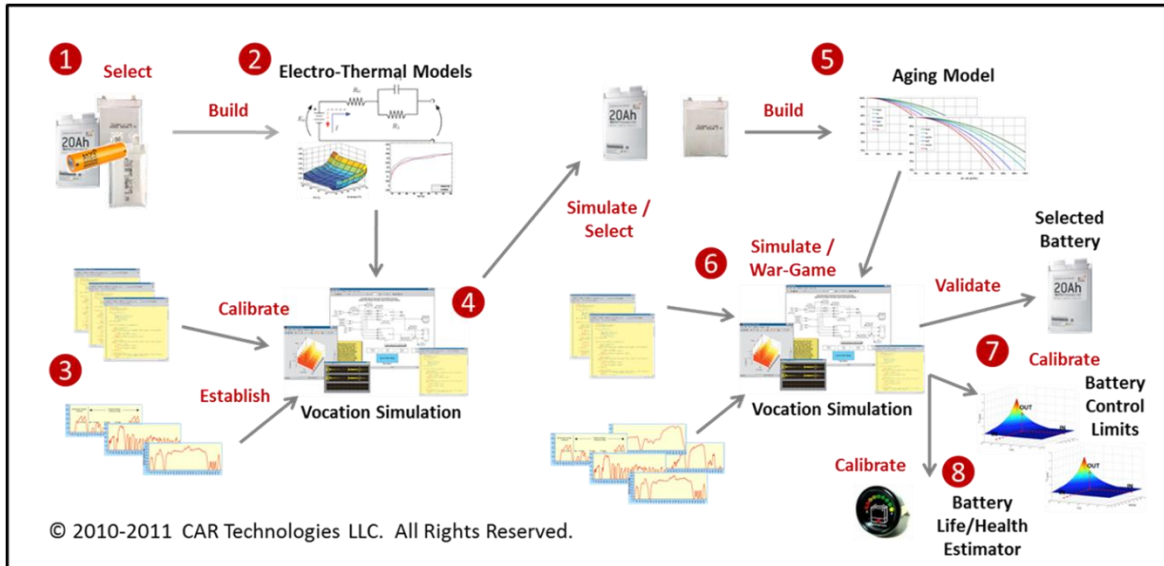
<b>CAR Technologies' advanced battery test lab includes:</b>	
<ul style="list-style-type: none"> <li>• 116 channels of battery cell cycling equipment (8V charge, 5V discharge, 400A),</li> <li>• 4 channels of 125 kW module / pack cycling,</li> <li>• 4 channels of 125 kW charge / 170 kW discharge module / pack cycling,</li> <li>• 8 - 32 cu. ft. environmental chambers and 2 - 64 cu. ft. environmental chambers.</li> <li>• 5 High Temperature WaterBaths</li> <li>• Wet lab for PbA and electrolytes</li> </ul>	
<p><i>Additional testing and engineering facilities (test cells) can be added in 90-120 days versus the 9-12 months lead-times currently experienced in the industry.</i></p>	

The facilities are fully supported with a Battery Research Director, Battery Lab Manager, Battery Engineers, and Battery Technicians as required.

### Battery Cell Failure Mode Analysis Facilities

<b>CAR Technologies' electron microscopy and analysis facility includes:</b>	
<ul style="list-style-type: none"> <li>• Scanning electron microscopy w/ EDX</li> <li>• X-ray diffraction and analysis</li> <li>• Light Microscopy</li> <li>• Modeling and characterization of energy storage cells at different scale lengths (micro, nano, molecular)</li> <li>• Guest offices for short &amp; long term visiting researchers</li> <li>• Dedicated Sample Preparation Facilities for metals, ceramics, nanomaterials and biomaterials</li> </ul>	
<p><i>** Capabilities provided by the Center for Electron Microscopy and Analysis at 1305 Kinnear Road.</i></p>	

With over 25 years of advanced powertrain architectures and controls experience, CAR Technologies' automotive and energy storage expertise makes us a valuable testing and engineering partner across the full spectrum of OEM battery validation and engineering processes, whether you are validating the basic battery and battery pack configuration BEFORE designs are finalized, developing essential data to FINE-TUNE the BMS and battery control strategies, or ENABLING a foundation for providing in-vehicle battery life/health prognostics.



**CAR Technologies is focused on developing and delivering projects in the following areas:**

- Standards-based and Custom Battery Testing Services
- Battery Modeling / Age Modeling
- Materials Characterization and Modeling
- BMS H/W, S/W and Algorithm Development
- Battery and Cell Warranty/FMEA Analysis
- Energy Storage (Battery and Ultracapacitor) Module Design and Prototyping
- Program Management (University Research)

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