

YOUR GUIDE TO UNLOCKING ELECTRIFICATION IN NICHE MARKETS

Comprehensive Vanguard™
battery solutions plus
your expertise can make
transitions seamless
and easy.

VANGUARD™



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1. THE ELECTRIFICATION OPPORTUNITY

LET'S GIVE NICHE MARKETS A NEW WAY TO POWER UP.

Here at Vanguard, we're committed to equipping our Technology Partners (Tech Partners) with the knowledge and tools necessary to drive the electrification of outdoor power equipment using Vanguard solutions. The demand for sustainable products is rapidly increasing, driven by environmental awareness, regulatory pressures, evolving consumer preferences and more.

This surge in demand presents a significant opportunity for original equipment manufacturers (OEMs), particularly those in niche markets. Electrification offers them and their customers a compelling pathway to reduce emissions and lower operational costs while enhancing equipment performance. You can play a vital role in their success.

As integrators and channel partners for Vanguard Commercial Electrification solutions, you'd have direct access to our latest products and serve as trusted advisors to OEMs, guiding them through the electrification process. **You can help transform their electrification visions into reality.**



The transformational shift in how we design, manufacture and use compact equipment is here. What is this shift? It's electrification — and it offers a compelling way to reduce emissions and operational costs.



2. UNDERSTANDING NICHE OEMS AND THEIR NEEDS

THESE OEMS FACE REAL-WORLD CHALLENGES ...

Electrifying equipment presents unique challenges for smaller OEMs that impact their ability to quickly adopt electric solutions and remain competitive. Your role as a Tech Partner is crucial in guiding them through the complexities.

WHAT TYPES OF CHALLENGES DO THEY FACE?

- > **Limited Resources:** Niche OEMs typically have smaller budgets and fewer personnel compared to larger OEMs. This can restrict their investments in R&D, testing and integration engineering.
- > **Specialized Requirements:** Niche applications often demand highly specialized and customized electric solutions. Off-the-shelf components may not always meet their unique needs, requiring tailored engineering and integration.
- > **Low Production Volumes:** Niche OEMs often produce equipment in lower volumes, which can make it difficult to achieve economies of scale in component sourcing and manufacturing.
- > **Technical Expertise:** Electrification requires specialized knowledge in areas such as battery technology, motor control and power electronics. Niche OEMs may lack in-house expertise, making it challenging to design, integrate and support electric systems.

When you recognize challenges like these, you can better position Vanguard's electrification solutions and your services to meet the specific needs of these OEMs. Your expertise combined with our comprehensive solutions and support can help them overcome these hurdles and successfully transition to electric power.



2. UNDERSTANDING NICHE OEMS AND THEIR NEEDS ... SO GIVE THEM AN ADVANTAGE.

Despite the challenges, electrification offers niche OEMs significant advantages to enhance their equipment, improve customer satisfaction and drive growth. As a Tech Partner, you'd help OEMs realize these benefits and succeed in the evolving market.

BATTERY-POWERED EQUIPMENT OFFERS MULTIPLE ADVANTAGES:

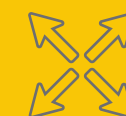
- > **No Maintenance:** Battery-powered equipment requires less maintenance due to the absence of engines, transmissions and other mechanical components. This increases end-user uptime and productivity, a significant advantage in demanding niche applications.
- > **Improved Comfort and User Experience:** Electric equipment operates more quietly and produces zero emissions compared to gas-powered alternatives. This creates a healthier work environment for operators, especially in enclosed or urban settings.
- > **Versatility and Adaptability:** Battery-powered systems offer greater design flexibility, enabling OEMs to develop innovative equipment for specific niche applications. Electric motors provide precise control and instant torque, which enhances equipment performance and versatility.
- > **Regulatory Compliance:** Electrification can help OEMs comply with stricter emissions regulations, particularly in urban areas, which opens up new market opportunities.
- > **Energy Efficiency:** Electric motors are more energy-efficient than internal combustion engines, converting more energy into useful work. This reduces energy consumption and lowers operating costs for end users.
- > **Reduced Dependency on Fossil Fuels:** Electrification reduces reliance on gasoline and fossil fuels, protecting OEMs and end users from fuel price volatility while helping to lower operating costs.



No Maintenance
Requirements



Improved Comfort and
User Experience



Versatility and
Adaptability



Regulatory Compliance



Energy Efficiency



Reduced Dependency
on Fossil Fuels

2. UNDERSTANDING NICHE OEMS AND THEIR NEEDS

CONSIDER THESE KEY FACTORS WHEN EVALUATING EQUIPMENT FOR ELECTRIFICATION.

Not all equipment is equally suited for electrification. As a Tech Partner, you'd help OEMs identify the most promising candidates for electrification within their product lines. Together, you'd look at things like:

- > **Equipment Size and Type:** These differences can significantly influence the complexity and feasibility of electrification. Smaller, walk-behind equipment may be simpler to convert than large, heavy-duty machines.
- > **Usage Patterns:** Evaluate how the equipment is used, including duty cycles, operating hours and frequency of use. Equipment with high usage or frequent starts and stops may benefit more from electrification.
- > **Power Requirements:** Analyze the equipment's power demands, including both peak and continuous power requirements. Determine if the available battery technology can meet these needs while maintaining desired performance.
- > **Operating Environment:** Consider the environment in which the equipment operates. Electrification is particularly advantageous for equipment used in urban or enclosed areas where emissions and noise are a concern.

REMEMBER

Not all machines need to be electrified — sometimes it makes sense to keep a gas-powered machine as is. Help your OEMs prioritize equipment with high fuel consumption and/or those that operate in environments where emissions are a key concern.



3. THE VANGUARD ADVANTAGE

GET ACQUAINTED WITH VANGUARD'S COMPREHENSIVE SOLUTIONS.

For smaller OEMs, partnering with a supplier that offers comprehensive and integrated electrification solutions can significantly streamline the development process and accelerate time to market. OEMs that are new to the electrification space might not realize that there's much more involved with electrifying a piece of equipment than just selecting a battery pack. At Vanguard, we provide a distinct advantage by offering a "one-stop shop" for all key electrification components.

This integrated approach simplifies sourcing, ensures compatibility and optimizes system performance, allowing you and your OEM customers to focus on innovation and application-specific design.

KEY FEATURES AND BENEFITS OF OUR LITHIUM-ION BATTERIES INCLUDE:



High Energy Density: They offer a higher energy density compared to other rechargeable battery types, enabling longer run times and greater equipment performance.



Lower Self-Discharge Rate: They have a lower self-discharge rate, which reduces downtime and increases equipment availability.



Longer Life: They're designed for a longer lifespan that provides reliable power and maximizes the ROI for both OEMs and end users.



Lighter Weight: They're typically lighter than traditional battery technologies, helping to improve equipment maneuverability and reduce overall weight.

Vanguard is truly a one-stop shop designed to alleviate the amount of work you and an OEM have to do.

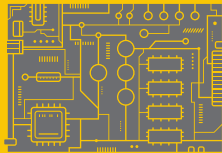


Vanguard provides a fully integrated system, which is the biggest advantage for you and your OEM customers. This includes the lithium-ion battery with an integrated BMS, motors, motor controllers and chargers.

3. THE VANGUARD ADVANTAGE

WE DEMAND SAFETY — YOU DESERVE IT.

At Vanguard, safety is our #1 priority. We understand that battery safety is a critical concern for OEMs and end users alike. That's why we've engineered numerous safety features into our battery packs to provide peace of mind and reliable operation.



HOW DO WE DO IT?

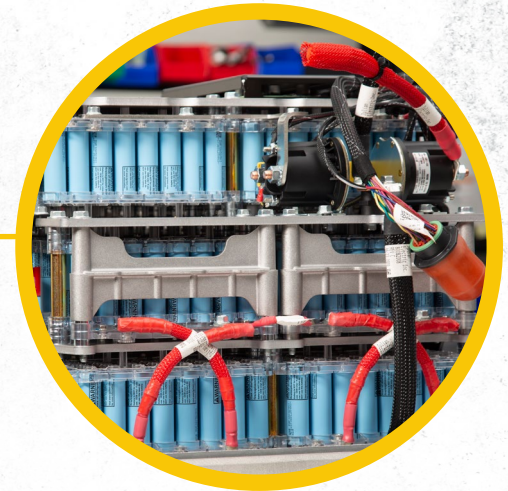
Battery Management System (BMS):

The BMS is the “brain” of the battery. It continuously monitors and controls various parameters, such as voltage, current and temperature. This intelligent system helps prevent misuse and abuse, protecting the battery and the equipment.

Passive Propagation Resistance (PPR):

We employ PPR techniques in the design of our battery packs. This involves strategically spacing and compartmentalizing cells to contain any potential failures and prevent those issues from spreading to neighboring cells.

Robust Design: Our battery packs are constructed with a durable enclosure to provide physical protection against mechanical and electrical damage, further enhancing safety. It also means the batteries are tough enough to handle your customers' most rugged jobs.



3. THE VANGUARD ADVANTAGE

CUSTOMER SUCCESS SPOTLIGHT

Vanguard electrification solutions have empowered numerous OEMs to thrive in the electric market. A prime example is our partnership with **Club Car**: an industry leader in golf cars, commercial utility vehicles and more.

When Club Car sought a new battery supplier to transition their vehicles from lead acid to lithium-ion, our comprehensive line of lithium-ion batteries proved to be the ideal solution. We provided Club Car with the flexibility, adaptability and performance they needed to develop their Tempo® line of vehicles, allowing them to compete effectively in an evolving market.

This successful collaboration demonstrates how Vanguard solutions can enable OEMs to innovate, enhance their product offerings and capitalize on the growing demand for sustainable electric equipment. As a Tech Partner, you'd help facilitate partnerships like these to drive mutual success.



4. EMPOWERING TECH PARTNERS FOR SUCCESS

THESE KEY CONSIDERATIONS ARE ESSENTIAL FOR SUCCESSFUL INTEGRATION.

Successful integration of electrification solutions is critical for maximizing performance, reliability and efficiency. As a Tech Partner, you'd play a vital role in guiding OEMs through this process to help ensure seamless implementation and optimal results.

HERE ARE SOME FACTORS TO CONSIDER:

> Compatibility With Existing Equipment:

- Assess the work required to convert existing equipment to electric versus designing a purpose-built system.
- Evaluate the complexity of the existing system — simple conversions are easier than complex embedded systems.
- Consider battery selection and its impact on the need for additional protection or mounting adjustments.

> Weight and Balance Considerations:

- Recognize that converting from an engine to a battery significantly impacts weight distribution.
- Make sure the design maintains an appropriate center of gravity and tilt angles, especially in mobile equipment.
- Account for the weight difference between lithium-ion and lead acid batteries, which can be a benefit or a detriment depending on the application. For example, extra weight is a benefit to some aerial lifts.

> Component Selection:

- Choose components specifically designed for the equipment type.
- Select components that communicate effectively with each other.
- Prioritize compatibility, reliability, performance and ease of installation.
- Understand that electrification requires replacing the fuel tank and spinning shaft with a new energy storage system (battery), motors and motor controllers.
- In multi-motor applications, a vehicle control module (VCM) is necessary to manage power distribution.
- Be aware of varying specifications and information from electrical component manufacturers compared to engine manufacturers.

In most cases, the components your OEMs choose must talk to each other to work properly. Understand the communication protocol being used between all the components to ensure that you're getting the full benefits of an electrified system.

4. EMPOWERING TECH PARTNERS FOR SUCCESS

DIVERSE CHARGING SOLUTIONS ALLOW OEMS TO ADOPT ELECTRIC EQUIPMENT WITH CONFIDENCE.

Charging infrastructure is a critical consideration for the successful adoption of battery-powered equipment. As a Tech Partner, you'd help guide OEMs through the planning and implementation of appropriate charging solutions. Here's what you should know about charging options.

> Importance of Charging Infrastructure:

- Infrastructure is crucial to support the availability and accessibility of charging for end users. It helps mitigate range anxiety — the fear of running out of battery charge before completing a task.
- Well-planned charging infrastructure supports the widespread adoption and growth of electric equipment.

> Charging Solutions and Options:

- **Onboard charging** involves a charger built into the machine that converts AC power from the charging station to DC power for the battery. Higher power applications may require access to a 240V outlet for faster charging.
- **Off-board charging** uses an external charger to deliver DC power directly to the battery.
- **Swappable battery systems**, like the 48V 1.5kWh* Commercial Battery, offer a third option. Discharged batteries can be swapped with fully charged ones, minimizing downtime. Swappable systems also allow for portable charging stations.

When helping your OEM customers plan their charging infrastructure, consider factors like these:

- The jobsite's electrical infrastructure and the requirements for installing charging stations.
- Voltage, amperage and location of charging points to optimize convenience and efficiency.
- Consultation with electricians or infrastructure specialists to ensure compliance with safety regulations and efficient charging setup.



Charging infrastructure is crucial for battery-powered equipment for such reasons as availability and accessibility, mitigating range anxiety, and supporting the growth of electric equipment.

4. EMPOWERING TECH PARTNERS FOR SUCCESS

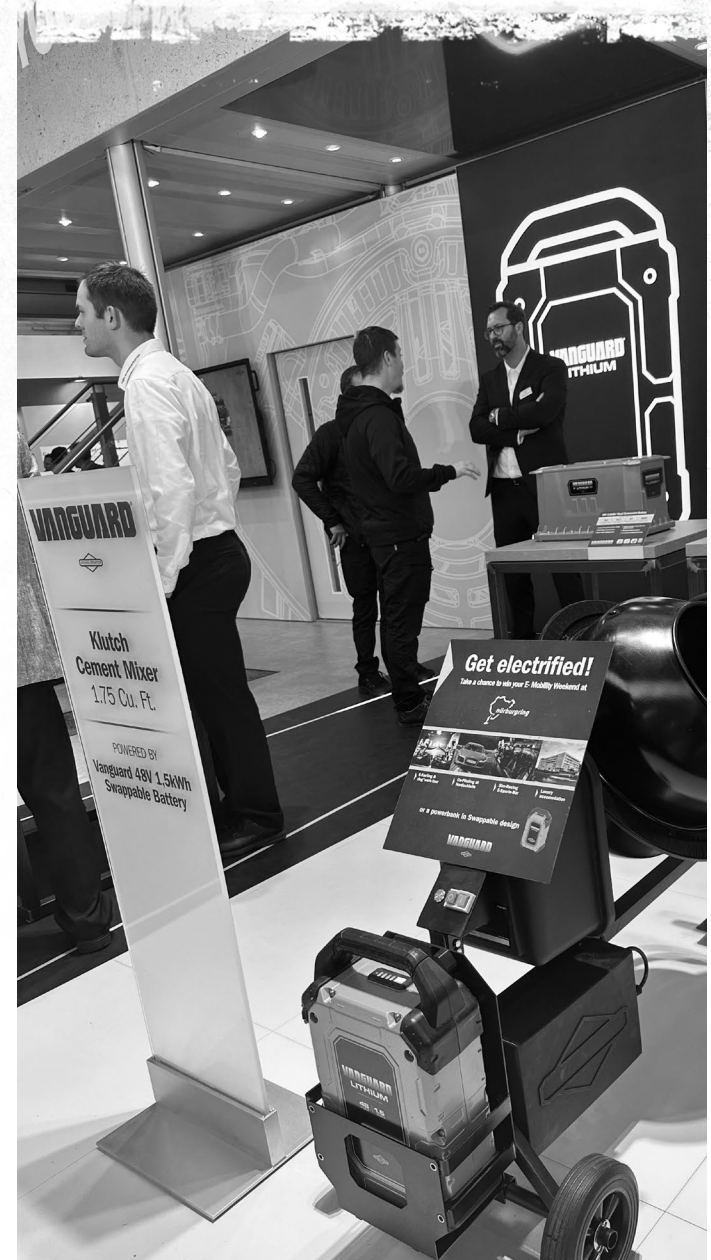
HERE'S HOW VANGUARD SUPPORTS TECH PARTNERS.

We're committed to providing comprehensive support to our Tech Partners, enabling you to effectively serve your OEM customers and drive mutual success.

HERE ARE SOME OF THE PRIMARY WAYS WE SUPPORT OUR TECH PARTNERS:

- > **Vanguard Co-Marketing Strategy:** We work to establish Vanguard and our Tech Partners as thought leaders to drive demand for lithium-ion battery systems in key target markets. This collaboration helps you reach and engage your target audience, fill your lead funnel and grow profitable revenue.
- > **Trade Show Support:** We provide support for Tech Partners participating in trade shows, including signage, literature and displays for battery packs, motors, motor controllers, chargers and so on. This helps you showcase what you can help OEMs accomplish with Vanguard's battery solutions to attract potential customers.
- > **Vanguard University:** Vanguard University is a training platform that provides up-to-date information on our products and customer support offerings. This resource helps you stay informed and knowledgeable so you can provide expert guidance to OEMs.

By leveraging support resources like these, you can strengthen your position as a trusted advisor to OEMs and maximize your success.



5. DRIVING THE FUTURE OF ELECTRIFICATION TOGETHER

OUR COLLABORATIVE APPROACH DRIVES YOUR SUCCESS.



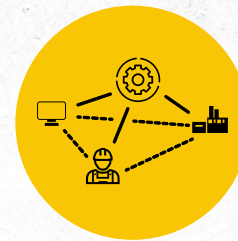
CONCEPT

Help with the full concept draft.
From analysis, scaling the power
output, to series cost analysis.



ENGINEERING & DESIGN

Integration of suitable components
and final electronic design.



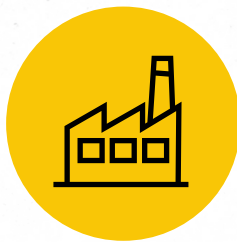
PROTOTYPING

System integration, machine
installation and successful proof
of concept.



COMMISSIONING

Assistance with the machine
start-up and testing.



INDUSTRIALIZATION

Optimization for the serial
production environment.



LAUNCH OF SERIAL PRODUCTION

Close collaboration with partner/customer
ensuring a smooth go to market.



KNOWLEDGE TRANSFER

With our power application expertise
and network of Technology, we are a
strong partner at your side.

5. DRIVING THE FUTURE OF ELECTRIFICATION TOGETHER

NEW ELECTRIFICATION OPPORTUNITIES AWAIT. PARTNER WITH US.

The electrification of niche markets presents a significant opportunity for OEMs and Tech Partners alike. By embracing this transition and collaborating effectively, we can drive innovation, enhance equipment performance and create a more sustainable future.

As a Vanguard Tech Partner, you'd be at the forefront of this exciting evolution. Your expertise, combined with our comprehensive electrification solutions and unwavering support, empowers OEMs to overcome challenges and achieve their electrification goals.

We're committed to providing you with the tools, resources and partnership you need to thrive in this dynamic industry. **Together, we can:**

- Lead the electrification of niche markets
- Deliver exceptional value to OEM customers
- Drive innovation and technological advancement
- Contribute to a cleaner, more sustainable future

Electrification opportunities are rapidly emerging, and Vanguard is the ideal partner to help you capitalize on this growth. Together, let's create exciting opportunities that empower OEMs to achieve new-found success.

Our well-rounded team will guide you through a process like this one so you can provide top-notch support to your OEM customers. If you're ready, let's connect.



6. FAQ

GET YOUR TOP QUESTIONS
ANSWERED HERE.**Q What specific support does Vanguard offer Tech Partners during the OEM integration process?**

A Vanguard provides guidance on compatibility, weight and balance considerations, component selection and charging infrastructure planning to ensure seamless integration.

Q What makes Vanguard's electrification solutions a "one-stop shop"?

A Vanguard offers a fully integrated system that includes lithium-ion batteries, BMS, motors, motor controllers and chargers, simplifying sourcing and ensuring compatibility.

Q How does Vanguard ensure the safety of its lithium-ion battery technology?

A Vanguard prioritizes safety with features like a Battery Management System (BMS), Passive Propagation Resistance (PPR) and a robust design.

Q What are the key advantages of lithium-ion batteries for niche market applications?

A Lithium-ion batteries offer high energy density, lower self-discharge rates, longer life and lighter weight, enhancing equipment performance and efficiency.

Q How can Tech Partners help OEMs identify the best equipment for electrification?

A You can guide OEMs by considering things like equipment size and type, power requirements, usage patterns and operating environment. And remember, not all machines need to be electrified — sometimes it makes sense to keep a gas-powered machine as is.

Q What charging options are available for Vanguard-powered equipment, and how do I help OEMs choose the right one?

A Charging options include onboard, off-board and swappable batteries. Factors to consider include end-user applications, available infrastructures versus needing to set them up, and machine usage patterns.

Q How does Vanguard help Tech Partners address concerns about range anxiety?

A Vanguard helps you plan effective charging infrastructure to alleviate concerns about running out of power.

Q What marketing and sales support does Vanguard provide to Tech Partners?

A Vanguard offers co-marketing strategies and trade show support to help you reach customers and grow your business. Please [fill out and submit this form](#) for more details.

Q What kind of training and education does Vanguard offer to Tech Partners?

A Vanguard University provides training on products, safety and battery technology to keep you informed and knowledgeable. You can access our learning management system here: <http://vanguardpower.com/Learning>

Q What makes Vanguard different from its competitors?

A Our integrated, comprehensive system and our commitment to Tech Partner support sets us apart. When you work with us, you never go it alone.

Q What's the first step to becoming a Vanguard Tech Partner?

A Just let us know you're interested. To do so, [fill out and submit this form](#) and we'll reach out to discuss partnership opportunities and requirements.

We're ready to work with you to make it happen.
LET'S TALK. vanguardpower@basco.com

VANGUARD

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