Ampcera Responses to Hanwha Solutions Questions

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AMPCERA LEADERSHIP TEAM

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General

01 **What is Ampcera's pitch?**

Ampcera is pioneering solid-state battery materials technology to advance safer, high-performance energy storage for electric vehicles, electronics, and defense. Founded in 2017 and supported by Hanwha Solutions, the company has raised over $18 million in Series A funding. Ampcera's platform, protected by 50 patents and 90+ trade secrets, spans electrolyte production to cell design to advanced manufacturing technologies, aiming for a 25% share of North America's SSB market by 2030. With scalable production of 1 ton per annum (TPA) and a team of 30+ experts, we partner with Tier 1 automotive, battery cell, and material companies to build the full-stack solution and lead the future of energy storage innovation.

02 **What is the specific customer pain Ampcera's product addresses?**

Ampcera's technology provides unique value by addressing critical energy storage challenges through a scalable, proprietary solid electrolyte platform. The company's initial solution will enable electric vehicles to achieve a 20% longer range in all environments and electronic devices to last 30% longer on a single charge, along with faster charging. This meets customers' needs for longer-lasting, high-performance batteries across diverse conditions.

With expertise in materials, cell integration, cell design, and manufacturing, Ampcera replaces traditional liquid electrolytes in today's lithium battery with solid ones, allowing for high-performance, smaller, cost-effective batteries—key to unlocking the true potential of electric vehicles and consumer electronics.

Technology (1/3)

03 **What is Ampcera's value proposition?**

Ampcera is pioneering the advancement of safer, high-performance energy storage solutions for electric vehicles, electronics, and defense. Ampcera's technology provides unique value by addressing critical energy storage challenges through a scalable, proprietary solid electrolyte platform. With expertise in materials, cell integration, cell design, and manufacturing, Ampcera replaces traditional liquid electrolytes in today's lithium batteries with a solid-state alternative, allowing for high-performance, smaller, cost-effective batteries – key to unlocking the true potential of electric vehicles and consumer electronics.

04 **What is Ampcera's product offering?**

Product: Solid electrolyte (core business)
Solution: Solid-state battery cell
Ampcera's core product is a solid electrolyte material that powers solid-state battery cells. With a decade of cell integration expertise, it enables high-energy-density batteries with fast charging. Ampcera's sulfide solid electrolytes—the material innovation that enables solid-state cells—are engineered for high energy density and fast-charging solid-state batteries with ionic conductivities of >1 mS/cm at RT with low D50 particle sizes in the range of 1.5-1.0 µm. These materials are manufactured in-house on a versatile 1-ton annual pilot production line that can be retooled and adapted to meet customer needs. The versatile production line supports an in-house production line for next-generation solid-state battery cells of 5-10 Ah in size that are manufactured with ultra-high energy density and fast charging in mind.

05 **What is the advantage of Ampcera's electrolyte material?**

Ampcera's solid electrolyte materials are designed with high phase purity for high-rate performance (via fast charging) and chemical stability. These attributes are achieved through an advanced electrolyte manufacturing process. Importantly, these features are also being qualified by over 200+ customers.

06 **How is Ampcera's electrolyte manufactured?**

Ampcera's solid electrolyte materials are manufactured using an IP-protected 5-stage manufacturing process designed for high-phase purity and modular scaling. Stage #1: Precursor procurement and quality validation ensures supply chain security and the highest level of material quality. Stage #2: Material preparation and homogenization ensure a scalable processing approach for achieving high phase purity. Stage #3: Material processing includes an IP-protected processing method that enables modular scaling to thousands of tons. Stage #4: Post-processing and particle size classification is a confidential processing approach for achieving small particle size distribution. Stage #5: Material packaging and distribution includes patented packaging technology to protect against moisture contamination.

07 **What is the advantage of Ampcera's battery technology?**

Ampcera's solid-state battery technology is designed for high energy density (>400 Wh/kg), long cycle life (>5000 cycles), enhanced safety, and fast charging (80% charge in 15 minutes).

High energy density is achieved using high active cathode loadings (>20 mg/cm2), ultra-thin solid electrolyte separating membrane (<20 µm), and high-content silicon composite anodes. Long cycle achieved through surface engineering of the active cathode and catholyte materials as well as process optimization of the cathode, anode, and separating membrane components. Enhanced safety is achieved by the elimination of the flammable liquid electrolyte and minimizing lithium plating and dendrite penetration through interface engineering between the solid electrolyte membrane and silicon composite anode and structural engineering of the solid electrolyte membrane itself. Fast charging is achieved through further process optimization of the cathode, anode, and separating components as well as process and formulation engineering of the solid-state electrolyte materials to ensure best-in-market conductivity and performance.

Technology (2/3)

08 Describe Ampcera's competition

Our direct competition is incumbent battery suppliers like LGES, Samsung SDI, Panasonic, and CATL, and the next-generation battery technology companies like those working on silicon anode and Lithium-metal. A solid electrolyte company like Ampcera can displace incumbents by offering superior performance (higher energy density, faster charging, longer cycle life, wide operational window), scalability, and cost-effectiveness. Key differentiators for Ampcera include innovative and "engineered" sulfide solid materials technology "platform", proprietary manufacturing processes, strong IP, a strong customer base including 5 of the top 10 automotive OEMs and 3 of the top 5 global battery makers, and a proven track record of commercial success with over 1100 orders filled across 200+ customers.

A well-defined commercial strategy, strong partnerships in upstream, midstream, and downstream/customer, and unique technology have been in place that provides a substantial economic moat, with differentiation through product development, speed to market, and cost leadership offering competitive advantage in the rapidly evolving energy storage space. Ampcera is the most capital-efficient among its peers, achieving significant milestones relative to the capital raised.

09 What is the all-climate battery solution?

Ampcera's long-term vision is to provide an all-climate solid-state battery solution to the market. Unlike traditional lithium batteries, solid-state batteries have the unique advantage of being heated to a moderate level to improve low-temperature performance. Ampcera has an IP portfolio centered around novel heating technologies to enable enhanced performance. In addition, the ability to operate at higher temperatures also allows for simpler, lower energy-consuming thermal management systems in EVs. Moreover, Ampcera is also tackling the low-temperature performance issue through engineering of the solid electrolyte materials using AI and quantum computing for advanced material discovery.

10 What is the composition of Ampcera's IP portfolio?

Ampcera's technology platform is designed to enhance the performance of next-generation battery technologies for electric vehicles, consumer electronics, and U.S. defense. This is supported by a robust intellectual property portfolio, encompassing over 50 patented and pending applications spanning 34 unique energy-related inventions, including electrolyte materials, next-generation battery structures, novel processing methods, and performance enhancement strategies. Ampcera also holds over 90 documented trade secrets related to its solid electrolyte and battery manufacturing processes. To maintain this pace of innovation, the company expects to have 75 patent applications (granted or pending) and more than 150 trade secrets by the end of 2025.

11 What are Ampcera's next steps for technical development in the next 12 months? How does the company plan to mitigate future technical risks and barriers?

In the next 12 months, Ampcera aims to achieve three key technical milestones:

1. Super-particle: Develop an A-sample-ready material by merging CY2024 solid electrolyte variants into a standard super particle, using structured data to optimize performance in industry-standard cells.
2. Complete Electrolyte Solution: Integrate sulfide solid electrolytes into multiple battery form factors, targeting fast deployment for short-to-medium term needs.
3. <0.5 MPa Stack Pressure: Stack pressure is crucial for solid-state battery performance, ensuring optimal contact between solid components. Over the past 1.5 years, Ampcera has successfully reduced stack pressure from 50 MPa to 2 MPa, marking a significant improvement. We will further reduce the stack pressure requirements to <0.5 MPa.

Technology (3/3)

12 **What is Ampcera's development stage?**

Pre-Commercialization. The company develops industry-relevant prototype solid-state battery (SSB) cells and collaborates with automotive and cell partners to achieve validation and qualification.

13 **Can I acquire Ampcera electrolyte materials?**

Yes. You can purchase Ampcera's solid electrolyte products at MSE Supplies (https://www.msesupplies.com/)

14 **Can I get a custom electrolyte formulation made and manufactured at scale?**

Yes. Let's connect to discuss more about your custom electrolyte needs. We can manufacture your electrolyte requirements at scale through strategic partnerships.

15 **Does Ampcera provide non-electrolyte battery materials?**

Yes. Ampcera provides coated cathode active materials (available at MSE Supplies) and has provided custom battery solutions for several of its strategic partners.

Total Addressable Market and Traction

16 **Describe Ampcera's target market**

Ampcera's solid-state battery cell—incorporating material designs—is customized for EVs, consumer electronics, and U.S. defense applications.

1. Electric vehicle: Ampcera delivers low-cost solid electrolyte materials that deliver breakthrough energy densities and fast charging (i.e., 80% charge in under 15 minutes) without compromising cycle life or safety.
2. Consumer electronics: Ampcera delivers small lightweight next-generation solid-state cell prototypes that offer high energy density with rapid discharge capabilities in all-climate environments.
3. U.S. Defense: Ampcera delivers premium solid-state battery cell prototypes that provide high energy and power densities, combined with the ultra-high safety levels needed in warfighter wearables, combat and transport-ready vehicles, and advanced air mobility.

Ampcera's business development strategy targets EV and cell OEMs, with the EV sector being the fastest growing. Additionally, expanding into electronics and defense sectors offers two key benefits: (a) Enhancing product performance through cross-market development. (b) Accelerating technology and time-to-market by leveraging insights from diverse sectors.

17 **Describe Ampcera's market traction**

1. Formal strategic partnerships with Tier 1 automotive and cell manufacturers in addition to Hanwha, with a goal of building a full-stack cell solution that integrates Ampcera's electrolyte technology.
2. Recipient of 7 government grants totaling >$8,000,000.
3. Since 2019-20, Ampcera has developed a core family of solid electrolyte materials, now the standard offering purchased by over 200 partners worldwide, generating annual revenue of $1 Mn. This baseline version is industry validated, leading to pilot production and increased demand. In response, we scaled up production and, based on customer feedback, developed "advanced sulfide solid materials" tailored to the specific needs of EV and cell OEMs. These customized, cost-effective, and hybrid material solutions address unique features, innovative designs, and lower manufacturing costs, and are available exclusively to our partners, not sold in the open market.
4. Serving both domestic and global markets since 2020.
5. Fulfilled >1100 orders for 200+ customers.

18 **What will Ampcera achieve in the next 12 months?**

The development projects outlined in "Ampcera's next steps for technical development in the next 12 months" in the technical page, will be combined to create a commercial solid-state battery, in collaboration with automotive and battery cell partners. These companies will integrate Ampcera's solid electrolyte architecture into various battery form factors. Through this pilot, Ampcera aims to accelerate the deployment of sulfide solid electrolyte solutions for short-to-medium-term needs. The company partners have already tested Ampcera's solid-state battery cell prototypes and requested additional samples (>1 Ah size) in H1 2025 for comprehensive testing. The main goal is to elevate the TRL to above 5 (on a scale of 10) by incorporating Ampcera's innovations in technology, integration, manufacturing, and supply chain.

Team and Partnerships

19 **What is the Ampcera team's history of success, experience with the identified market and industry, and in startup's current stage of venture and growth? What risks has the team mitigated so far?**

Our team of 30+ experts has over 200 years of combined experience in new energy innovation, spanning battery chemistry, engineering, automation, and manufacturing.

Co-founder and CEO Sumin Zhu brings leadership experience from Bruker, Thermo Fisher Scientific, and Vesuvius, with a PhD from Missouri University of Science and Technology.

Head of Business Development and Commercial, Abhishek Kumar, has 15+ years of experience in operations, investing, and strategy across Japan, Singapore, India, and the U.S., with roles at SoftBank, OLA Electric, and REC Group. He is a Stanford graduate and has built some of the largest solar PV farms and EV factories in Asia. Hui Du (Co-founder/CTO), Eongyu Yi (Director of Technology), and Emery Brown (Director of Manufacturing) are other Ampcera leaders.

The team through their collaboration with upstream, midstream, and downstream partners delivered industry-relevant cells, which were tested in real-world environments, effectively mitigating the initial "valley of death" in the lab-to-pilot scale-up process.

20 **List and describe Ampcera's key advisors and their contributions**

Advisors have played a crucial role in Ampcera's journey by providing strategic guidance and leveraging their industry experience. Alan Lin, Director of Investor Relations, manages relationships with current and potential investors, ensuring continued support and alignment with Ampcera's goals. Ross Dueber, Senior Business Advisor, advises on market direction and business strategy, drawing from his leadership experience at Powerside, ZPower, the US Air Force, Emerson, and Eaglepitcher. Mei Cai, Senior Technology Advisor, brings expertise in advanced battery technologies from her previous role as Director of Battery Materials at GM. Mei advises on technology strategy, particularly the commercialization of solid electrolyte technology.

21 **Does Ampcera work with strategic partners?**

Yes, Ampcera works with strategic partners in what is referred to as the full-cell stack solution comprising upstream, midstream, and downstream partners. Our upstream partners include raw material suppliers that support our manufacturing efforts. Our midstream partners include equipment, process development, cell integration, and manufacturing partners. Our downstream partners include customers and joint development partners.

22 **How does Ampcera work with automotive OEMs?**

Ampcera delivers low-cost solid electrolyte materials that deliver breakthrough energy densities and fast charging without compromising. cycle life or safety in all environments. Ampcera is currently collaborating with six Tier 1 EV and cell partners, who are also prospective customers, to conduct material and cell validations and qualifications. A six-step plan for cooperation with OEM partners spans from R&D to the start of high-volume production (>1000 tons annually of advanced electrolyte material).

23 **How does Ampcera work with consumer electronics?**

Ampcera delivers small, lightweight, next-generation solid-state cell prototypes that offer small form factors, lightweight, high-energy density, and fast charging. Our steps for cooperation with consumer electronic OEMs start with performance alignment and include alpha prototype cell development followed by beta prototype cell delivery and battery pack integration.

24 **How does Ampcera work with the U.S. defense?**

Ampcera offers high-energy, safe solid-state batteries for defense and aerospace applications. These batteries are designed for use in wearables, tactical vehicles, and unmanned aircraft.

Timing and Financials

25 **What is your estimated time for commercialization starting January 1, 2025?**

Electric vehicles: More than 24 months
Consumer electronics: 12 months

26 **What financing instruments did Ampcera raise capital?**

Equity: Hanwha Solutions & other investors: $10,000,000 (Series A)
Grant: DOE/ARPA-E: $8,000,000

27 **Is Ampcera privately funded?**

Ampcera secured $10M in Series A funding from its leading investor Hanwha Solutions in early 2023 to scale its electrolyte manufacturing process. Hanwha Solutions is a multinational energy services and petrochemical company and is part of the Hanwha Group of South Korea.

28 **Does Ampcera have any non-diluted funding?**

Yes, Ampcera has been a recipient of over 7 federally funded grants from the U.S. Department of Energy including SBIR, VTO, AMO, and ARPA-E offices totaling $8 million in funding. Ampcera is also part of the EVs4ALL program at ARPA-E to tackle the cold weather performance challenge of lithium batteries.

29 **Describe Ampcera's business model**

Ampcera's business model focuses on selling sulfide-based electrolytes and licensing solid-state battery designs and manufacturing processes. Instead of competing in the capital-intensive battery manufacturing sector, Ampcera specializes in electrolyte production, avoiding direct competition with customers and sidestepping the high costs of gigafactories. By prioritizing technology licensing and electrolyte supply, we collaborate with multiple battery manufacturers and EV OEMs rather than competing against them.

Profit margin: Ampcera aims for an EBIT margin of >35% and EBITDA margins exceeding 20% at a 2kT sales level.

Deployment and scaling strategy: The company collaborates with Tier 1 cell and auto OEMs to develop a full-stack cell solution integrating Ampcera's electrolyte technology, offering the following benefits:

1. Scalable development with insights into mass-production requirements and limitations.
2. Economy of scale and EV-grade manufacturing expertise.
3. Validation and confidence for battery and EV OEMs to adopt solid electrolytes.

Ampcera is empowering lives with material solutions for next-generation energy storage

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