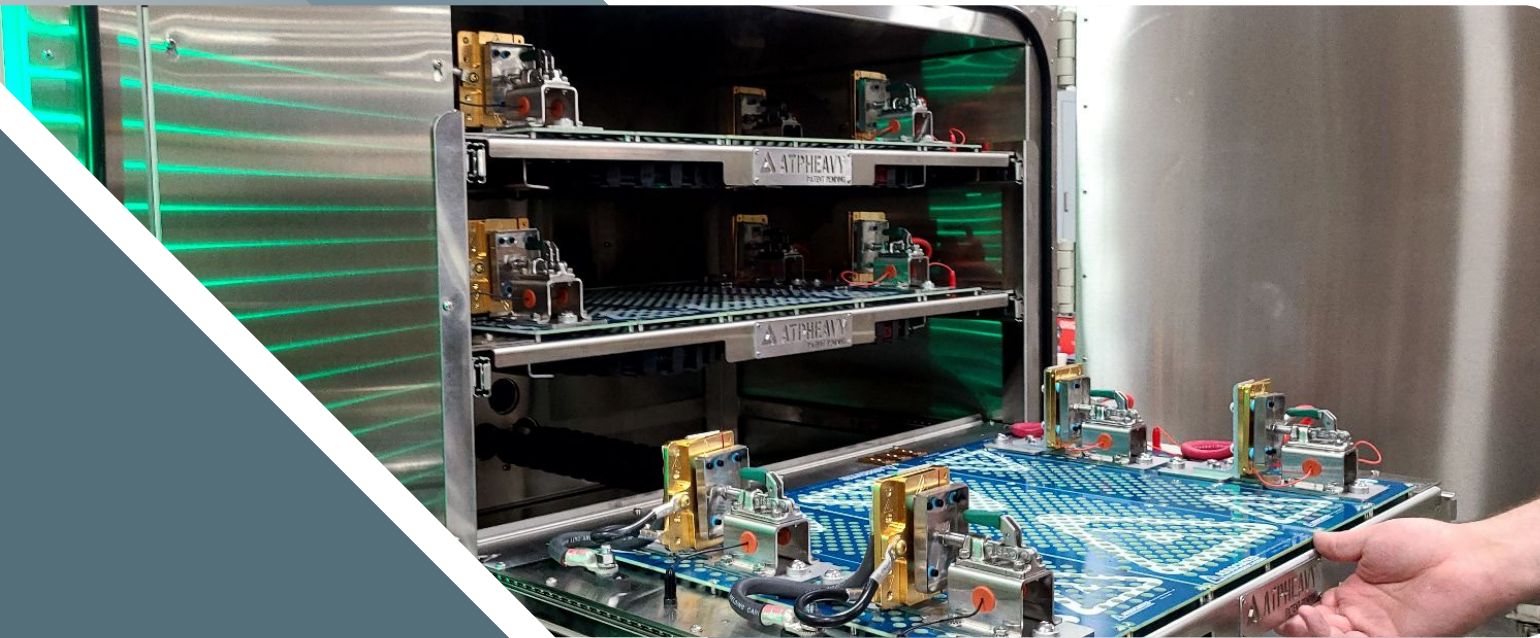


# ATP COST OF OWNERSHIP WHITE PAPER

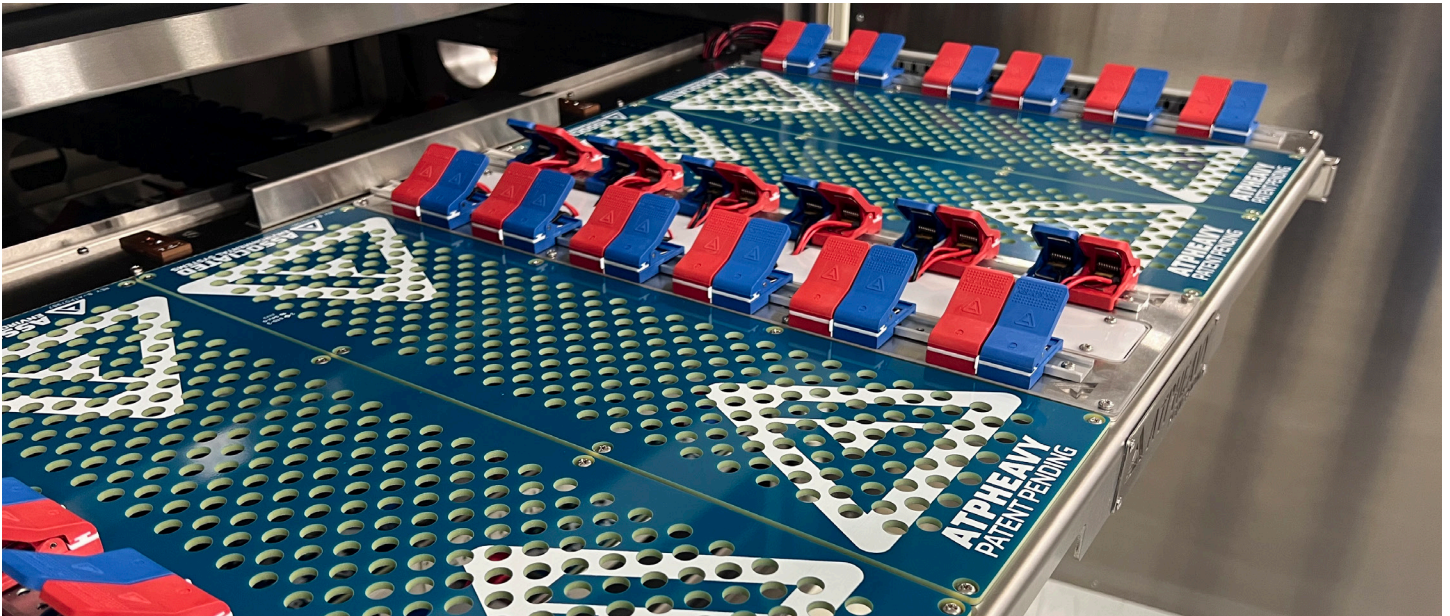


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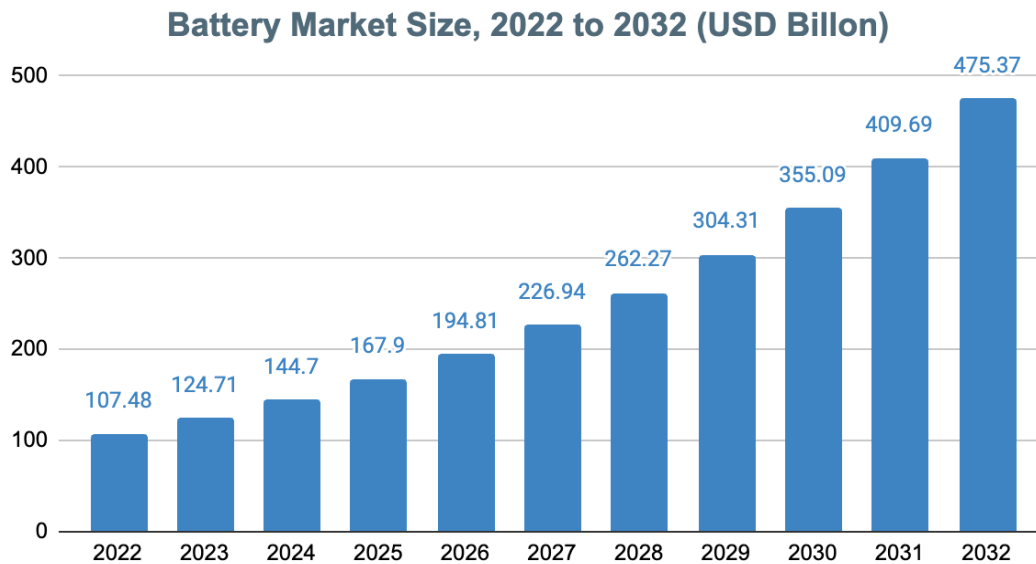
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# Abstract



Industries are constantly on the lookout for the best battery testing solution, from [consumer electronics](#) to [EVs](#). With the consistent influx of regulations and requirements, companies need products that can adapt to change regardless of cell format, size, ideal channel count, or floor space. Understanding this need, Associated Environmental Systems (AES) created the All Test Platform (ATP) series. Discover the value and cost-effectiveness of the ATP® series. Uncover industry challenges, gain insights into ATP fixtures, and see how investing in an ATP can effectively solve pressing problems.

# Introduction



The global battery market size is exploding. Valued at \$ 107.48 billion in 2022, it's expected to expand at a compound annual growth rate (CAGR) of 16.8% from 2023 to 2032. Battery testing is essential for determining battery performance, safety, and reliability. As batteries are subject to several factors that influence optimal function in these areas, batteries must undergo a series of tests that measure capacity while subjecting the battery to various environmental conditions. These tests can include capacity testing, efficiency testing, cycle life testing, abuse testing, cell formation testing, and more. Industries can go through various testing routes to assess the true value of a given battery for their application. They can either outsource a testing service or purchase one that provides them full autonomy over the testing process. Choosing the right partner is imperative, as testing can quickly become expensive.

Since its founding in 1959, AES has been dedicated to making sophisticated test chambers capable of meeting the most demanding testing requirements. A full-service provider, AES works with customers to find the best solution that meets their needs, from [battery test chambers](#) and standard temperature and humidity chambers to walk-ins. AES' fully integrated battery testing chambers seamlessly connect with any cyclers manufacturer. AES works with individually chosen manufacturers to maximize setup by maximizing channel count, amperage requirements, and lab layout.

The ATP series is another reflection of AES' commitment to customer satisfaction. Established in 2005, the All Test Platform solution has grown expansively, and as of 2023, AES has over 200,000+ active channels deployed in our ATP solutions and 5,000+ active battery test chambers. In the beginning, the ATP line started with developing solutions to test batteries found in consumer electronics, primarily focusing on cylindrical and coin cells. Once AES saw a larger need for higher amperage batteries, it realized the importance of modifying its current design to evolve with the industry's advancements, particularly in the EV landscape. Customers who turn to AES, from pharmaceuticals to EVs, can expect fixtures to save time and money. The investment in AES and our ATP series is unparalleled.

## Dynamic Solutions for Demanding Testing Needs



### *Choosing the Right Battery Test Chamber and ATP Solution*

#### *The Challenge:*

More than ever, there is a critical need for solutions addressing issues such as climate change, energy efficiency, and safety. These modern developments have accelerated the need for high-performing battery systems. Across the landscape, industries from EV to aerospace to consumer electronics and more feel the pressure to bring a product to market that is revolutionary and reliable. This pressure is reflected in the battery testing equipment market, expecting a CAGR of 4.70% by 2029.

Depending on the industry's need, an industry may leverage a smaller benchtop to an expansive walk-in or drive-in battery chamber to complete testing. Battery testing systems will enable them to measure battery capacity and detect anomalies while exposing it to various conditions such as cycle counts, voltage levels, and environmental conditions. Regardless of their required system, industries are searching for flexible testing solutions that not only test their products effectively but save them financially in the long run. The ATP series is the perfect solution.

AES's ATP series allows industries to meet pressing requirements and adapt to shifts in testing strategies without purchasing an entirely new chamber. As technology advances and ongoing demands arise, industries are engulfed with multiple testing requirements and regulations. Apart from requirements, new chemistries can shift an industry's testing focus. For example, the automotive industry is transforming. Major car manufacturers worldwide are committing billions to develop EVs and EVs with longer-lasting batteries. [General Motors' new Battery Innovation Lab](#) in Michigan is estimated to cost \$40 million alone. While lithium-ion batteries are expected to remain the [dominant battery technology in 2024](#), prominent battery chemistries such as sodium-ion and cobalt are rising to the forefront. To keep up with these changes, EV manufacturers need an adaptable solution. Their older test chambers cannot adapt as quickly, and they spend more money routinely to meet shifts.

## AES Solutions

Staying vigilant, aware, and attuned to market changes guides AES' innovations, which led to the ATP® series. Industry professionals can use this lineup of [battery testing fixtures](#) inside our battery testing chambers to provide integrated, adaptable, and compatible solutions, allowing them to accommodate a variety of cell formats, sizes, channel counts, and amperage requirements without having to purchase new chambers or fixtures when testing requirements change.

Currently, there are four types of battery fixtures within the ATP series. This growing list includes:

### A. ATPHEAVY

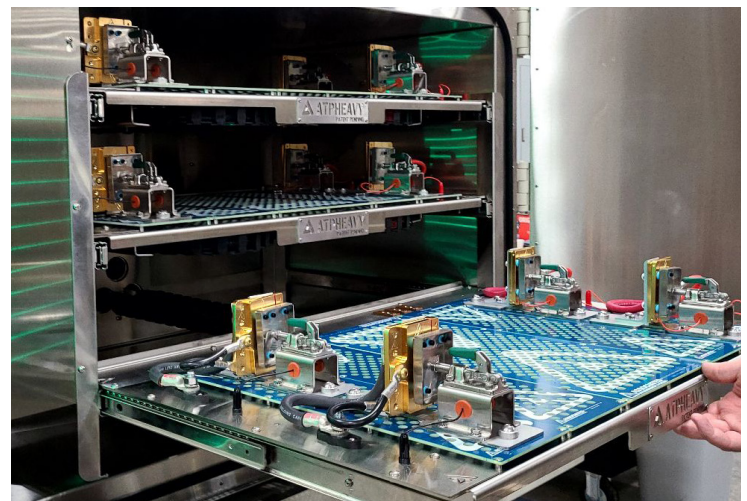
Our patent-pending ATPHEAVY battery testing fixture is designed for those who require high amperage testing, such as EV companies.

Capable of testing up to 1200 amps, ATPHEAVY is uniquely designed to accommodate prismatic cells. This fixture is designed to pneumatically lift the cells directly to the contact point to charge/discharge cells.



### B. ATPHEAVY Adaptable

Building off of the success of the patent-pending ATPHEAVY, the ATPHEAVY Adaptable is designed to support battery testing technology advancements. Engineered for all battery formats and sizes, including larger capacity batteries, multiple geometries of the pouch, and prismatic and cylindrical cells, the patent-pending ATPHEAVY ADAPTABLE can be adjusted to accommodate different high-amperage testing requirements. Within the Adaptable, there are five modular perforated test surfaces that can be customized to accommodate various elements, such as clips for pouch cells, additional thermal channels for cell monitoring, high-current terminal posts, and more.

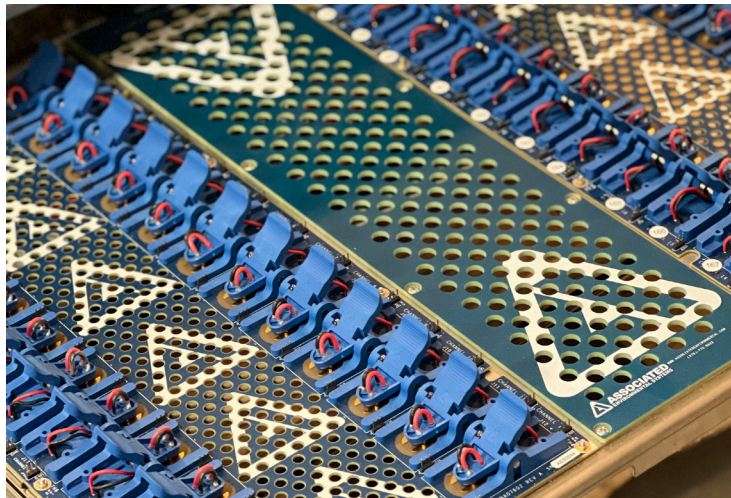


# AES Solutions

*Continued*

## A. ATPPRIME

AES's patented system, ATPPRIME, is a system for high-density testing of batteries within an environmental chamber. Its standard maximum current reaches up to 20 amps. This allows for a higher density of cells tested at lower currents. Our ATPPRIME can accommodate up to 192 cells situated across four shelves. Its perforated surface is designed to maximize airflow and maintain consistent temperature conditions. Its versatility allows the user to facilitate testing multiple cell types within the same fixture for nearly all cell formats, including coin, cylindrical, prismatic, pouch, and pack batteries, and enables quick switching between cell types.



## B. ATPFLEX

AES' ATPFLEX can be placed into most temperature-only or temperature and humidity chambers. It is a perfect option for customers who want to add the capability of battery testing into their pre-existing chamber. Regardless of the environmental chamber manufacturer, ATPFLEX is compatible with most chambers, providing the convenience of testing two to six channels at a time.



# Test Chamber Cost-Benefit Analysis



## *The Challenge*

In an effort to cut down on manufacturing costs, companies tend to assume that building their own battery fixture in-house or outsourcing from multiple manufacturers will save them time and money. The reality of accrued costs quickly challenges this assumption. Outsourcing testing alone can cost roughly thousands of dollars between various chamber and cyclor manufacturers. Companies that choose to use their engineers to build their own fixture can end up exceeding \$4,000+ per week on the given project, which could take six to ten weeks—and there is no guarantee that the solution will work. The total cost is influenced by factors such as the number of engineers involved, the hours devoted to the project and the salary distribution.

This commitment of time and financial resources can often lead to a company's poor return on investment (ROI). Additionally, battery costs, including EV battery cells, are expected to spike as high as 22% by 2026. This surge will increase the cost for EV manufacturers to produce EVs, as there is a growing scarcity of key raw materials needed to make battery cells. More than ever, EV manufacturers will need a provider that can give them a solution that will save them resources, be adaptable to ongoing project needs, and provide a lifetime value. The ATP series can do just that.



# AES Solutions

AES has been in the business for over a decade, providing customers with the most modern, cost-effective solutions. Companies frequently approach AES with the mindset that building a fixture alone will save them resources, only to quickly discover quite the opposite. For example, a materials scientist from a battery pack manufacturer initially did not think purchasing an already-equipped battery fixture was worth the investment. After diving into the logistics and calculating the ROI, the manufacturing company realized that building a fixture in-house was not sustainable enough to keep up with ongoing demands. Turning to a partner they could trust, AES was able to provide them with an efficient solution.

While the price of an AES battery fixture is project-dependent, potential customers can expect to pay a total estimate of \$20,000-\$50,000 for a fixture across our ATPPRIME and ATPHEAVY platforms. While this is a broad range, it shows the complexity of the fixture itself depending on channel count, number of shelves, and amperage requirements. This investment, though, is highly logical in that AES has done the research and spent a decade perfecting our solution, thinking out each and every material that goes into our design.

Looking into the breakdown of the ROI calculated for creating versus buying a fixture, if they were to assign two engineers who earn \$50 an hour to build the fixture working 40-hour work weeks. This could cost them around \$4,000 a week. These projects could take about six to ten weeks to develop, plus they would have to test and integrate the fixture into the purchased chamber(s). You would be looking at \$24,000- \$40,000, and the solution is not guaranteed to work. What happens if the solution you created and spent six to ten weeks developing suddenly becomes obsolete with your next project? You would have to start from ground zero again and repeat this process. What if you needed more than one fixture for different testing requirements? What if your testing required five or ten fixtures? This would not be a sustainable way to compete with the current market. AES has been in the battery testing industry for over a decade, creating solutions that can grow alongside testing demands. With AES creating your fixture, your engineers can work on other projects while we do the work for you. If your requirements change, you can call any of our battery testing experts, and we will work with you and redesign your solution to meet your current demands. In building your own solution, you want it to work, but does it prioritize the safety of each cell, the equipment, and your engineers? AES takes safety very seriously. We have incorporated safety features to prevent and mitigate thermal runaways from being uncontrolled and potentially harming your cells and equipment. These are all potential design options AES has already integrated into fixtures and our chambers, so you can rest assured during your testing.

Our ATPs provide a lifetime value. If taken care of properly, the gold-plated contacts resist corrosion, and the materials can be changed and reconfigured over time instead of being replaced. Integrated PCBAS circuit boards allow customers to optimize their fixtures depending on their ongoing needs. AES's perfected solution provides customers with the capability to have an ATP for over a decade with no repairs, modifications, or replacements.

# The Importance of Choosing AES

Chamber size is pivotal in battery testing. Understanding which testing chamber size is needed is essential to identifying the appropriate amount of cells under test, the energy produced by each cell, and the force the door can effectively handle. Many companies needing a battery test chamber often assume they must maximize channel count by purchasing the biggest chamber. This can lead to companies purchasing a chamber that is too large for their lab space or risking safety. If safety hazards then arise, such as the risk of a [BTE \(Battery Thermal Event\)](#), could place your employees, cells, and equipment at risk. You will spend more money than you should on repairs and maintenance fees.

Safety is an essential part of battery testing. If battery cells are positioned too closely together, a chain reaction can occur, causing thermal runaway to propagate from cell to cell. AES prioritizes safety first and foremost, which is why each battery fixture is designed to prevent and mitigate any risk in the chamber environment. To promote the safety of users, AES developed AES SAFE for its line of battery test chambers. AES SAFE chambers, such as the [SC-512-4-SAFE](#), have the required safety measures to avoid circumstances that could lead to a BTE so customers can feel comfortable innovating. From product sensors to a burst disk and safety purge, customers can have the most appropriate options for their specific risk level. Beyond the initial design and construction of each battery chamber and fixture, AES will ensure that each purchased product maintains its ROI through regular safety maintenance checks. AES's extensive experience eliminates the risk of larger issues and protects the long-term life of the product.

## Conclusion

As the world shifts, AES will be here to help its customers navigate an evolving frontier. Our dedicated team welcomes customers' ideas and visions and is committed to transforming those aspirations into tangible realities. AES's entire team operates with a customer-centered approach with decades of experience.

Learn more about AES's battery fixture solutions and how they can support revolutionary products. It's an investment that stands the test of time.

# References and Appendix

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