

# Advancements in CFD for Battery Energy Storage Systems

## The Challenge

Fueled by an increasing desire for renewable energies, many Utilities are considering significantly increasing their investments in battery energy storage systems (BESS). Indeed, renewable energy sources tend to be erratic with peak production times not necessarily aligned with peak demands. This creates a logistical nightmare for the Utility which strives to supply its customers with a reliable and uninterrupted power source. This is where BESS shines, by storing renewable energy when supply exceeds demand, and restoring that energy to the grid when needed; the BESS provides the much-needed flexibility and resiliency to the grid.

However, this large array of energy storage and delivery comes with significant challenges to the cooling and ventilation system design, and potentially significant costs of on-site modifications should the challenges not be addressed up front. Decision makers may see the risks—time, money, reputation—associated with system outages and costly cooling system rework as a barrier preventing them from participating in this expected record industry growth.

## The Solution

### Reduce Risks by Implementing Simulation Early in the Design Process

Rand Simulation has the expertise to provide simulation-based guidance early in the design cycle, ensuring that designs work correctly the first time. Our team has 200+ combined years in the engineering simulation and design industry, and we have completed more than 4,000 CFD, FEA, and electromagnetics analysis projects. Our proven, collaborative approach means we will work with you from brainstorming through successful analysis, making sure the results meet your expectations. And our deep knowledge of the Utilities industry means that we will work efficiently because we speak your language, understand your challenges, and are aware of regulations you must follow.

Our experts can help you dramatically reduce the chance of costly rework on built structures by testing a battery energy storage system design early in the process or when the system goes down, identifying possible performance issues, and adjusting the design to address those issues. Our analysis capabilities include:

- ▶ Evaluating HVAC performance
- ▶ Quantifying temperature uniformity in batteries
- ▶ Ensuring temperature is within the range set by warranty
- ▶ Resolving aging discrepancies between batteries
- ▶ Solving end of life capacity problems



“Rand SIM has supported many of our battery Storage efforts for some of the largest systems in the world. Their support has been crucial in guiding us down the right path to meet stringent manufacturer temperature requirements and tight power purchase agreement schedules. Their CFD experts continuously review our projects, create new analyses and support engineering as well as construction modifications for HVAC systems, drastically increasing battery operability and life span. The Rand SIM team has been responsive, professional, consistent, and on the mark for all of the battery storage systems projects they have supported. Owners and EPC contractors have all been very thankful to have Rand SIM consultants on the Engineering team, providing them with great confidence in their designs!”

—Tony SlatonBarker, PE  
VP Energy and Sustainability  
Coffman Engineers, Inc.

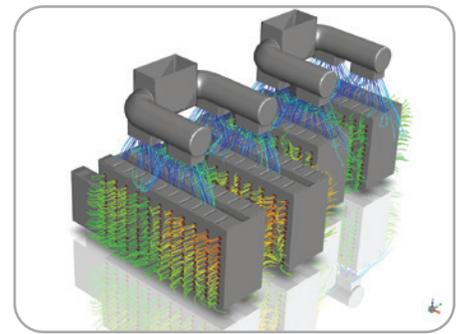
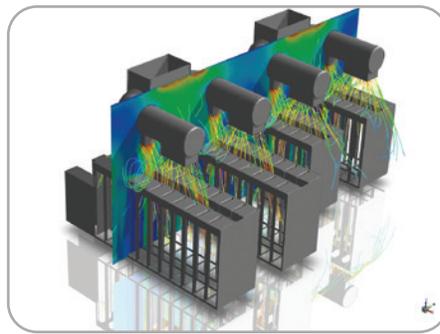
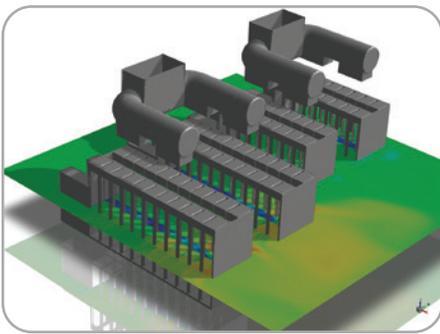
## The Value

### Save Time, Money, and Your Reputation

#### *Solve Complex Problems Before Building*

The process of physically testing a new battery energy storage system can take weeks, and often occurs on-site in the initial phase of the system deployment. If the system fails any part of the test, the project moves backwards, increases in costs, and frustrates all involved. Rand SIM will replace much of the physical testing work with simulation analysis, allowing you to:

- ▶ Generate a much more mature design
- ▶ Spend more time on value-added activities
- ▶ Enhance cohesion between designers, machinists, and other stakeholders



*Simulated flow and temperatures within a battery array under a proposed ventilation system design.*

#### **Reduce Downtime**

In addition to creating efficiencies during the initial design process, Rand SIM can get you back up-and-running quickly when something goes wrong with the completed product. You will no longer need to spend weeks diagnosing a problem. Instead, our team can use Ansys Fluent software to quickly identify the source of the problem, design a fix, and quantify its effectiveness.

#### **The Rand Simulation Difference**

Ansys Fluent software is only half the equation. The other half is partnering with a company that can help you efficiently implement the software and get a strong return on investment.

Rand SIM has extensive experience with the battery energy storage system industry, acquired through a plethora of projects from multi-billion-dollar organizations to start-up businesses both as a CFD lead and peer reviewer. By combining best-in-class simulation software, computing resources and experienced engineering resources, Rand SIM is here to provide industry leading simulation methodology and fast simulation turnaround to help you gain confidence in your design quickly and accurately.

Contact us today for a complimentary workflow assessment for your BESS projects.

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#### **About Rand Simulation**

Rand Simulation is focused on helping organizations bring their product vision to reality through incorporating engineering simulation technology into the product development process. Rand Simulation caters to product development organizations looking to compress the design process, maximize innovation, strengthen competitive differentiation and grow bottom-line profitability. Rand Simulation serves as both a North American reseller of ANSYS engineering simulation software and as a trusted design consultant offering insights gained on over 3,000 design projects using engineering analysis software to balance design performance with size, cost, DFM and aesthetics.