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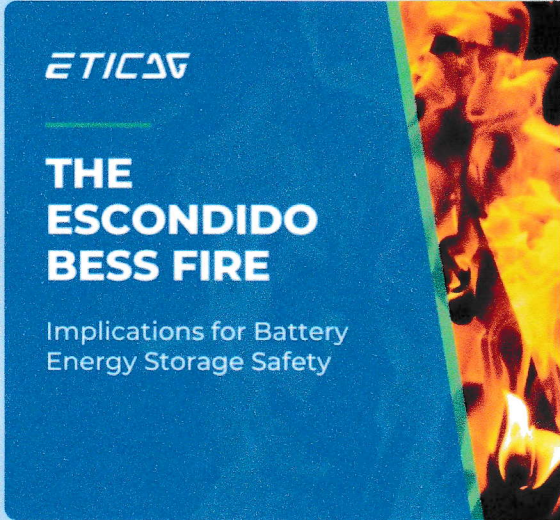
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The Escondido BESS Fire: Implications for Battery Energy Storage Safety

March 21, 2025 |  EticaAG Team



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The Escondido BESS fire highlights the urgent need for improved safety in battery energy storage. As lithium-ion fires become more frequent, solutions like immersion cooling and smarter fire suppression are essential. This incident is a wake-up call for the industry to prioritize proactive safety measures and regulatory advancements.

Introduction

Energy storage is the backbone of renewable energy integration. But when things go wrong, the consequences can be severe. In September 2024, the Escondido Battery Energy Storage System (BESS) fire sent shockwaves through the energy industry. This wasn't just another fire—it was a stark reminder that safety in energy storage is non-negotiable.

Understanding what happened, why it happened, and how we can prevent future incidents is critical. **The future of energy storage depends on better safety measures, smarter technology, and innovative solutions like immersion cooling.** Let's dive into what we can learn from the Escondido BESS fire and what the industry must do next.

Incident Recap

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Details of the Fire

On September 5, 2024, a **fire erupted** at San Diego Gas & Electric's (SDG&E) 30MW/120MWh BESS facility in Escondido, California. The fire was confined to a single containerized unit out of the 24 on-site and lasted approximately 13 hours before burning out. The blaze broke out in one of the battery storage containers, quickly escalating due to the highly flammable nature of lithium-ion cells.

According to reports, the fire was first detected by the facility's monitoring systems, triggering an immediate response from SDG&E personnel and local emergency services. The fire suppression systems activated, but due to the intense heat generated by the thermal runaway event, the flames persisted for hours. Firefighters arrived on the scene and implemented specialized containment strategies to prevent the fire from spreading to adjacent containers.

One of the biggest concerns was the potential for toxic gas emissions. As a precautionary measure, authorities issued evacuation orders for nearby residents. Fortunately, air quality monitoring throughout the incident indicated that emissions remained within safe limits, and no significant environmental damage was recorded.

Emergency Response

The Escondido Fire Department and SDG&E personnel executed a well-coordinated response. Evacuation orders were promptly issued and lifted shortly after, reflecting adherence to industry best practices. The firefighters worked closely with SDG&E engineers to ensure the safety of first responders while mitigating further damage. Specialized equipment, such as thermal imaging cameras, was used to monitor hotspots within the affected battery unit.

Firefighters utilized cooling agents designed for lithium-ion battery fires, as conventional water-based suppression methods were ineffective. This targeted approach prevented further flare-ups and ensured that no additional containers were compromised.

Current Status

Investigations into the root cause of the fire are ongoing, but preliminary reports suggest a possible electrical fault or manufacturing defect within one of the battery cells. The facility remains offline, with regulatory agencies working alongside industry experts to assess the damage and determine necessary safety improvements. SDG&E has committed to reviewing its fire prevention measures and may implement additional safeguards, including enhanced battery monitoring and fire suppression upgrades.

Paused Battery Storage Projects

Following the Escondido fire and similar incidents, several battery storage projects across the country have been put on hold. Utilities and developers are reassessing safety protocols and implementing additional fire prevention measures before proceeding with new installations. Some states, including California and Arizona, have temporarily halted approvals for large-scale battery storage facilities while safety reviews are conducted. This pause underscores the need for comprehensive

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have temporarily halted approvals for large-scale battery storage facilities while safety reviews are conducted. This pause underscores the need for comprehensive risk assessments and improved fire mitigation strategies before further expansion of BESS infrastructure.

Lithium-Ion Battery Storage Risks

Thermal Runaway: The Core Issue

Thermal runaway is the primary cause of most lithium-ion battery fires. It happens when a battery cell overheats beyond its safe limit, triggering a chain reaction that spreads to neighboring cells. This reaction escalates quickly, resulting in a fire that can be extremely difficult to control.

Once thermal runaway begins, traditional fire suppression methods become largely ineffective. The intense heat generated by the reaction far exceeds the capacity of most fire suppression systems. As a result, the fire can last longer, making it harder for emergency responders to control. The increasing size of battery storage systems adds to the risk, as larger systems create more potential for a widespread fire.

Toxic Emissions: A Hidden Danger

Beyond the visible flames, battery fires also **release dangerous toxic gases**. These include hydrogen fluoride (HF), carbon monoxide (CO), and other volatile compounds. Hydrogen fluoride poses serious health risks, including respiratory damage and severe skin burns.

These hazardous gases complicate firefighting efforts. The conventional methods used by firefighters cannot easily contain these emissions, which can spread quickly and endanger both responders and nearby communities. Moreover, water-based suppression methods can worsen the release of these toxic byproducts, making it more challenging to manage the fire safely.

Historical Context: Not the First, Not the Last

The Escondido fire is part of a troubling trend of incidents involving large-scale battery energy storage systems (BESS). Other high-profile fires, like the one at the **Moss Landing** facility in California, reveal a recurring issue with the safety of battery storage. These events highlight the ongoing risks associated with the growing use of lithium-ion batteries in energy storage.

The question is no longer just about why these fires occur, but how to prevent them. The frequency of such incidents signals the need for better safety measures and more robust industry regulations. Until these concerns are addressed, the risks associated with battery storage will continue to pose significant challenges for the energy sector.

Challenges In Extinguishing Lithium-Ion Fires

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Challenges In Extinguishing Lithium-Ion Fires

Why Traditional Firefighting Fails

Traditional firefighting methods, such as using water, can make a lithium-ion battery fire worse. When water comes into contact with the batteries, it can **short-circuit the cells**, exacerbating the situation and potentially causing the fire to spread further. This reaction is particularly dangerous because it increases the intensity of the fire and can lead to additional battery cells igniting.

Additionally, **conventional fire suppression systems are not designed to effectively reach the densely packed battery modules**, which makes it challenging to fully control the fire. These systems are built for standard fires but lack the specialized capability to target fires within the intricate, tightly packed arrangements of battery cells, allowing the fire to persist.

Even after the flames appear to be under control, the danger of **thermal runaway** persists. Thermal runaway occurs when a battery continues to overheat and reignite, even after the initial blaze seems suppressed. This complex phenomenon means that **thermal runaway can continue for hours**, even with active suppression efforts. Firefighters face the additional challenge of managing an evolving fire that may reignite without warning.

To combat these unique challenges, firefighters must be equipped with **specialized training and tools** tailored to the specific needs of lithium-ion battery fires. This includes the use of specific fire suppression agents and equipment that can withstand extreme temperatures. This situation underscores the necessity of **proactive safety measures** that address the root causes of these fires, rather than relying on reactive solutions after the fire has already begun.

Advancements In Battery Energy Storage Safety

Immersion Cooling Technology: A Game Changer

One of the most promising solutions to lithium-ion battery fires is **immersion cooling**. Instead of relying on air cooling or traditional suppression, immersion cooling submerges battery cells in **non-flammable, dielectric liquid**.

Benefits of Immersion Cooling

As the energy storage industry continues to evolve, the need for more effective and reliable safety measures has become increasingly urgent. Traditional cooling methods, such as air cooling, are often insufficient in preventing thermal runaway, especially as battery sizes and capacities continue to grow. Immersion cooling represents a revolutionary shift in how we manage battery safety. By using a non-flammable, dielectric liquid to submerge the batteries, this method not only mitigates the risk of fire but also offers a more efficient and sustainable solution.

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Key benefits:

- Prevents thermal runaway before it starts.
- Eliminates fire risk by removing oxygen from the reaction process.
- Extends battery lifespan by maintaining stable temperatures.
- Enhances energy efficiency and reliability.

This technology is **not just an option—it's the future of safe energy storage.**

Regulatory Responses And Industry Standards

Policy Changes: The Industry Reacts

In response to recent incidents, including the Escondido fire, regulatory bodies have intensified efforts to establish stricter safety standards for BESS facilities. The California Public Utilities Commission (CPUC) has implemented new maintenance and operation standards, mandating the development of emergency response plans and technical logbook standards for BESS operators.

Industry Best Practices

The energy storage industry must take responsibility for safety. Implementing best practices such as:

- Regular thermal imaging inspections.
- Smart battery management systems (BMS) for real-time monitoring.
- Adoption of **immersion cooling** for next-generation BESS facilities.

Safety should never be an afterthought. **It should be built into every step of the design, installation, and operation of BESS facilities.**

Looking Ahead: Lessons And Future Safety Measures

The Path Forward

The Escondido fire is a wake-up call. But **it's also an opportunity** to innovate and push for safer, more resilient energy storage solutions.

Key takeaways include:

- **Thermal runaway remains the biggest threat to battery storage.** Prevention is the only real solution.
- **Traditional fire suppression methods are inadequate.** We must invest in

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- **Traditional fire suppression methods are inadequate.** We must invest in technologies like **immersion cooling** that address root causes, not just symptoms.
- **Regulation and industry standards must evolve.** Safety improvements should be proactive, not reactive.

The future of energy storage is bright—but only if we prioritize safety. The time for change is now.

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