

INTELLIGENCE UPDATE

South Korean data center fire sparks a stark reminder



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On September 26-27, 2025, South Korea's National Information Resources Service (NIRS) data center in Daejeon (87 miles/140 km south of Seoul) suffered a catastrophic fire incident that started with a lithium-ion battery thermal event. The loss of the site crippled hundreds of government systems and exposed weaknesses in resiliency across systems and procedures.

The incident started as batteries were being relocated from the server floor of the data center to the basement. Contractors were removing aging Li-ion batteries, using a type of nickel-manganese-cobalt (NMC) cell chemistry, from the IT floor as a precautionary move. However, one of the battery packs in the basement entered thermal runaway that resulted in an uncontrolled fire. The fire burned for almost a day, taking more than 200 firefighters and 60 fire engines to contain and extinguish it.

The incident is a reminder of the concomitant risks that come with high energy density Li-ion cells if not mitigated appropriately. It also provides another example of multi-layered failings in infrastructure resiliency as hundreds of terabytes of government data were irrecoverably lost due to major gaps in IT disaster recovery practices.

What went wrong?

Ironically, what ultimately set the stage for the fire incident was an attempt to avoid it. The data center had large amounts of Li-ion batteries in the IT room, positioned within 1.97 feet (60 cm) of live servers, and the contractors were relocating the aging batteries to the basement.

Preliminary findings and official statements show cascading failures in fire suppression and containment, as well as a lack of IT preparedness for the catastrophic loss of hardware. The 22-hour fire destroyed IT racks and power equipment, and the severity of the damage to the facility requires phased remediation. The scale and intensity of the blaze severely disrupted operations and complicated suppression efforts.

There are several factors that may have contributed to the loss of the site:

- **Aging batteries.** Some of the battery cells were far along their useful life cycle at 11 years. Over time, as cell components degrade due to repeated cycling and material aging, the likelihood of a substandard cell entering thermal runaway increases, even under normal conditions.
- **Density-optimized volatile cell chemistry.** The cells reportedly used a type of NMC chemistry. NMC chemistries are known for their performance, chiefly energy density, but their chemical make-up makes them a potent source of combustibles that are self-sufficient even in the absence of atmospheric oxygen. This makes NMC battery fires an extraordinary challenge to manage, requiring a careful selection of containment measures (chemical and physical barriers, distancing) and fire suppression techniques that also provide a strong cooling effect.
- **Basement location.** NIRS appears to have been addressing a legitimate concern by moving the UPS batteries, which were previously positioned within close proximity of IT hardware, out of the data hall. In many older facilities, the basement can seem a logical location: offering spare mechanical, electrical and plumbing (MEP) space, shorter cable runs, and minimal disruption to IT systems.
- **Relocating batteries below grade.** Heat, smoke and flammable off-gases have fewer escape paths, and emergency access becomes more difficult. Basements also trap heat and hinder firefighting efforts, prolonging suppression and increasing the extent of damage.
Modern fire-safety codes make this clear. Under the National Fire Protection Association (NFPA) 855 standard and the International Fire Code (IFC) (2021, section 1206), below-grade lithium-ion energy storage installations are restricted, unless engineered mitigations are provided, such as dedicated ventilation and exhaust, gas detection systems, explosion venting, and two-hour fire-rated construction. UL 9540A (Test method for battery energy storage systems standard) fire-propagation testing specifically considers the danger of trapped off-gassing: failing cells emit hydrogen, carbon monoxide and hydrogen fluoride, which can quickly accumulate in confined underground spaces.
- **Potential abuse during disconnection, handling or reconnection.**
Electrochemical battery cells, while containing no moving parts, can develop failures due to mechanical shocks, or exacerbate an already present latent failure. Similarly, electrical shocks, such as surge currents during disconnection, reconnection and testing procedures, may also trigger failures in some cells that result in thermal runaways.

Ultimately, the disruptive effect of the loss of a data center site was exacerbated by existing IT practices. Hundreds of government systems went down, many remain partially or fully offline, and a local electrical incident became a national continuity event due to concentrated workloads and recovery paths. Most damaging, however, was the permanent loss of the government's G-Drive, which stored about 858 terabytes (TB) of government data and had no off-site protection. The fallout now spans long restoration timelines, service disruption and public scrutiny, resulting from a systemic breakdown where procedures, compartmentation, site strategy and data protection all failed simultaneously.

Alternative chemistries are available

For many years, NMC cells were the leading type of Li-ion chemistry in mission-critical power

applications due to their superior energy density and broad availability supported by high-volume Li-ion supply chains. Increasingly, more operators now prefer lithium-iron-phosphate (LFP) or lithium-titanate (LTO) cell chemistries as these options have become more available and tested. These chemistries, however, trade compactness — a major driver of the business case for NMC — for better safety and longevity.

Table 1 compares legacy NMC/NCM cells with today’s safer LFP and LTO options for stationary UPS, highlighting energy density trade-offs versus thermal stability, cycle life and fire risk in data centers.

Table 1 Lithium-ion battery chemistries for stationary UPS applications

Chemistry	Energy density (Wh/kg)	Cycle life	Thermal runaway onset	Relative fire risk
NCM/NMC (LiNiCoMnO ₂)	180-250	1000-2000	≈ 150°C	High
LFP (LiFePO ₄)	140-180	3000-6000	≈ 260°C	Low
LTO (Li ₄ Ti ₅ O ₁₂)	80-100	10,000 +	≈ 400°C	Very low

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A reminder for operators

The recent incident underscores the significance of architecture and cell chemistry in equipment selection and achieving data center resiliency objectives. Crucially, facility layout, fire containment capabilities, and fire suppression and equipment selection, the battery monitoring system and the physical and chemical barriers of the battery packs should be appropriate for the characteristics of the battery energy storage system deployed. LFP and other chemistries have attractive fire safety profiles and operational reliability in UPS systems relative to NMC cells, easing some of the concern around the probability of thermal runaway, as well as the costs of appropriate risk mitigation.

Compliance with standards such as NFPA 855 and the IFC 2021 is essential to implementing appropriate fire-rated enclosures, detection, ventilation and physical separation for battery energy storage systems. These measures are fundamental for risk mitigation and post-incident system recovery.

However, the incident is only the most recent reminder that physical protection of the infrastructure alone is insufficient to guarantee service continuity. Operators must architect data platforms to achieve critical recovery time objectives (RTO) and recovery point objectives (RPO). Data resiliency is enhanced through multi-site synchronous replication, automated failover pathways and periodic integrity validation of backups stored at geographically separate sites. Facility upgrades and maintenance workflows should incorporate pre-validated backup environments and disaster recovery procedures. Only with redundancy engineered across electrical, network and data layers can an operator ensure continuity in the face of severe

disruptions.

The Uptime Intelligence View

Modern codes already incorporate lessons from lithium-ion incidents and fire tests, but recommendations typically assume by-design techniques rather than in-situ mitigation. Relocating batteries to a “safer” place can be part of a comprehensive solution if the hazards of thermal runaway are also mitigated. This calls for more expert input into how an energy storage system affects site resiliency with all its concomitant complexities from battery chemistry, placement, containment and maintenance protocols.

ABOUT THE AUTHOR



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Dr. Rand Talib is a Research Analyst at Uptime Institute with expertise in energy analysis, building performance modeling, and sustainability. Dr. Talib holds a Ph.D. in Civil Engineering with a concentration in building systems and energy efficiency. Her background blends academic research and real-world consulting, with a strong foundation in machine learning, energy audits, and high-performance infrastructure systems.

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