

Data-driven insurance for batteries: An unsung hero of the green energy transition

Insurance | Insurance is a cornerstone of de-risking financing and investment into energy storage. Data and analytics-driven decision making is not only for the operation and optimisation of batteries, it's also vital for peace of mind and cementing the long-term success of the industry, Charley Grimston, co-founder of specialist insurer Altelium writes.



Credit: Altelium.

Insurance has always been a building block of market growth. The possession of insurance or, in the case of lithium-ion battery products, an insured warranty, is a sign that the product is supported, understood, evaluated and assessed against risk.

The warranty will last beyond the life of the original manufacturer and gives the product quality assurance and bankability, enabling the market to grow and mature. It therefore plays a vital role in the development of the battery energy storage market.

In addition to this role in helping to secure finance, or in taking risk and financial liability off a business's balance

Insurance impacts on nearly every aspect of creating a successful market for energy storage.

sheet, insurance can play a key part in helping to meet Environmental Social and Governance (ESG) targets. In doing this, it also helps address and overcome some of the key challenges of the sector, namely confidence in battery lifecycles and fire safety risks.

This is because the information and techniques required to secure insurance, such as due diligence of risk and risk mitigation, are also required by new climate change regulations.

The process can also play a meaningful part in establishing best practice procedures relating to site planning, design and operation to mitigate fire risk, particularly in the context of securing Operational All Risk (OAR) insurance for energy storage sites.

The global standard for corporate climate-related financial reporting is the framework of The Task Force on Climate-related Financial Disclosures (TCFD). Endorsed by the G7 and G20, more than 2,200 organisations have officially supported reporting in alignment with the TCFD.

Countries like the UK and New Zealand have introduced mandatory reporting requirements aligned with the TCFD's recommendations, and US president Joe Biden is quoted as saying that his administration's policy is to promote "consistent, clear, intelligible, comparable, and accurate disclosure of climate-related financial risk" and to "act to mitigate that risk and its drivers".

The demand from investors for meaningful information on how companies are preparing for the climate transition is directly relevant to anyone operating in the energy storage market.

While this top-down pressure is being applied, there is also pressure from the bottom up, as consumer rights are strengthened. For example, the Danish consumer ombudsman recently confirmed that scientific documentation such as life cycle analysis must be provided to back up green claims, with sizeable fines for any company found guilty of 'greenwashing'.

Similarly, in the UK the Competition and Markets Authority (CMA) has begun its review of industries where there are consumer concerns about misleading 'green claims'.



President Biden has emphasised the importance of disclosing climate-related financial risk.

Claims of 'green wash' will be judged against the six principles that are based on existing consumer law:

- Claims must be truthful and accurate
- Claims must be clear and unambiguous
- Claims must not omit or hide important relevant information
- Comparisons must be fair and meaningful
- Claims must consider the full life cycle of the product or service
- Claims must be substantiated

It's easy to see how these six principles could be applied to insurance, or the provision of information as part of the insurance process.

Understand risk to reap rewards

In the same way that life cycle analysis of carbon emissions has to be calculated at every stage in the product's development, from first to end of life to give a realistic calculation of carbon output (or reduction) so too risk has to be understood and quantified at every stage; from understanding manufacturing systems and internal battery chemistry, to knowledge about best practice operating plans and procedures in energy storage systems.

This is why insurers who specialise specifically in batteries are so important to the future of the energy storage market, because few have the ability to understand the chemistry and technology involved, or the ability to process and apply the battery data required to understand, mitigate and price the risk to offer realistically valued premiums and meaningful terms.

While energy storage companies will want to ensure good ESG ratings for their stakeholders, investors and customers, the metrics and processes involved can play an important part in securing insurance,

reducing risk, improving operational safety and increasing profitability.

An example of how this will work in practice is provided by the Moss Landing Energy Storage Facility, at 400MW/1,600MWh currently the world's largest battery energy storage system (BESS) project. Its 300MW/1,200MWh Phase 1 shut down last September following "a high temperature event". It will come back online in the first half of this year.

It has been reported that rather than battery modules overheating and causing the incident, it was actually a sprinkler system's response to smoke coming from an air handling unit. A bearing unit failed, which caused the heat detection system to trigger automatic flooding.

There had initially been no battery failure although the automatic drenching caused damage to 7% of the installed battery modules.

Future energy storage sites will now take such a circumstance into account and the likelihood of it happening again will be planned out through different sensors and systems.

Reviewing design plans, including heating and ventilation, fire detection systems such as gas detection and infrared thermal cameras, plus water management, spacing of units and blast walls, will all be part of good risk mitigation and planning.

Work together with your insurer

There is, of course, mutual interest between lenders and borrowers in ensuring projects are appropriately protected against relevant risk exposures. The more well designed and operated the storage system, the more favourable the insurance terms will be and it stands to reason, the more sustainable and higher ranking on any ESG framework that asset will perform.

Insurers are the keepers of extensive applied battery knowledge and experience, and by forming a good working relationship and sharing knowledge with them, the energy storage market will benefit from this expertise through improved premiums and services.

There are two layers to the process used by insurers to assess risk. Firstly the reference data of the batteries involved is examined, to understand the battery chemistry and the electrical architecture within the BESS. The second layer is to look at the operational data from the site to understand how the asset has been designed and built and how it is being managed - the system of checks and maintenance in place.

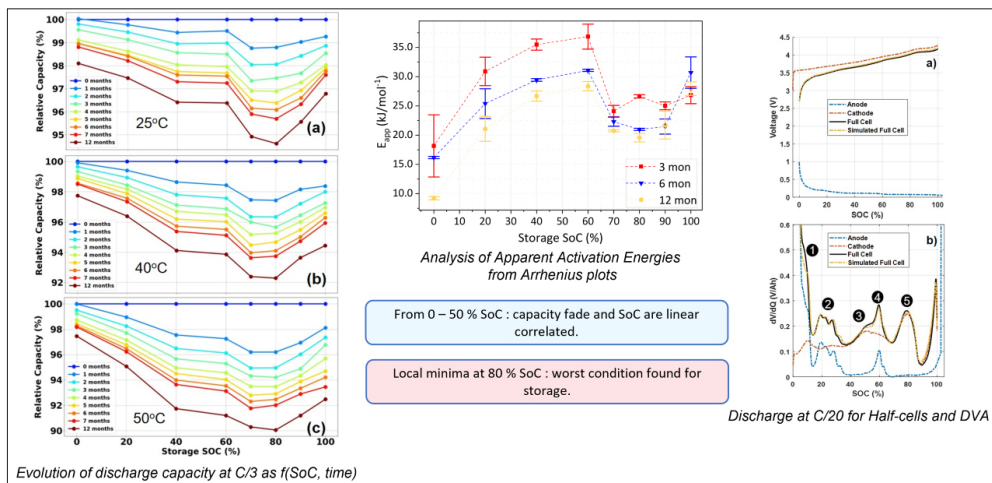
AI and advanced science replaces historical reference points. Altium for example works with Lancaster and Newcastle Universities in the UK, each specialists in different areas of lithium-ion chemistry, and our co-founder Professor Harry Hoster is Scientific Director of ZBT, Centre for Hydrogen and Fuel Cell Technology at Duisburg-Essen University, Germany.

How battery data is gathered and used

Battery chemistry and health is obviously the predictor of future health and safety. Knowing the internal resistance of a battery cell gives an indication of lithium plating which affects both degradation and likelihood of short circuits occurring.

The data on different chemistries and performance against charging cycles and operating conditions is gained through enhancing real life battery data from telematics and connected devices with AI, and testing batteries in laboratory conditions to both gather raw data and test the AI modelling outcomes.

Lithium ion battery degradation slide Dr Alana Zülke.png



Up to 150 battery cells can be simultaneously tested, ageing batches of batteries under different, well defined conditions of current, voltage and temperature. This speeds up a process that normally takes a year to a matter of weeks.

We can determine from the data what the gradient of degradation is and match that against the mean data we have for that chemistry, and also determine other factors inside the battery.

The chart below is taken from a presentation given at the 2021 Altelium Industry Day where Dr Alana Zülke presented the results of a four year research project between five universities, coordinated from the Lancaster Energy Bat Lab, to test the affect of calendar and cyclic ageing on batteries.

This has proven that battery degradation is highly dependent on the charge level at which the battery is left and on the ambient temperature, factors which are at play in all BESS facilities. The research allows optimised life prediction models to be developed and informs better use strategies to extend the durability of batteries.

This informs due diligence, where we assess the design and manufacturing process to consider all the electrical and electro mechanical systems within the BESS to identify the failure rate of different parts and their optimal operating condition.

Running data monitors the performance of the asset for compliance against insurance terms and allows us to feed back data to the operator so that they can optimise the asset lifetime and output.

On the fire risk and explosion side, the design of the battery is explored but also the design of the system within the container, and the overall site layout, what we describe as the second layer of assessment.

Looking at the site, it is vital for example that there is proper separation of units one from another, with fire walls between each; proper types of fail-safe systems must be in place so that the system can be shut down by a bystander or emergency responder.

From a sustainability and risk perspective this is clearly a symbiotic relationship. While we are looking for good design from factors such as chemistry and cooling systems, and good husbandry from asset management and maintenance, site owners are looking to protect their assets and investment and optimise their returns through the same processes.

Connected Energy's 1.2MW/720kWh BESS project assembled using Renault second-life EV batteries at an industrial site in Belgium, Europe.



Credit: Connected Energy

Learning from the UK's biggest BESS made with repurposed EV batteries

This process has just been undertaken at Cranfield University, a British postgrad research university. It has installed a BESS to allow the site to balance its energy behind the grid, accommodate a newly enlarged solar farm and an air source heat pump on the district heating to reduce reliance on the gas-combined heat and power system (CHP).

While Cranfield's system is dwarfed by sites such as Moss Landing, what is significant about it is that it's the biggest second-life battery storage system to date in the UK.

The three containers supplied by Connected Energy each hold 24 second-life Renault Kangoo car batteries. One will take excess solar generation at the weekends and deliver this back to the campus on Monday. Two others will connect the battery storage system directly into two of the site's 40 transformers. This scale of application is exactly what many organisations across the world will need to switch to green energy solutions, reduce their reliance on fossil fuel-based energy and meet net zero targets.

Perhaps even more importantly, Cranfield is a blueprint for the EV industry, where batteries are given a second life.

This second life must be facilitated to reduce waste and maximise the use of the embedded carbon locked in vehicle batteries, and in this respect having the ability to diagnose healthy batteries is absolutely crucial.

Strong ESG ratings can mean lower capital costs

Mitigation through risk transfer to the insurance market through organisations

such as Altelium is one of the most cost-effective, tried and tested ways of obtaining such protection for insurable risks. Plus as mentioned, it can provide key metrics for ESG targets or climate-related financial disclosures.

What those metrics should be is still open to discussion. There are several agencies specifically established to provide ESG ratings, such as MSCI, Vigeo Eiris which is part of Moody's Investors Service, FTSE Russell from the London Stock Exchange Group and RobecoSAM.

All work on the basis of rules-based methodologies, for example Vigeo Eiris applies a score from 0 – 199 against up to 38 criteria developed for 40 different industries.

Because a good ESG rating can help attract a lower cost of capital there is a big incentive to scoring well on these measures, beyond the desire to do the right thing for the environment. A high ESG rating can also help to recruit and retain staff and customers, but gathering, collating and scoring the required data can be complex task. Using the data for insurance purposes adds value to the work involved.

The most important aspect to the metrics, from the point of view of ESG and the CAS principles, are that they are clear and meaningful and this is obviously applicable to the insurance and warranty application process too.

The key steps in supplying information for insurance assessment, ESG or climate disclosure are:

1. Share information & plans
2. Create a framework of questions and answers which can form KPIs and be easily updated
2. Provide regular feedback of any changes to plans

3. Share learning from across the market, as in the Moss Landing example to build on and share from experience.
4. Involve specialists such as fire experts or design engineers from your insurers team

At Altelium we have an online system or platform which provides a step-by-step guide through this process, and most insurers are moving to this type of model.

Adapting, learning and overcoming industry's challenges

Once an account or customer is accepted, an online 'wizard' prompts with question and responds intelligently with further questions and prompts to help capture all the information required to assess risk and provide insurance cover.

Platforms such as this are often called 'end-to-end' because the entire process from initial due diligence, data analysis, paperwork and payment, monitoring and management processes are all handled within one Cloud-based, secure system.

"With an active and engaged insurance market, the sector will be able to adapt, learn and overcome the challenges it faces"

With an active and engaged insurance market, the sector will be able to adapt, learn and overcome the challenges it faces, most notably in mitigating fire risk and also further down the line, trading in second life batteries and managing them at their end of life.

In December the EU published its Circular Economy Action plan outlining the mandatory requirements for all batteries (i.e. industrial, automotive, electric vehicle and portable) placed on the EU market. Requirements include use of responsibly sourced materials with restricted use of hazardous substances, minimum content of recycled materials, carbon footprint, performance and durability and labelling, as well as meeting collection and recycling targets.

With its emphasis on end of life and recycling this is another area where insurance will help to inspire the necessary finance to invest in recycling plants as well as develop protocols and procedures for the safe handling and transportation of used batteries.

When the system of disclosures and reporting is working well it will be the driver for the transition to green energy through battery storage systems operating under ever safer and more sustainable conditions, with insurance underpinning a lively and rewarding market. ■

Author

Charley Grimston is executive Chairman and co-founder of Altelium, an insurtech business offering insurance for batteries driven by real-time AI-powered data analytics. He has deep experience of the insurance industry and floated the first Lloyd's quoted investment trust underwriting vehicle on the London Stock Exchange, under the Hambro Conning Grimston flag (HCG Lloyd's Investment Trust plc). Charley was a founder member of Lloyd's Corporate Capital Association. He remembers the excitement of first seeing a US wind turbine in 1976 being underwritten in the Lloyd's market and has been involved in the green energy industry ever since. Charley is a member of the British Standards Institution (BSI) committee which developed the UK standards for safe and environmentally conscious handling of battery packs and modules.



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