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LARGE SCALE BATTERIES FOR ENERGY PROJECTS: LITHIUM BATTERY DESIGNS

This series of articles will highlight the commercial case for two different types of large scale battery. Large scale batteries widely differ in terms of their flexibility, life-time resilience, day-to-day reliability, initial purchase price (or CAPEX) and the ongoing cost of their maintenance & upgrades (OPEX). It is, obviously, crucial to identify the right battery design and manufacturer.

Battery Designs

It is easy to waste money on an over-specified battery that offers expensive features and benefits you will seldom use.

It is also easy to waste money on a battery which is simply not up to the job, vis-à-vis Balancing & Back Up requirements and / or the climatic conditions faced and final costs of system failure there.

There is a multitude of different battery types. Their characteristics vary hugely. The manufacturers and the designs of each type vary widely too, in terms of the robustness, reliability and long-term performance and maintenance, warranty and general aftercare requirements.

Prices vary as well and price itself is not always a reliable guide to value or performance. In short, the large scale battery market is still evolving. Fragmented, unregulated, opaque: It is a challenge, but the rewards for getting it right are huge.

Lithium Battery Designs

Lithium ion is a 'conventional solid-state' battery which involves the exchange of free ions across an exchanger, a technology which was pioneered by Sony in the late 1980s. It is now over-taking sodium sulphur as 'battery of choice' in large scale battery applications.

Pros:

- Has the highest energy / power densities of any battery - 0.250 kWh/kg / 0.325 kW/kg.
- Simple 'plug and play' installation.
- Well known, commonly-understood technology with a large number of producers.

Cons:

- OPEX may be unpredictable and rise in the future if cell-replacement costs escalate - but some manufacturers offer a 10 year/100% performance guarantee.

- Batteries produce toxic and non-recyclable waste products, including hydrogen which is explosive, hence the need to assiduously manage the delicate operating balance of these batteries at all times using the control systems and maintaining fire prevention systems. In tropical climates there is a residual fire risk, however robust the product chosen.

- The price of the main raw material (Lithium Carbonate) is rising. This may affect CAPEX/purchase price in the short-term and OPEX over the long-term. Between 5% and 8% of fuel cells typically need replacing every year, although this will depend on how they are used & cycled. Whatever the figure is, this cumulative degradation effect needs to be reflected in the OPEX of any financial model.

Conclusion:

Lithium Ion is a proven and increasingly favoured technology which is fast becoming the large scale battery of choice among European smart grid and embedded generation developers.

That said, there is still concern about some safety and security issues, especially if the batteries are to be stored in a confined enclosure or catacomb where temperatures may surpass 35 - 40oC, or where humidity may change rapidly, or where they are left in exposed areas which may also be prone to very high ambient temperatures.

The risk of fire and of explosion are known risk factors with any lithium battery.

Large scale Lithium batteries are now believed to be illegal in New York for example. Fears of terrorism (or a proximate fire) may be the thinking behind this move. Whether these fears are founded or not, the concern is that a lithium battery may be a target object/hazard, even if the battery itself is properly maintained.

Prospect Law and Prospect Advisory provide legal and business consultancy services for clients involved in the infrastructure, energy and financial sectors.

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