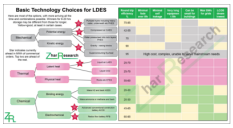
Long Term Grid Storage Can Do Short Term As Well

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Media:



Much discussion of green grids revolves around avoiding waste (curtailment) rising to the 12% upper figure predicted by IRENA. Most immediately, it should be avoided by more timely installation of vast amounts of short-term storage, the quickest fix being lithium-ion batteries. This reflects the inevitability of wind and/ or solar power winning on cost in most regions. Pumped hydro is too slow to approve and install even where sites are suitable. The next concern is the need for long-term storage. The new Zhar Research report, "Long Duration Energy Storage LDES Markets 2023-2043: Grid Microgrid Delayed Electricity 6 Hours to Seasonal" details that trillion-dollar cumulative opportunity with unique new forecasts, roadmaps and technology assessments.

Huge Storage is Coming

Dr Peter Harrop, CEO of Zhar Research explains,

> "Grid storage needs are becoming extremely large with Tesla calling for 240TWh primarily to support the economic success of solar power. Within that, the LDES Council recommends 85-140TWh of long duration energy storage worldwide by 2040 with an investment of $1.5 and 3 trillion. Zhar Research believes that about 112TWh of LDES may be achieved by that time. RethinkX calculates that, on cost alone, the US should be entirely on wind and solar power supported by storage clocking 35-90 days average duration (time of subsequent discharge at full rated power) depending on region. That ignores strategic reserves, LDES technological breakthroughs and electric vehicles assisting with short term storage so, in reality, that average duration could be longer. For now, Zhar Research projects a global average of 56 days duration in 2040, rising thereafter."

As we approach 100% wind and/or solar in more places, we need a lot of storage capable of covering months of dull, windless weather, of the type that hiked up electricity prices in the UK in 2020 because of a lack of storage. We even need some seasonal storage because, where most of us live, solar will often end up cheapest and, in winter, it gives only one fifth of the amount of electrical energy in such regions. Stakeholders are increasingly aware.

Long Term Can Do Short Term Too

However, the Zhar Research report comes to one surprising conclusion. Whisper it quietly, but it is a myth that most of these emerging LDES technologies still need today's short-term storage because they will lack the capacity and speed of response. For example, gravity storage lifting blocks can store forever with no "leakage" or fade of capacity but it can also respond in seconds.

Advanced batteries responding in seconds and replacing lithium-ion may never competitively store for more than 30 days delay or duration after such a time. However, up to 30 days duration is much more of the potential demand than lithium-ion can provide because it ceases to be viable above a mere six hour duration.

Derisking Investment

LDES investment can be derisked because, after installation, it can mostly be used for short-term, long-term or both forms of storage and those decisions can change as required over the life of the installation. The new LDES technologies mostly have life ten times that of today's batteries so versatility of usage through that long life matters. However, extra capacity is required to provide simultaneous short and long term usage if that is envisaged. Should we cost the LDES short-term bonus incrementally?

Back to the Future

With pumped hydro, this has been staring us in the face all along. It can respond rapidly and currently it is used for short term storage but it is well capable of months to seasonal storage at the necessary GWh levels if only we had enough of it. Leakage, including evaporation, is minimal, particularly if the reservoirs are covered in solar panels. Some new pumped hydro already offers 22 hours duration (specified GWh divided by GW). However, as long as it is a scarce resource it will not be designed or used for much more.

Look at Air Storage Differently

Contrast the now-established success of the complementary options of compressed air grid storage at large capacity underground and liquid air storage for other sites and large microgrids. One day, most of these newer options may be designed to perform both long- and short-term storage even where they are slow to charge because that is not the need. With short-term grid storage, fast discharge is the primary need. Particularly with compressed air, the current practice of designing them for 6- 12 hours duration need not continue when the percentage penetration of wind and solar calls for more, though seasonal will be a stretch with forms of air, carbon dioxide or hydrogen grid storage all being contemplated. With enough installed capacity, a single facility may viably serve both functions at the same time without issues of fires, fade of capacity, disposal, toxicity, short life, scarce materials if we exclude hydrogen because of safety, leakage and indirect global warming. Calculations please.

Many Newcomers

Lithium-ion batteries for most new grid and large microgrid (100MW data centers, desalinators etc.) may one day face a perfect storm of less need and that need partly served by LDES installations. Reduced short-term need may come from such things as vehicle-to-house, vehicle-to-grid and smart grids, even grids over wider areas of the globe. Add to that wave and tidal power, monster wind turbines tapping the more continuous wind above 200 meters and airborne wind energy flying kites and tethered drones. Expected soon are versions of all of these providing at least 1MW. All have potential to be made into GW farms. None can respond to changing demand through the day but at least none are dead at night, during precipitation or on dull days.

Adjacent Opportunity

Beyond LDES, Zhar Research covers an adjacent trillion-dollar opportunity in its report, “Active Cooling: Large New Materials, Systems Markets 2023-2043”. Compressed air, liquid air and liquid carbon dioxide LDES all need large scale cooling but the burgeoning demand for cooling extends to air conditioning, freezers, industrial and medical cryogenics, smart apparel and much more.

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