



CLEAN**HORIZON**

The Energy Storage Experts



Update from the Field – November 2019

A monthly analysis note from the energy storage experts

Table of contents

Executive summary	2
New regulations and initiatives discussed this month	5
Europe	5
United Kingdom	5
Asia	5
India	5
Project updates and announcements	6
Overview of the 2019 market for utility-scale energy storage projects	6
Projects announced or contracted this month	6
Oceania	7
Europe	7
Americas	8
Africa	9
Projects commissioned this month	9
Europe	9
Oceania	10
Tenders this month	10
Americas	10
Asia	11
Africa	11
Focus of the month: Energy storage beyond Lithium-ion: Technologies, market movements and cost of storage	12
Redox-flow batteries are the most common alternative to Li-ion batteries, but other technologies attempt to capture market shares	12
Main contenders to Li-ion batteries	12
Redox flow batteries are developed at the MW-scale, but deployments remain rare	14
Vanadium flow batteries express highly volatile electrolyte prices that directly impact the technology's cost of storage and lead to market uncertainty	15
While numerous, flow battery manufacturers have different evolution perspectives and business attractiveness levels	17
Mergers and acquisitions beyond lithium-ion	18
Lithium-ion batteries are likely to remain the most cost-competitive technology, unless claims from alternative providers become real	18
Levelized Cost of storage of a typical grid-connected energy storage system	19
Levelized Cost of storage of a solar-plus-storage system and comparison with CSP	21
Appendix – Assumptions considered	22



Update from the Field – November 2019

A monthly analysis note from the energy storage experts

Table of figures

Figure 1: Utility-scale energy storage projects announced/contracted and commissioned in 2018 and 2019 (ongoing).....	6
Figure 2. Share of operational storage systems (by technology).....	12
Figure 3. Leading vanadium flow battery manufacturers.....	15
Figure 4. Vanadium electrolyte prices and corresponding energy costs.....	16
Figure 5. Evolution of energy cost based on technology and storage duration.....	16
Figure 6. Qualitative overall rating of leading flow battery manufacturers.....	17
Figure 7: Movements in the flow battery sector in 2019.....	18
Figure 8: LCOS of various energy storage technologies for 1 cycle per day.....	19
Figure 9: Figure 6: LCOS of various energy storage technologies for 2 cycles per day.....	20
Figure 10: Levelized cost of energy of PV + storage and comparison to CSP.....	21
Figure 11: Cost assumptions used in LCOS calculations.....	22
Figure 12: PV costs and assumptions considered.....	22