



Tomorrow's Battery Today

Vol. 3 Newsletter



Less cost, less land, more power, and longer duration

INTRODUCTION

What if Carbon Reduction Clean Energy Storage was available at even cheaper cost than lithium-ion batteries? It is. The CRCES™ technology, for many applications, has a cost footprint significantly below that of lithium-ion batteries. You also get the benefits of US materials, content, and labor combined with a great carbon footprint for less money.

This cost comparison showing lower cost is based on complete CAPEX and OPEX but has not taken full credit for the reduced land required with CRCES™ technology versus traditional batteries. Another large benefit is knowing that the life of a CRCES™ unit is 20+ years and with battery technology, replacement costs will be required, and battery life is significantly less than CRCES™. When projecting future battery costs, most companies will take the most optimistic timelines and cost reduction to project out a cost in the future that is lower than today.

Although that was accurate for the last 5 years, in the last year the tide has changed. Battery prices are starting to go up, and this does not even consider the negative impacts on the environment, so it is almost impossible to look at the total cost of batteries today. Even without considering all the additional cost factors for lithium-ion batteries, CRCES™ technology is often less expensive.

PV BATTERIES VS. SOLAR CRCES™

To have an apples-to-apples comparison the AT&V team has referenced one of our earlier examples of a Photovoltaics (PV) battery project versus solar with CRCES™ technology. Prices on equipment and components have been pulled together mid-December 2022 and based on the battery on a \$750/kWh price. This still does not have any cost impacts for environmental impacts and potential disposal. Replacing the batteries, in the future, carries a lot of unknown

risks and could be crippling to the financial well-being of the overall project.

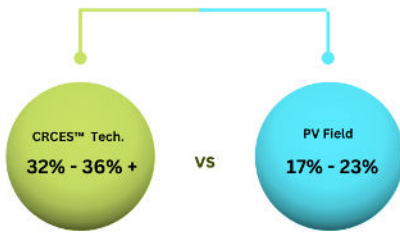
RAPID PRICE CHANGE FOR BATTERIES

If you have not been securing quotes for lithium-ion grid battery systems in the last (3-4) months, you might be behind the times. The pressure of growing demand, combined with shrinking resources and supplier controls over certain markets are all leading to increased prices. Some of this is cost driven, while other forces are simply demand versus supply. No matter which side of the equation you look at many variables are pushing the price of batteries up.

DEMAND FOR LONG-DURATION ENERGY STORAGE (LDES)

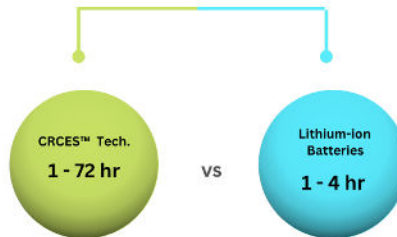
As renewables from solar and wind expand and the market reduces traditional power supply from coal

Solar Energy Efficiency



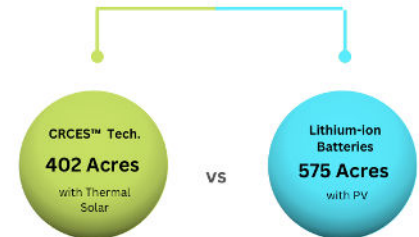
Solar troughs with CRCES™ technology vs PV

Energy Distribution Duration



CRCES™ storage vs. lithium-ion battery

Land Required for Solar and Storage



83MW thermal solar field with CRCES™ 300MWhr vs 83 MW Photovoltaic panels with Lithium-Ion Batteries 300MWhr

and gas plants, the demand for energy supply over longer durations grows. In fact, this segment is growing faster than other segments and taking on a life and profile on its own. Over the last (6) months some foreign markets, California, and the US Federal Government have identified LDES as a critical need. California has decreed that utilities expand LDES by 2026. The Federal government has identified over \$350M to be spent in this segment and that is just the start. As we curtail traditional power plants, which had a potential energy storage component associated with the pile of coal, fuel stored, and/or CNG in the pipeline, we find that our grid is more exposed than ever. This will require a continuing growth in the LDES segment. The US government has targeted 8-24 hrs. of distributed capacity as their goal for LDES. Although this is significant, even the traditional storage to stabilize our grid requires significant increase over the efficient ability of lithium-ion batteries.

NON-ECONOMIC BENEFITS OF CRCES™ TECHNOLOGY

The original goal of CRCES™ technology was based on economic performance. There was no recognition of benefits from an improved carbon footprint, longer life, US content, or better efficiency of performance. Everything was based originally on pure economics versus the lithium-ion grid battery systems. That model is still driving CRCES™ technology, but the list of unforeseen benefits continues to grow. These benefits include:

- Reduced carbon footprint over batteries
- Unknown cost of battery replacements in the future
- Reduced land mass required for projects versus batteries
- Creation of more US jobs over battery development projects
- Efficiency in Long Duration Energy Storage (LDES)
- Unlimited life cycles
- (20)+ year unit life
- Shorter project schedules for deployment
- Efficient utilization and storage of low-quality waste heat

RELEVANT NEWS ARTICLES

- Long-Duration Energy Storage to get \$350M from Department of Energy
- California’s Long Storage Call Shines Spotlight on Support Gaps
- US Sets Another Record for Quarterly Energy Storage Installation Figures
- Corre to Deploy 320 MW CAES Long-Duration Energy Storage Facility for Eneco in Netherlands
- Lithium Battery Pack Prices go up for First Time since BloombergNEF began Annual Survey

RELEVANT CRCES™ TECHNOLOGY ARTICLES

- Tomorrow’s Battery Today
- For a Greener Tomorrow
- Tomorrow’s Battery Today Newsletter (Vol. 1)
- Tomorrow’s Battery Today Newsletter (Vol. 2)
- CRCES™ Frequently Asked Questions

MOVING FORWARD

Put CRCES™ to the test. Send us your RFQ for energy storage along with the performance specifications and the CRCES™ team would be glad to review the application and recommend a CRCES™ design or alternate energy storage system of the best fit for your project.