

*“Can Lead Acid Batteries  
Maintain Their Market Share?”*  
***Yes with new “Lead”ing Technologies***

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# Lead Battery Industry is Growing

- Battery business is good for everybody including lead battery producers.
- Growth in traditional markets is increasing lead battery demand.
- Technology advancements are opening new applications in “mobility for the masses”, small hybrids and grid storage.
- New technology is helping lead grow production capacity...even in Europe!



## Lead Giga-Factory in EU Announced

**Monbat eyes expansion to make bipolar batteries in Bulgaria**

Mon, 03/04/2019 - 00:00 -- Hugh Finzel



Bulgarian lead-acid company Monbat has confirmed proposals for a major expansion of its manufacturing operations in the country to produce bipolar batteries under licence from US-based Advanced Battery Concepts (ABC).

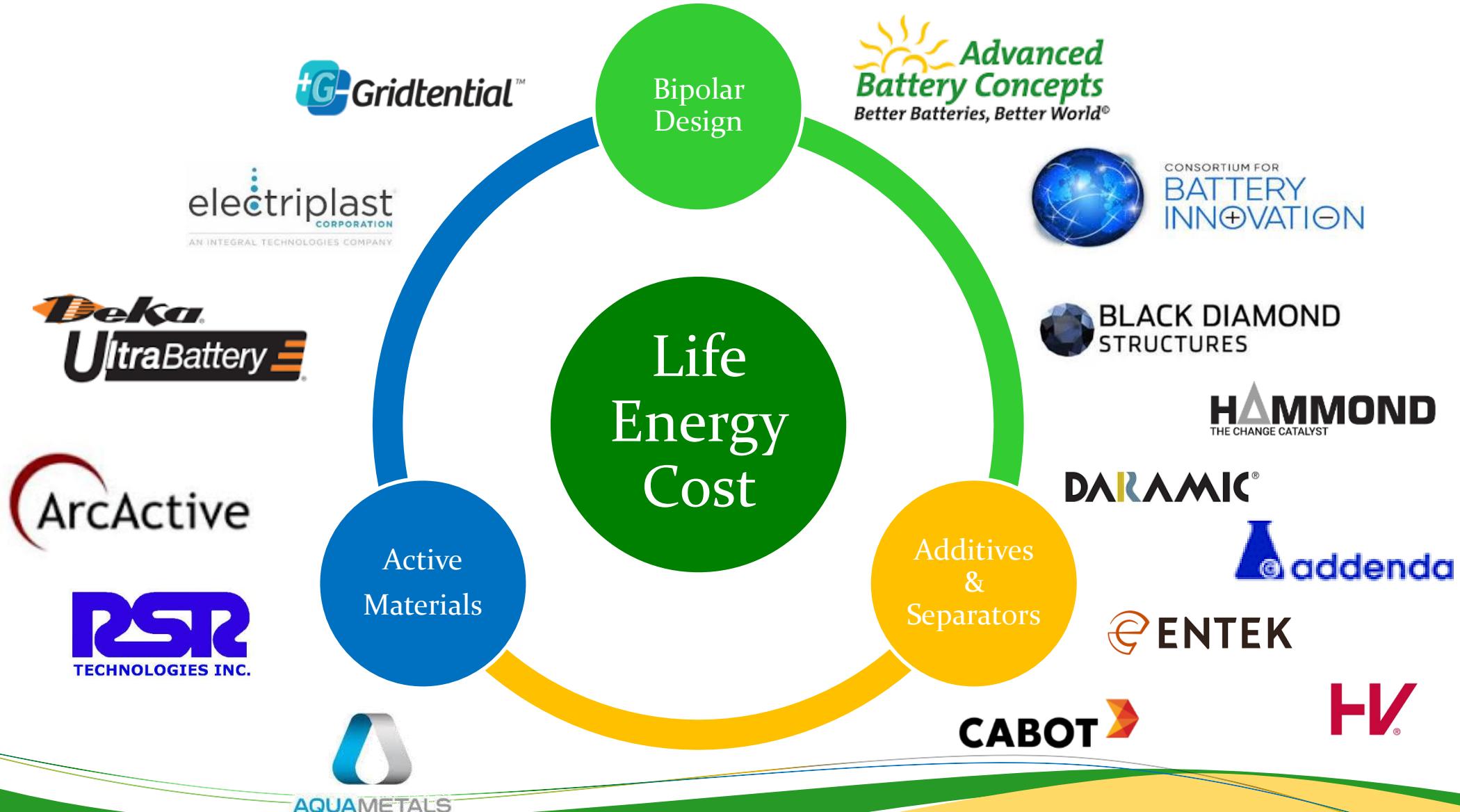
Monbat's licensing deal for ABC's GreenSeal bipolar lead technology was [announced](#) earlier this year—but neither company would say where the batteries might be made.

However, *BEST Battery Briefing* has now confirmed Monbat has taken the first steps towards building a 2.4 gigawatt-hour plant in Vratsa, Bulgaria, especially for the production of bipolar batteries.

Monbat has filed a notice of intention to build with the office of Kalin Kamenov, Vratsa's mayor, indicating the company would be prepared to invest BGN42 million (US\$24.5m) in the project—

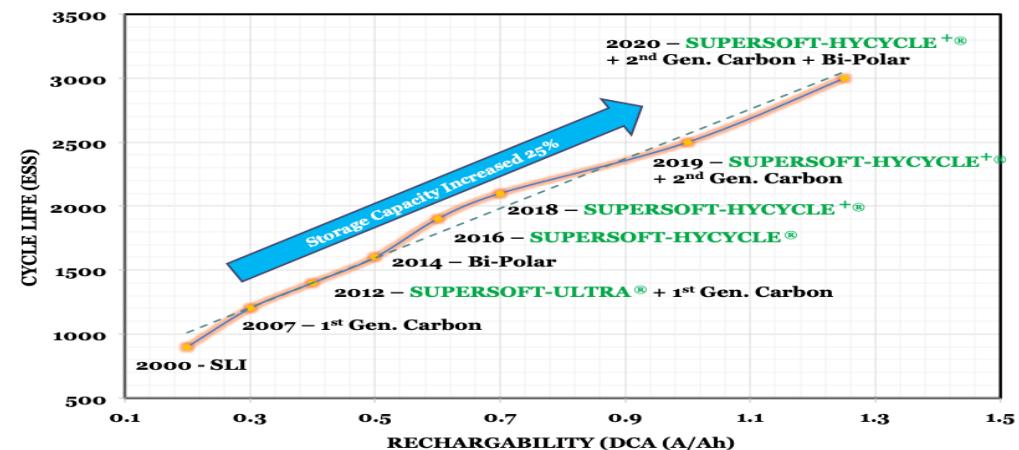
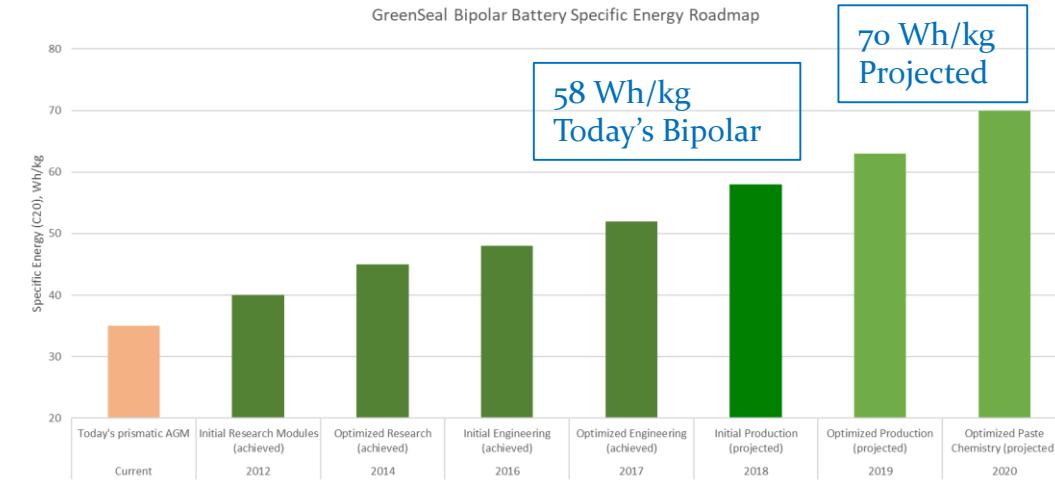


# Lead Technology Areas



# Today's Advanced Lead Performance

- Energy density in lead batteries has been increasing too:
  - AGM  $30 \rightarrow 42 \text{ Wh/kg}$
  - Flooded  $25 \rightarrow 51 \text{ Wh/kg}$
  - Bipolar  $40 \rightarrow 58 \text{ Wh/kg}$
- And life throughput continues to increase with a combination of new technologies.
- Result is lower cost, improved performance with 100% recyclability

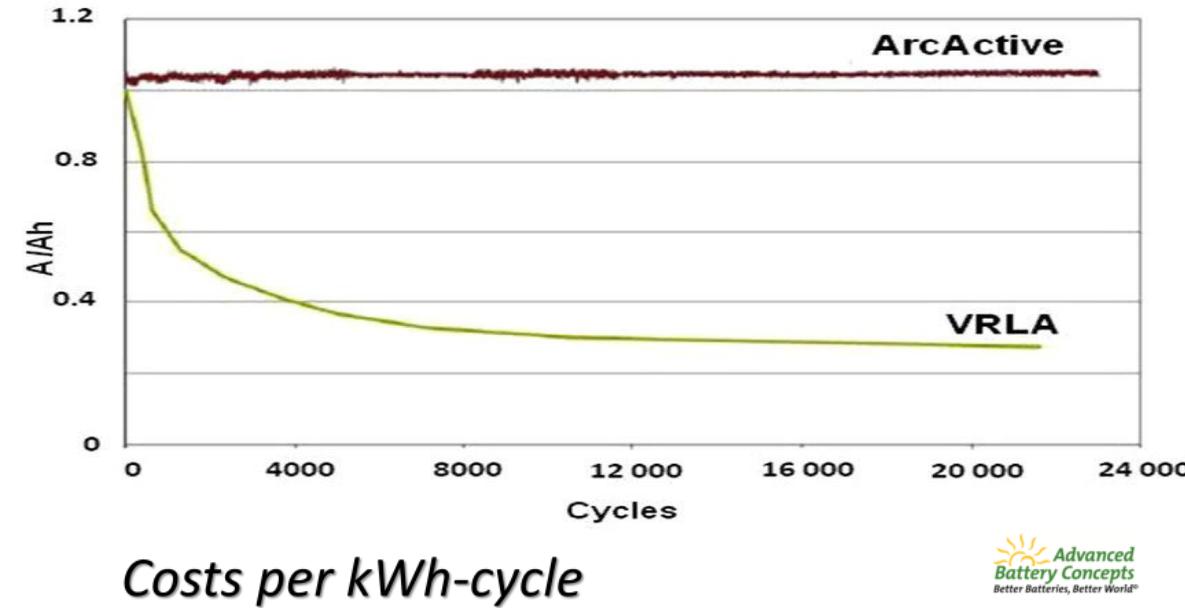


Improved Materials + Advanced Product Architecture

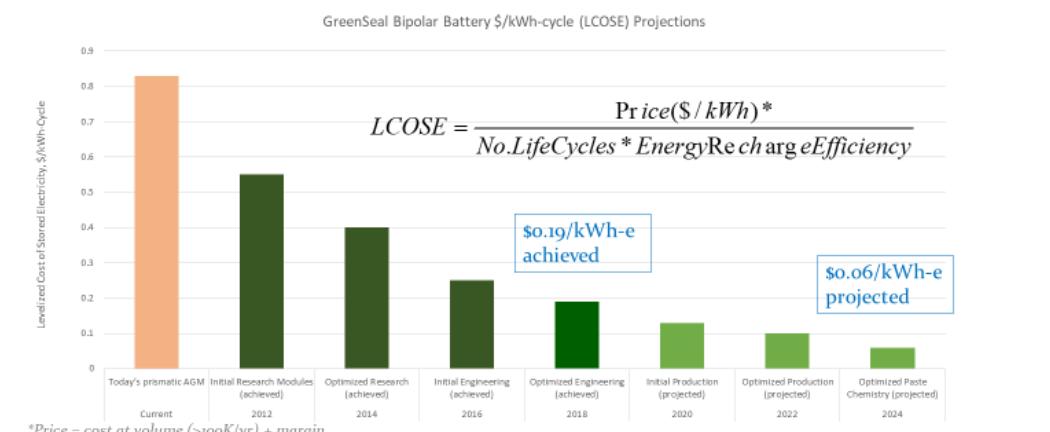
RSR TECHNOLOGIES INC.

# With More Future Growth Coming

- ABC projects that the lead battery industry will **more than double** in the next 10 years driven by technology advancements
- Improved charge acceptance & PSOC life will grow lead markets in automotive S/S and small hybrids.
- Growing low range, low speed EV markets will predominately use lead because of cost.
- Improved cycle life and lower production costs will grow leads use for grid storage
  - Bipolar assembly reduces costs with higher throughput, less energy and less lead.
  - New oxides, additives & materials improve mechanical integrity leading to longer life.
  - Project **6¢/kWh-cycle LCOSE** with profit is possible.



Costs per kWh-cycle



# Thank You