

Welcome

ZAF Energy Systems Introduction

“Changing the Way We Power the World”™

2/21/20

ZAF Energy Systems Introduction

Overview

- **Founded March 2011, Columbia Falls MT; LRIP established October 2017, Joplin, MO**
- **Battery company specializing in zinc chemistries**
 - **Nickel-Zinc**
 - **Zinc-Air**
 - **Rechargeable Hybrid Aqueous Battery (ReHAB)**
- **Currently produces a G31 size Nickel-Zinc battery for the following markets**
 - **Telecom**
 - **Data Centers**
 - **Heavy Trucking**
 - **Military**
 - **Marine**
- **ZAF has 9 issued patents and 19 applications in various stages of prosecution**

ZAF's Research and Development facility is located in Bozeman, MT. This 8,000 ft² facility houses scientists, engineers, and technicians and is equipped with analytical tools and battery testing units.

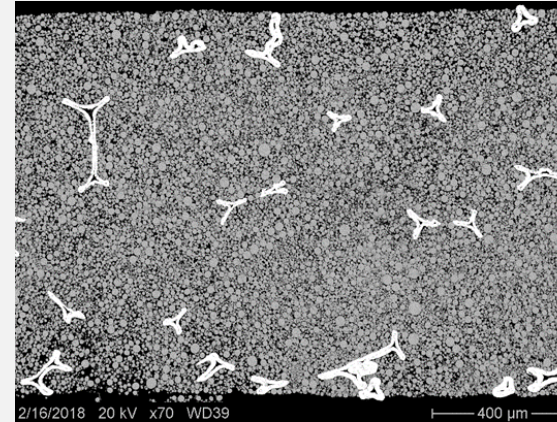
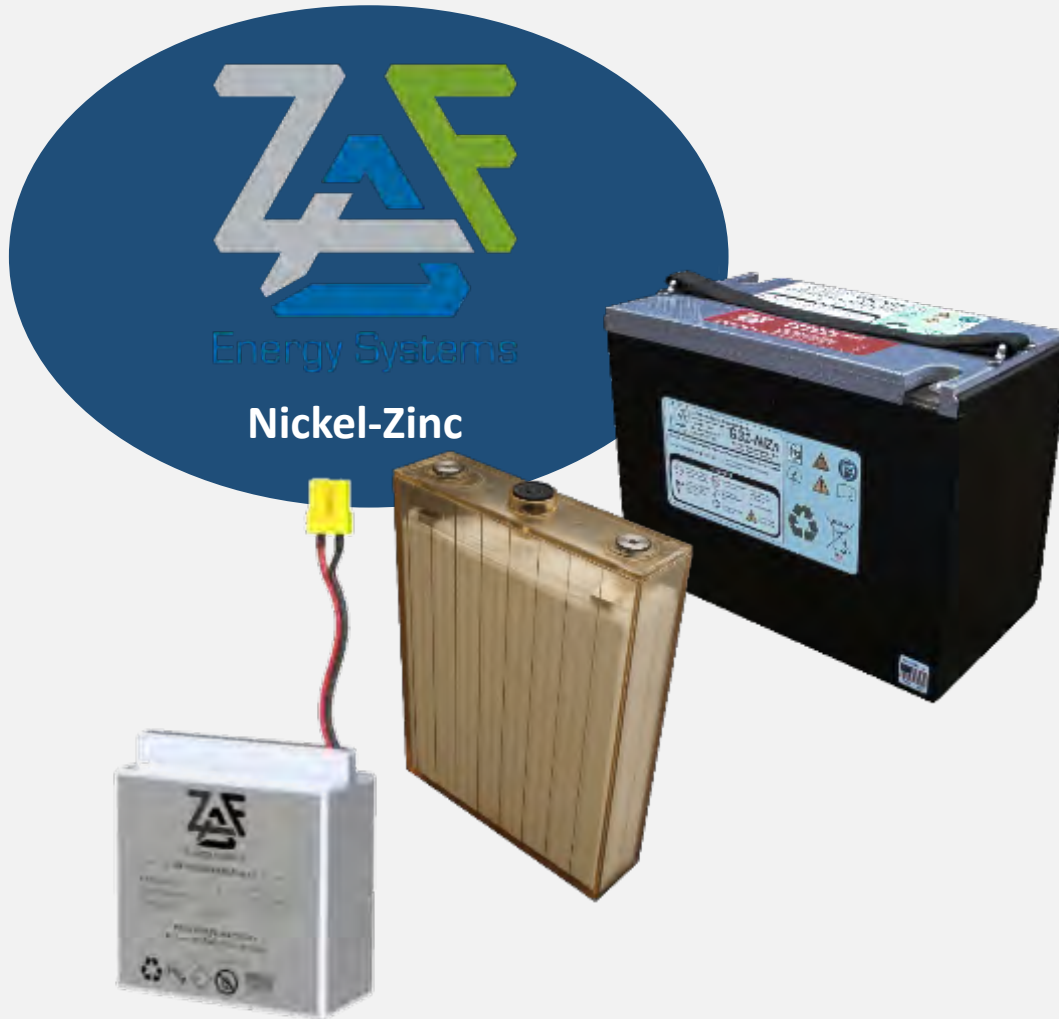


ZAF's 33,000 ft² low rate initial production (LRIP) facility is located in Joplin, MO. This facility is equipped with tape casters, presses, and slurry mixing equipment. It also contains cell assembly, activation stations, and a test lab for cell formation.

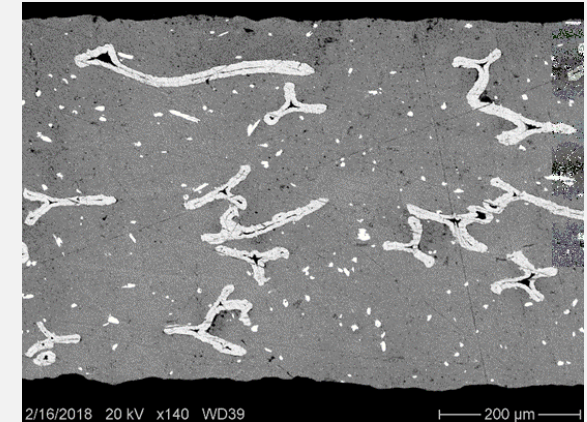


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Nickel-Zinc Battery Chemistry



Positive electrode: $2\text{NiOOH} + 2\text{H}_2\text{O} + 2\text{e}^- \rightarrow 2\text{Ni(OH)}_2 + 2\text{OH}^-$



Negative electrode: $\text{Zn} + 2\text{OH}^- \rightarrow \text{Zn(OH)}_2 + 2\text{e}^-$

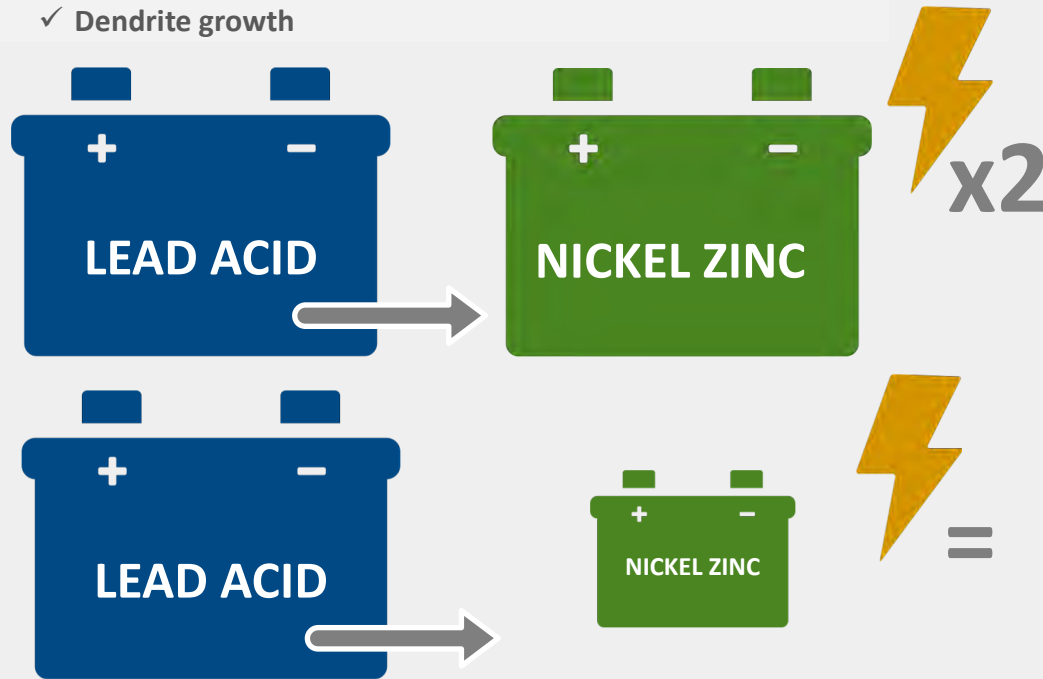
Parameter	
Positive electrode electrochemistry	$\text{Ni(OH)}_2/\text{NiOOH}$
Negative electrode electrochemistry	ZnO/Zn
Electrolyte (% potassium hydroxide)	20-35%
Separator	Microporous + wicking
Nominal cell voltage (V)	1.65
Operating temperature range (°C)	-30-60
Theoretical specific energy (Watthour per kilogram)	334
Specific energy (Watthour per kilogram)	60-90
Energy density (Watthour per liter)	90-170
Specific power (Watt per kilogram)	290 (for 10 min to 1V)
Power density (Watt per liter)	550 (for 10 min to 1V)
Charge retention (% loss per month)	<10%
Cycle life (cycles at 100% DOD)	>500

Why Nickel Zinc Batteries?

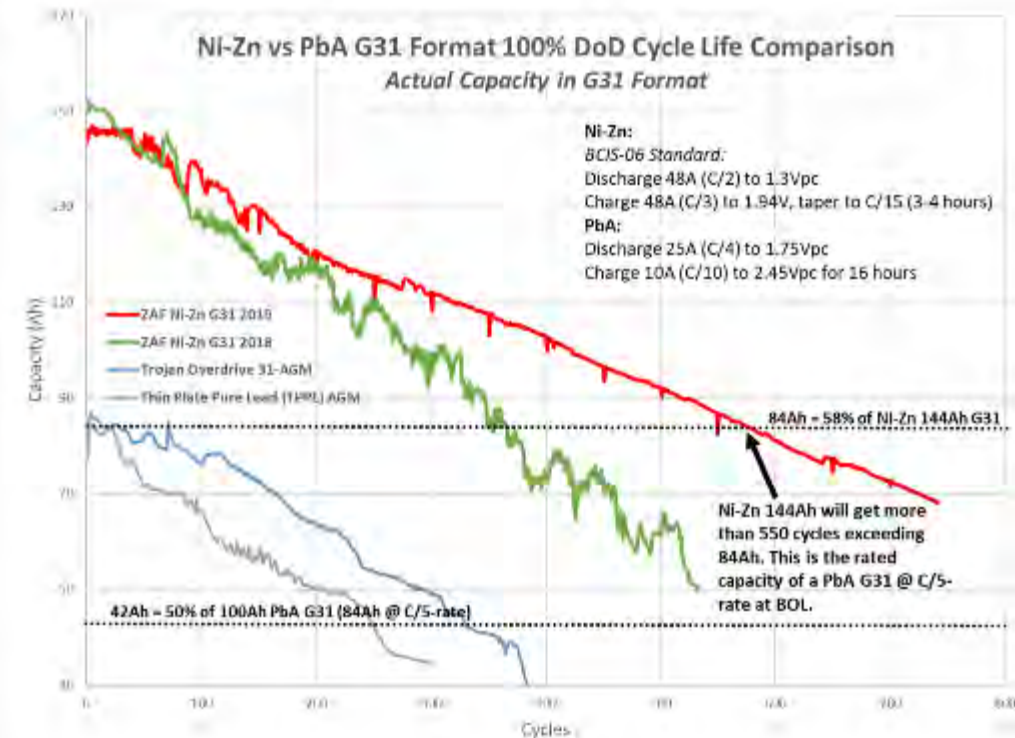
Why ZAF?

ZAF's nickel-zinc battery design solves historic problems.

- ✓ Electrolyte dry out
- ✓ Zinc migration
- ✓ Dendrite growth



A Nickel Zinc (NiZn) battery can give 2x capacity and cycle life in the same size or the same capacity and 2x the cycle life as a Lead Acid battery in half the footprint.



“Good News Everybody”



FOR IMMEDIATE RELEASE

ZAF Energy Systems Raises \$22 Million From Key Strategic Investors

Funds to accelerate commercialization of ZAF nickel-zinc battery in the transportation, healthcare, defense, heavy industrial equipment, and data storage markets

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JOPLIN, Mo. – February 10, 2020 – ZAF Energy Systems Inc. (ZAF), a developer of next-generation battery technology, announced today that it has completed raising its needed investment. Included in the \$22 million Series A funding round were investments from institutional and strategic investors including Elevage Capital Management, Catalus Capital, and Holt Ventures. ZAF will use the funds to accelerate the commercialization and adoption of its nickel-zinc (NiZn) battery technology.

Manufacturing News...



Manufacturing News...



ZAF IP Exit – Æsir Formation

Potential 18-month Event Horizon



ZAF Energy Systems, Inc., brand identified as an “asset-lite” IP-business exit model.

Est. 3/2011



ZAF Energy Systems, Inc., IP exit.

~2021

11/2019

ZAF’s LRIP continuing operations requires brand identity for continued operations—Æsir Technologies, Inc.

*Formation of,
Æsir Technologies, Inc.*



Æsir Technologies, Inc.

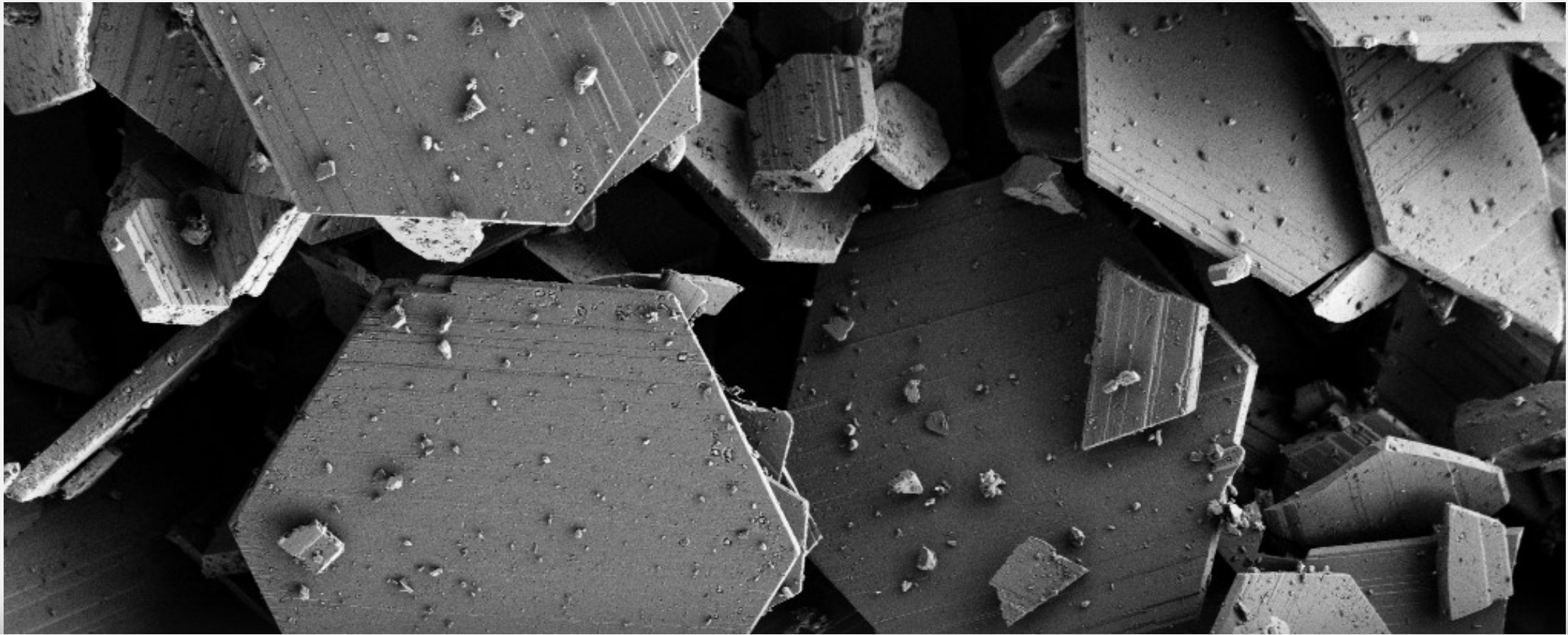


Contract Award

Minuteman III, ICBM Silo Ground-Station Backup Power

- Air Force is seeking potential replacement for ICBM ground facility battery
- ZAF Energy Systems to design, develop, test, and deliver a prototype Ni-Zn battery for testing at an Air Force facility
- Duration 24 months
- Awarded: 9-27-2019
- Contract Value: \$1.4M





Thank You - NAATBatt

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