



e-Zinc – NRCan Breakthrough Energy Solutions Canada

Public Report



Natural Resources
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1.1 PROJECT BACKGROUND

Founded in 2012, e-Zinc is a corporation based in Toronto, Canada that has developed a breakthrough electrochemical technology for storing energy in zinc metal. This affordable, flexible, and long-duration energy storage solution will provide the platform for the world's energy markets to be fully powered by renewable energy, enabling a zero-carbon energy future.

With the support of **NRCan**, e-Zinc designed, manufactured, tested and validated the performance of a demonstration scale e-Zinc energy storage system. This type of system will be used (1) in combination with wind or solar in off-grid applications to reduce/eliminate reliance on diesel generators, (2) behind-the-meter as a replacement for diesel in backup power/resilience applications, and eventually (3) at a grid-scale to support the deep levels of renewable energy penetration required to achieve our carbon reduction goals.

During this project, e-Zinc made extensive improvements on its cell and system design, and validated the performance of its technology in the lab and in the field. The e-Zinc team grew from 10 to 33 full time employees over the project period and will continue to grow as e-Zinc's product nears commercialization.

1.2 PROBLEM STATEMENT

There is no adequate solution for long-duration energy storage needs, a \$20B market growing at >20% annually:

1. **Off-grid/remote applications** rely on diesel generators that are expensive to operate, are a significant environmental concern, and contaminate local air quality. These customers include remote communities and homes, islands, mining operations, telco towers, military bases, etc.
2. **Resiliency/back-up power applications** also rely on diesel generators. These customers include commercial & industrial facilities (prone to grid outages), utilities (seeking non-wires alternatives), hospitals, etc., who want to ensure uptime in an economical, safe, and non-polluting manner.
3. **Renewables integration** – eventually, as markets around the world begin to cross the threshold of >50% penetration levels of renewables, utilities, system operators and regulators will require long-duration storage to balance their grids. e-Zinc will be the technology of choice for days, weeks and even seasonal levels of storage.

1.3 SOLUTION SUMMARY

e-Zinc's technology is disruptive because of its ability to provide low-cost energy storage capacity at a capital cost up to 80% less than lithium-ion or other batteries. Its systems can be flexibly designed for applications requiring hours, days, or longer durations of storage, and power capacity ranging from residential (kW) to utility/grid-scale (MW). e-Zinc's other striking advantages are its long lifetime (usable capacity never fades over time), wide operating temperature range (-30°C to 60°C), fire resistance, and that it is 100% recyclable/reusable at the end of life. The key environmental benefit from applications of this breakthrough technology will be the



elimination of greenhouse gases through the replacement of diesel/fossil fuel generation with reliable renewable energy.

1.4 PROJECT OBJECTIVES

With the support of NRCan, e-Zinc designed, manufactured, tested and validated the performance of a demonstration scale e-Zinc energy storage system. The project objectives were the following:

- Design and build 100W/24-48-hour e-Zinc base modules (i.e., cells).
- Design and integrate a demonstration scale e-Zinc energy storage system.
- Complete all testing and validation of the e-Zinc energy storage system to ensure compliance with customer and market needs.

1.5 PROJECT PARTNERS

Faromor Ltd. (a CANARM Company) and Faromor CNG Corp.

Faromor offers a range of automation and power products (including management controls, air circulation systems, etc.) with supply to global customers. Additionally, there are two separate companies as part of the Faromor Group: Faromor Ltd., which focuses on animal welfare and energy use on farm, and Faromor CNG, focused on commercializing low carbon energy projects in Rural Ontario.

Faromor's consortium partner role was to operate as the site host for e-Zinc's new energy storage system.

SunGrid Solutions Inc.

SunGrid Solutions, based in Cambridge, Ontario, was the system integrator within the consortium partnership; they have a strategic interest in combining solar energy generation with energy storage systems and they provide enabling services through development, engineering, construction, and financing of the complete energy system.

SunGrid's consortium partner role was to support the integration of the energy storage system and the interconnection of the system at the field testing location.

Toyota Tsusho Canada Inc.

Toyota Tsusho Canada Inc. ("TTCI") is a wholly owned subsidiary of Toyota Tsusho America, Inc., which in turn is a subsidiary fully owned by Toyota Tsusho Corporation, a large, international trading company with over 900 subsidiaries and affiliates across the globe. Their Machinery, Energy & Project division covers a wide breadth of different business interests, including their electric power business; they also have exceptional channels to several off-grid and microgrid applications.

This consortium partner was instrumental in helping e-Zinc create new supply chains for the production of its technology, and also in building channels to market via TTCI's distribution network on both a national and international scale.

1.6 TOTAL PROJECT COST

- Project total: \$5,800,000
- NRCan Breakthrough Energy Solutions Contribution: \$1,622,000

1.7 PROJECT RESULTS

Project accomplishments include the following:

- The 100W/24-48 hour cell architecture was designed with customer form factor requirements in consideration, and with numerous cell innovations. A new cell architecture was also developed, leading to significant improvements in reliability and performance.
- A thorough Design for Manufacturing (DFM) approach was utilized and the entire BOM is manufacturable using standard processes (injection molded plastic, sheet metal stamping, CNC milled parts, etc.).
- The balance of system equipment was designed, built, and validated, including the air system, electrical drive train, and cell control boards and software.
- The system has been packaged into cargo trailers and has been deployed at the Faromor site for field testing.

1.8 BENEFITS OF THE PROJECT

Long-duration energy storage has tremendous potential, but the commercialization journey is long. The aggressive cost targets required for success can only be achieved at a high-volume production scale, but to justify investment, demonstration projects must initially be done at higher price points. Public sector funding is pivotal to allow demonstration projects to materialize, such that proof points can be reached to allow further investment decisions to be made.

The public sector funding for this project provided e-Zinc with the opportunity to:

- Design a product that meets the technical and regulatory needs of the North American market
- Build an ecosystem of partners in North America
- Expand e-Zinc's team from 10 to 33 full time equivalents (all in Canada)
- Develop working relationships with Utilities and Regulators in Canada
- Demonstrate e-Zinc's technology to prospective customers in Canada
- Progress to higher volume manufacturing methods

These outcomes will greatly accelerate e-Zinc's path to market, and in turn, accelerate Canada's path to decarbonization.

1.9 KEY LESSONS

Performance specifications for long-duration energy storage in Canada

- **Systems with durations in the range of 24-48 hours are suitable for near to medium term use cases.** Beyond this duration range there are diminishing returns.
- **Roundtrip efficiency and self-discharge rate (within reason) are less important parameters for long-duration energy storage.** Project economics are much more sensitive to capital cost; a small improvement in capital cost is worth much more than a large improvement in roundtrip efficiency or self-discharge rate.

Business case for long-duration energy storage in Canada

- **New revenue streams and/or subsidies for initial deployments will likely be required** to unlock the energy system benefits that can be provided by grid-scale long-duration energy storage.



- **Faster decarbonisation (than currently planned) could further improve the business case for long-duration energy storage**, as it would lead to more price volatility & higher potential revenues for long-duration energy storage assets.

1.10 NEXT STEPS

In December 2021, e-Zinc successfully closed its **Series A** financing, securing **USD \$25M¹**. The investment was led by [Anzu Partners](#), a financial VC investor with deep experience in manufacturing and hardware tech. Additional investors that joined the syndicate include [Toyota Ventures](#), a corporate strategic VC with the ability to support e-Zinc's manufacturing and supply chain needs, and [Eni Next](#), a corporate strategic VC that will support e-Zinc with its downstream deployment opportunities.

The use of proceeds from e-Zinc's Series A is to establish its low volume manufacturing capabilities to build demonstration systems of consistent cell quality for further in-field testing and validation. Importantly, this will also allow the company to validate these manufacturing capabilities in advance of its Series B raise, which will be used to scale up its manufacturing capabilities and progress the commercialization of e-Zinc's technology.

In addition to the Series A financing, in March 2022 e-Zinc won the **CAD \$1M grand prize** through the Natural Resources Canada (NRCan) **Charging the Future Challenge²**, which aims to recognize organizations accelerating battery innovations that could help substantially reduce greenhouse gas emissions. This prize will provide additional support to e-Zinc to help the company achieve its key milestones over the next two years.

¹ Private Capital Journal. (2022, April 7). *e-Zinc secures US \$25M Series A led by Anzu Partners*. Retrieved from <https://privatecapitaljournal.com/e-zinc-secures-us-25m-series-a-led-by-anzu-partners/>

² Natural Resources Canada. (2022, March 30). *Canada Announces Grand Prize Winners of Impact Canada Challenges*. Retrieved from <https://www.canada.ca/en/natural-resources-canada/news/2022/03/canada-announces-grand-prize-winners-of-impact-canada-challenges.html>