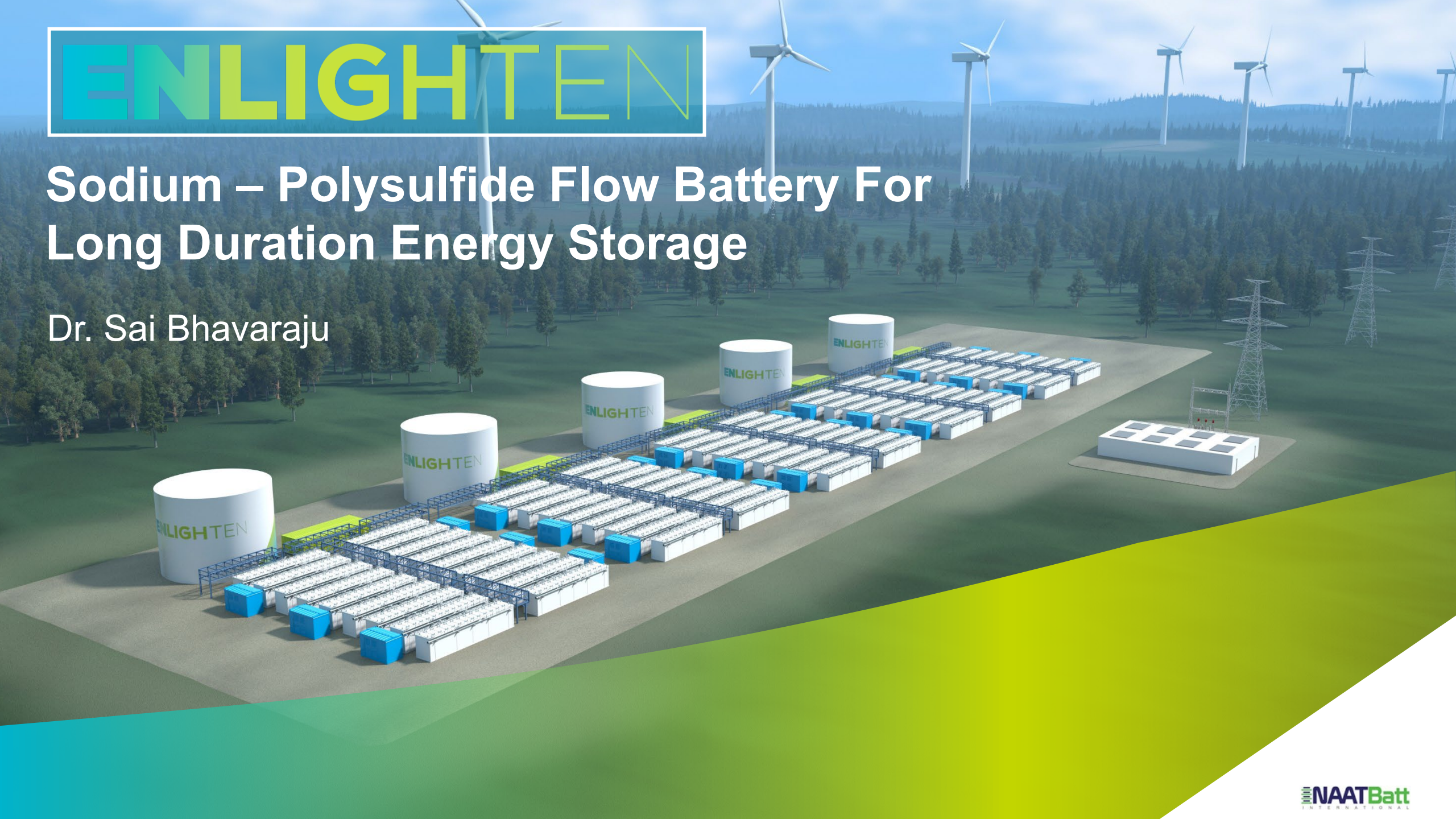
ENLIGHTEN

# Sodium – Polysulfide Flow Battery For Long Duration Energy Storage

Dr. Sai Bhavaraju

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# Enlighten Innovations Inc.

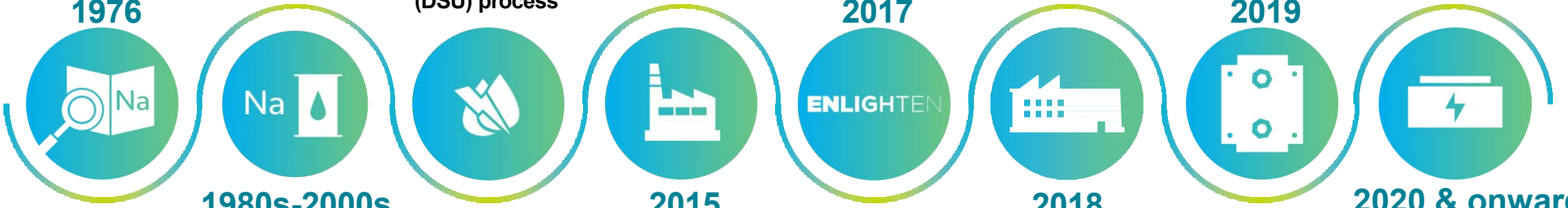
Experienced team with proven track record of building shareholder value

in large scale energy sector projects, based in Broomfield CO, and Calgary AB

- Long Duration Battery Energy Storage (8 to 100+ hours duration) using Na instead of Li
- Market Leading Cost Structure
  - Decoupled Power and Energy
  - High Energy Density
  - Low-Cost Chemicals
- Breakthrough Technology with Broad Portfolio of IP
- Defined Pathway to First Revenue

# The History: Decades of R&D and Operational Experience

***Enlighten's advantages: strong IP, operational know-how and experience in at-scale applications***

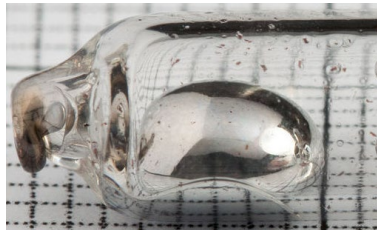


# Enlighten's Energy Storage Technology

**NaSICON**

Solid State $Na^+$ Conductor for < 125 °C Operation

**Liquid Sodium Anode**

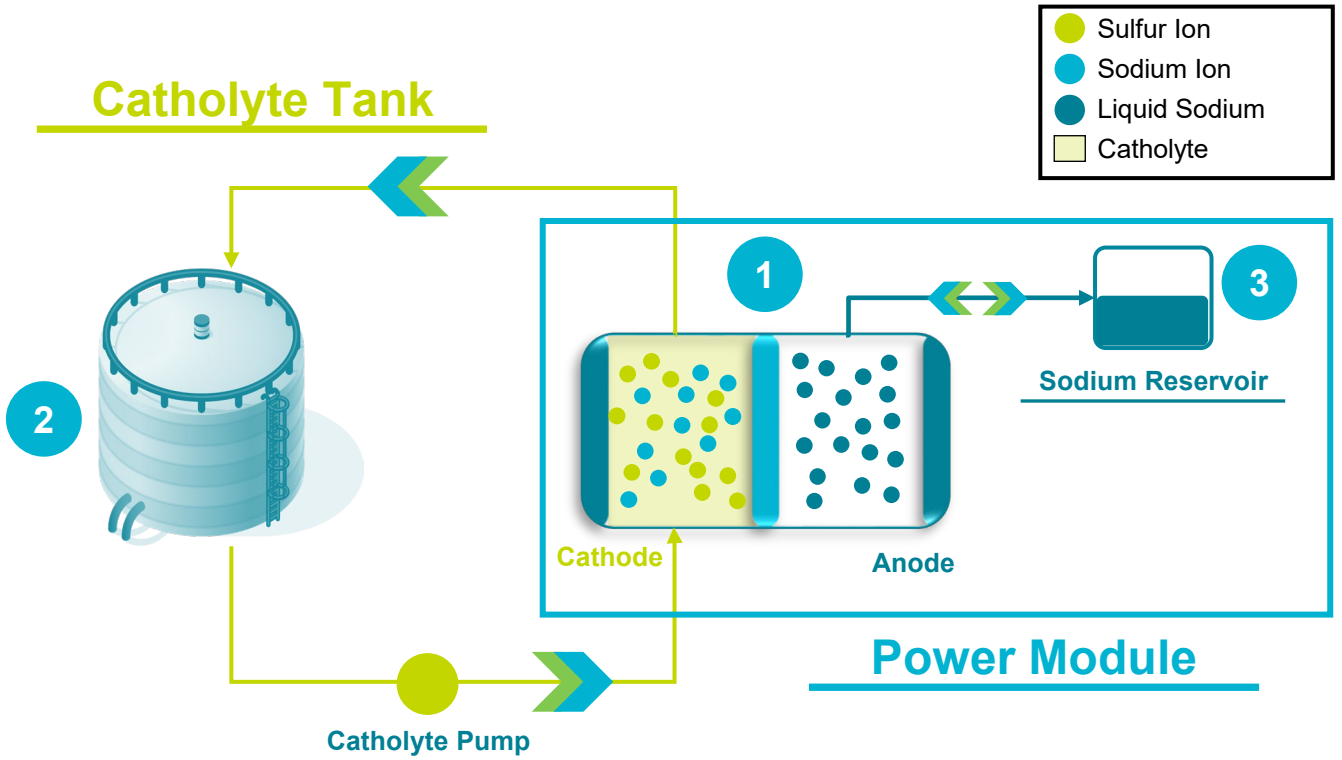


High Energy Density Liquid Metal for < 125 °C Operation

**Sodium Polysulfide Rich Catholyte**

High volumetric energy density, and low-cost

*Three technical breakthroughs enable a low-cost, high-energy density, and perfectly decoupled energy storage solution based on sodium polysulfide flow battery chemistry*



# NaSICON Manufacturing

NaSICON Manufacturing → Stack Manufacturing → System Integration

*Enlighten Core Competences*

*Focus in 2023 & Beyond*

***Drive Down Costs Through Advanced Manufacturing at Scale***

***Enlighten is shifting to a unique ceramic membrane forming process, which is more cost-effective manufacturing processes to produce low-cost, and thinner NaSICON separators.***


***Enlighten has established a 15,000 sq ft NaSICON ceramic separator production facility to batch and mill raw materials for subsequent forming and sintering into 6" × 6" plate form***

# Stack Development & System Integration

## *Scalable, Compact Design*

***115 °C operation allows rubber and plastic battery cell & stack construction components***

## *Project Infinity*

***We are currently constructing a 20 kW – 24 hr demonstration system for performance, safety, & system integration validation***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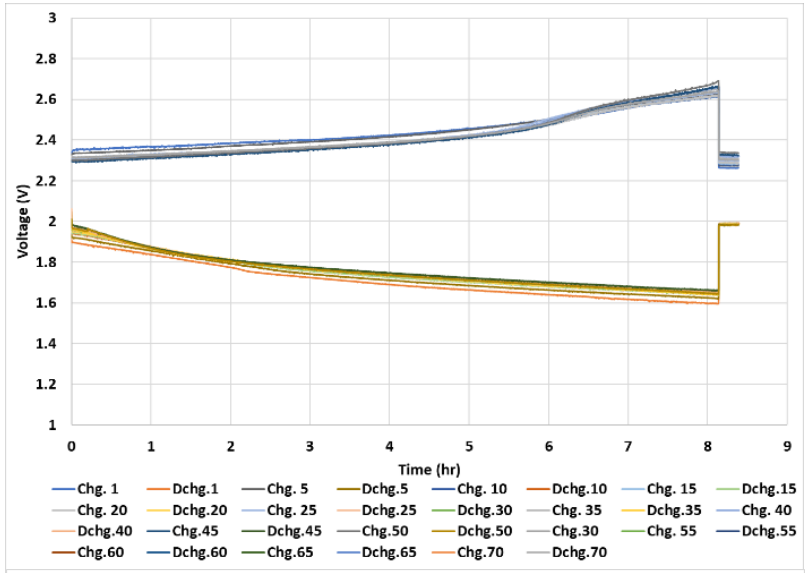
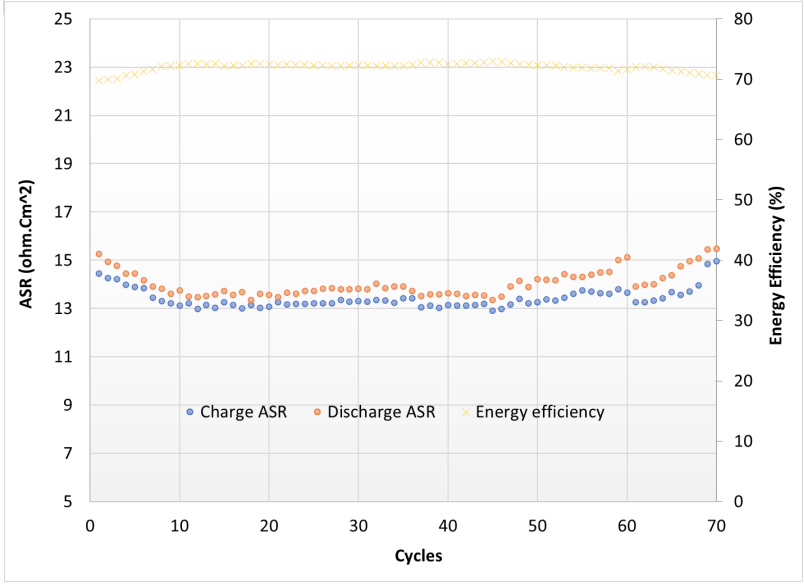
# Tracking Along the Performance Testing Goals

***Unit Cell Testing***

***&***

***Sample Performance***

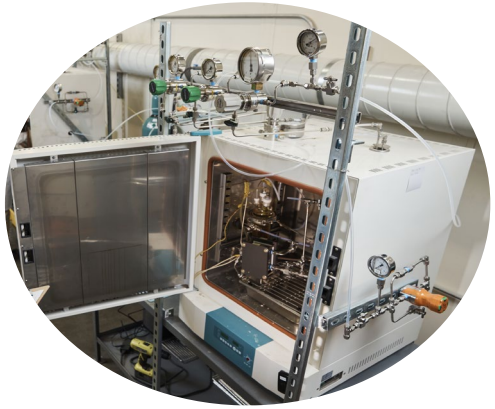



| | | Demonstrated |
|---|---|---|
| Performance | Energy Density (Wh/L) | 115 - 135 |
| | Discharge Current Density (mA/cm²) | 60-75 |
| | Cell Area Specific Resistance (Ohm.cm²) | 8-10 |
| | Cycle Count (#) | 180 |
| | Voltage efficiency (%) | 60% |
| | Coulombic efficiency (%) | 100% |
| Longevity | Separator Life (months) | 36 |
| | Catholyte stability (months) | 12 |

***Demonstrated Performance to-date***

# Enlighten's Development Pathway to Commercial Projects



## Lab testing – W scale

Product development and lab-scale testing (2017+), performance testing (2020+)

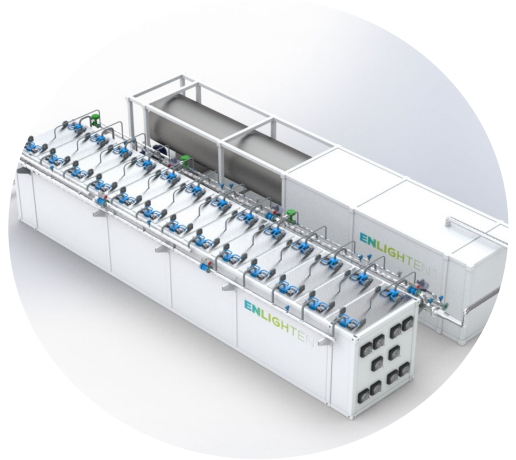
**Ongoing Testing**
**2-50W cells**


## Pilot – kW scale

Technology showcase on existing site, using commercial battery stacks.

Pilot used to validate customer use cases.

**Startup in 2024**
**20 kW/480kWh**



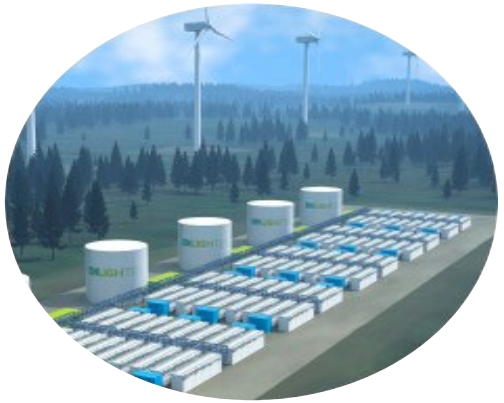

## On-Site Demonstration – MW scale

Grid scale projects with industry partners.

Demonstrate commercial and operation scaleup.

**Planned for 2024+**

**Seeking Strategic Partner with VRE Assets & DOE Involvement**



## Scaling to GW

Commercial scale projects and manufacturing.

**Target 2026+**

# Thank You