Lab Embedded Entrepreneurship Programs
Long Duration Storage Shot Summit:
Lab-Embedded Entrepreneurship Program Session

manufacturing.energy.gov
Lab-Embedded Entrepreneurship Program

Empower innovators to mature their ideas from concept to first product, positioning them to align with the most suitable commercial path to bring their technology to scale.

1. **Recruit** the best energy technology innovators

2. **Leverage** expert mentorship and world-class facilities at the national labs on a win-win basis

3. **Accelerate access to follow-on funding**

Position people and technology for market

[https://www.energy.gov/eere/amo/lab-embedded-entrepreneurship-programs](https://www.energy.gov/eere/amo/lab-embedded-entrepreneurship-programs)
Accelerate Progress to Market

Technology Idea

Stipend & Benefits

- A monthly stipend, health insurance, and travel funds allows innovators to focus on their technology & business full-time.

Access to National Lab Resources

CRADA* provides funds for use at the Labs, access to resources and connects Innovators with Lab staff.

Mentorship & Business Training

- Business & commercialization training, mentorship, and organized events lead to networking, community building, and improved outcomes.

Market

Private Investment

*CRADA – Cooperative research & development agreement
Program Success

LEEP Innovator Follow-on-Funding
Over $522M

- 96% success rate for companies continuing to operate after the program
- 12 Innovators have been recognized in Forbes’ 30 under 30
- 11+ companies are selling commercial products
Today’s Panel

LEEP Managers, Advanced Manufacturing Office, DOE

Joe Cresko
(Chief Engineer)

Paul Syers
(Technology Manager)
Vanadium replaced by a simple organic compound that functions as BOTH the negative fuel and positive electrolyte.

Expensive selective membrane replaced by a simple porous separator

NET RESULT:
More energy at lower cost

➢ Higher Voltage (2X)
➢ Multielectron capability (2X)

The Jolt Organic Redox Flow Battery
### Milestones and Progress

#### ACTIVITIES

**Launch**
- Initial concept
- Lab data
- IP license

**Technical Progress**
- Lab space
- Material screening
- Modeling
- RFB prototype

**Business Development**
- CRI Program
- I-Corps
- Tech validation
- Build team

**Commercialization**
- Larger prototype
- Scale-up
- Field Trial
- Extended testing

#### FUNDING

- Seed funding $275k
- OE Orcelle Award
- Shell/NREL GCxN

砷 arsenic $1.1 M in non dilutive funding to date
Before Innovation Crossroads

2018

- High Voltage Electrolytes for ultracapacitors
- Reduce Cost & Size of ultracapacitors
- $400M Direct Electrolyte Sales
- $550k Non-Dilutive Grants
- 150+ Initial Prototypes

Value

2021

- Rapid & Auto Electrolyte Screening for ultracaps & lithium-ion batteries
- Reduce Time & Cost to develop application specific products
- $5B+ Initial Cell Market
- $3.7M Non-Dilutive Grants
- 3 Products Under Development

Tech

Funding

Progress

Innovation Crossroads provided us with:

- Extensive Technical Resources
- Commercialization Guidance
Energy Storage Demand

1 TWh Annually
By 2025
$100 Billion in Batteries

Market Drivers

- **RENEWABLES & GRID ESS**
  - **COST**
    - Global Deployment needed will cost trillions
  - **SAFETY**
    - Permitting barriers due to flammability

- **AUTOMOTIVE**
  - **COST**
    - 65% of EV cost derived from battery pack
  - **SIZE**
    - Low Range & Slow Charging

- **DEFENSE**
  - **SIZE**
    - Weight limitations & Low Range
  - **SAFETY**
    - Flammability is a vulnerability
Problem: Cost, Time, & Risk
Solution: ATLAS-SYSTEM

**Atlas-Cells**
- Spectator Material does not change behavior
- High Reproducibility
- Explicitly measure everything in a battery

**Data Processing**
- Calculates performance metrics
- Identifies point of failure

**Pilot System Operating at Joint Institute for Advanced Materials**
**Rapid Materials Development**

**Advantages from Eonix ATLAS System**

**Rapid Materials Development**

**Pilot System** developed at Oak Ridge National Lab

**Scaled System** at the Joint Institute for Advanced Materials

**ATLAS is a productivity multiplier for energy storage materials research**

**Pilot System**

- Long Term Cycling
- Post-Mortem Characterization
- PhD Labor

1 Chemistry $125,000

**ATLAS**

- Short Term Cycling
- In-Situ EC
- Semi-Auto

1 Chemistry $7,500

**Result:** Eonix can rapidly develop new material products that address the differentiated needs of the energy storage market **37X faster** than competitors.

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**Time & Cost to Understand a Novel Chemistry**

<table>
<thead>
<tr>
<th>State of the Art</th>
<th>ATLAS</th>
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</thead>
<tbody>
<tr>
<td><strong>10 Months</strong></td>
<td><strong>8 Days</strong></td>
</tr>
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WHAT HAVE WE DONE WITH ATLAS?
Non-flammable Lithium Ion Battery

Opportunity

Grid storage deployment is expected to grow from 12 GWh (2018) to 158 GWh (2024) in six years.

Value

Problem

FDNY requires fire suppression system
AZ Temp ban on LiB after grid explosions
SK has had 23 grid fires

Solution: Carbonate Free Electrolyte

Plug & Play non-flammable electrolyte
Carbonates are required for longevity
Selected candidate has Melting point of 25 C

25% Of Cost

- Fire Suppression System
  - Increases CapEx
- Emergency Explosive Gas Ventilation System* (APS)
  - Increases CapEx
- HVAC or Liquid* Cooling System (APS)
  - Increases CapEx, OpEx, & LCOE
**2020**

**Electrolyte Screening**

- **21 Chemistries**

**2021**

**1 Ah Cells**

- Non-Flammable (F.P. >160°C, 10x higher)
- > 70°C Operation
- Plug n' Play with existing Electrodes & Form Factors

**2022**

**Production Prototypes**

- **18650 & 10Ah Cells**

**2023**

**Stage 1: Module Level Demonstration**

- **CELL** 52x Cells

**2023**

**Stage 2: Rack Level Demonstration**

- **MODULE** 8x Modules

**2024**

**Stage 3: Pilot Project**

- **RACK** 4x-32x Racks

**2024**

**Grid Storage Pilot**
Rapidly Designing Electrolytes

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Collaborators - Strategic Partners - Chemical Suppliers – Battery Manufacturers
Any Questions?

Thank you!

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