

# INNOVATION CROSSROADS

OAK RIDGE NATIONAL LABORATORY

# Welcome

Oak Ridge National Laboratory is managed by UT-Battelle for the U.S. Department of Energy.

Innovation Crossroads is a public-private partnership founded by Oak Ridge National Laboratory and supported by the U.S. Department of Energy's Advanced Materials and Manufacturing Technologies Office, Building Technologies Office, Office of Electricity, Office of Science Advanced Scientific Computing Research program, and the Tennessee Valley Authority.

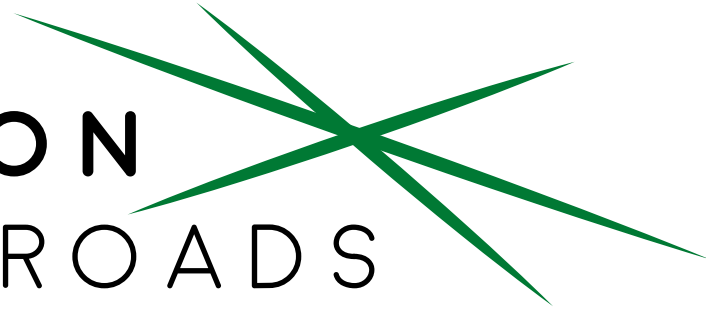
U.S. DEPARTMENT OF  
**ENERGY** | **LEEP**  
Lab-Embedded Entrepreneurship Program

**TVA** TENNESSEE  
VALLEY  
AUTHORITY

# Outline

- Program Overview
- Meet The Team
- Meet Our Innovators
- Program Metrics
- Alumni Spotlight
- Ecosystem and Partners
- Programming and Curriculum
- Application Process
- Discussion

# INNOVATION CROSSROADS



OAK RIDGE NATIONAL LABORATORY

## Program Overview

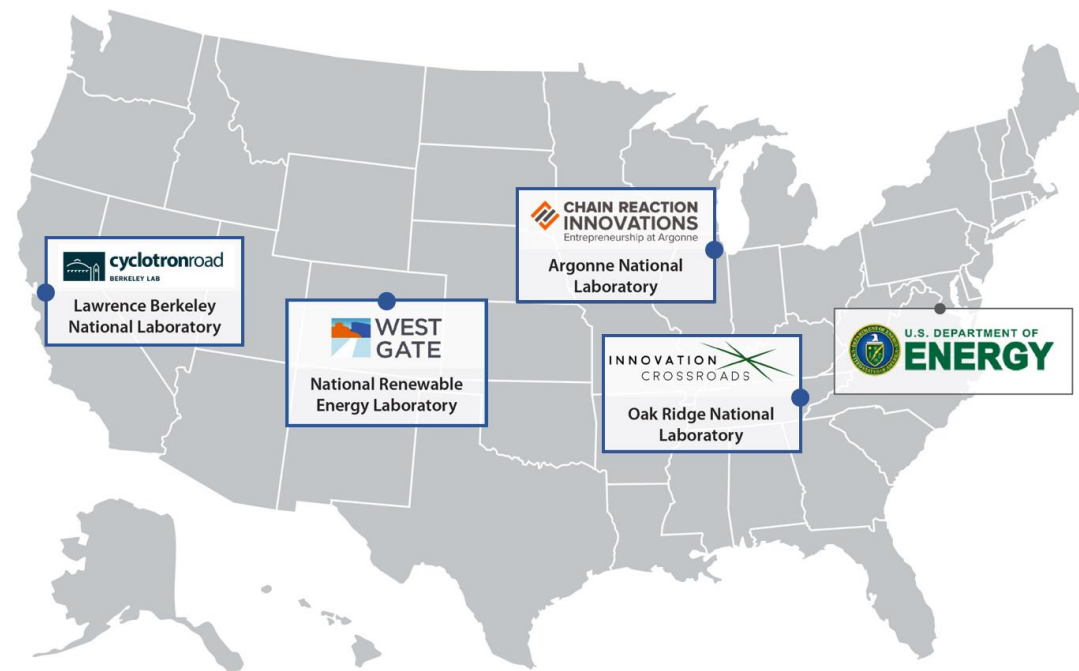
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# About LEEP

The Lab-Embedded Entrepreneurship Program (LEEP) is a fellowship that connects entrepreneurs with world-leading scientists and facilities at U.S. Department of Energy national laboratories. LEEP accelerates the deployment of transformative energy technologies that address climate change and other challenges, while also creating jobs, promoting domestic manufacturing, and providing benefits to disadvantaged communities.



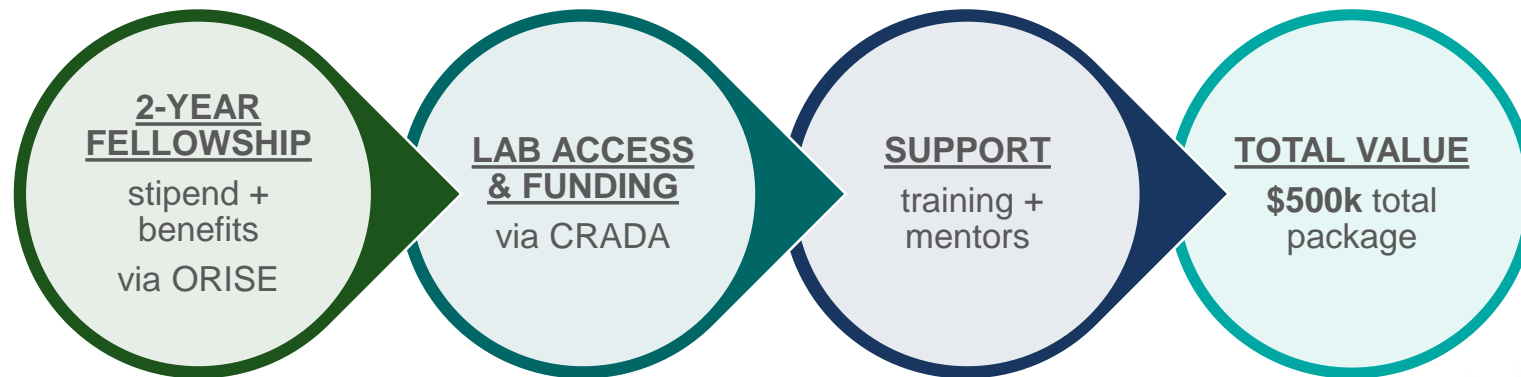
## Vision:

- **Recruit** the best energy and advanced manufacturing innovators
- **Leverage** expert mentorship and world-class facilities at national labs on a win-win basis
- **Position** people and technology for market







# About the Program

- **Accelerating Innovation:**

- The Innovation Crossroads Program takes top entrepreneurial scientists and engineers and embeds them at Oak Ridge National Laboratory to perform early-stage research and development that will lead to the launch of energy or manufacturing businesses in the future.
- In addition to technological access and support, the program trains innovators to develop entrepreneurial acumen and skills, while introducing them to our ecosystem partners needed to facilitate commercial and investment opportunities.
- This dual focus on early-stage R&D and entrepreneurial development provides innovators with the platform they need to take their ideas from the lab and onto the commercialization pathway.



# 2023 Program Sponsors

Sponsors	Mission
<b>Oak Ridge National Laboratory</b>	 <b>Scientific Discovery, Clean Energy, &amp; National Security</b> Mission: As the US Department of Energy's largest multi-disciplinary laboratory, we deliver scientific discoveries and technical breakthroughs to realize solutions for complex challenges including the transition to clean energy, mitigation of climate change, improvements to human health, and innovation that strengthens economic competitiveness.
<b>Advanced Materials and Manufacturing Technologies Office</b>	 <b>Transform Materials &amp; Manufacturing</b> Mission: AMMTO provides planning, management, and direction necessary for a balanced program of research, development, demonstration, technical assistance, and workforce development to support domestic manufacturing that is critical to achieving a clean, decarbonized economy.
<b>Building Technologies Office</b>	 <b>Building Efficiency &amp; Energy Cost Reduction</b> Mission: The Building Technologies Office develops, demonstrates, and accelerates the adoption of cost-effective technologies, techniques, tools and services that enable high-performing, energy-efficient and demand-flexible residential and commercial buildings in both the new and existing buildings markets, in support of an equitable transition to a decarbonized energy system by 2050, starting with a decarbonized power sector by 2035.
<b>Office of Electricity</b>	 <b>Secure &amp; Resilient Power Grid</b> Mission: A secure and resilient power grid is vital to national security, economic security, and the services Americans rely upon. Working closely with its private and public partners, the Office of Electricity leads the Department's efforts to ensure that the Nation's most critical energy infrastructure is secure and resilient. These efforts will strengthen, transform, and improve energy infrastructure so consumers have access to resilient, secure, and clean sources of electricity.
<b>Office of Science Advanced Scientific Computing Research Program</b>	 <b>Discovery &amp; Innovation</b> Mission: Deliver scientific discoveries and major scientific tools to transform our understanding of nature and advance the energy, economic, and national security of the United States.
<b>Tennessee Valley Authority</b>	 <b>Energy, Environment, &amp; Economic Development</b> Mission: TVA works to improve lives by providing safe, clean, reliable and affordable electricity; supporting a robust, award-winning economic development policy that has created prosperous communities throughout the region; and upholding an environmental stewardship program that has created some of the most beautiful and productive waterways in the United States.

# Providing Multi-Faceted Support

Innovation Crossroads offers unique multi-faceted support tailored to the individual needs of each startup company. This unique structure, combined with ORNL's diverse capabilities, provides fellows the opportunity to take their groundbreaking research to market more quickly and with more impact.

## National lab expertise

ORNL is DOE's largest science and energy laboratory and home to some of the nation's most significant user facilities. Because Innovation Crossroads entrepreneurs work within ORNL, they have immediate access to essential tools and resources. This access reduces cost, risk, and R&D time, allowing fellows to focus on creating the next generation of game-changing technologies.

## Multidisciplinary collaboration

Innovation Crossroads participants work with ORNL's renowned scientists and engineers across many disciplines, including biological and environmental sciences, advanced materials, neutron sciences, nuclear science and engineering, and high-performance computing, providing a platform for accelerating innovation.

## Business mentoring assistance

Innovation Crossroads has a growing network of partners who offer a unique entrepreneurial and business mentoring experience. The program facilitates connections with industry executives, investors, entrepreneurs, and other experts from academia, government, and finance who can serve as advisors and mentors to help develop priorities, mature skills, provide guidance, and make connections to their broader networks.

# Accelerating Innovation by Leveraging ORNL's Unique Resources and Capabilities



Building Technologies  
Research and  
Integration Center

Carbon Fiber  
Technology  
Facility

Center for Nanophase  
Materials Sciences

High Flux  
Isotope Reactor

Center for Structural  
Molecular Biology

Manufacturing  
Demonstration Facility

National  
Transportation  
Research Center

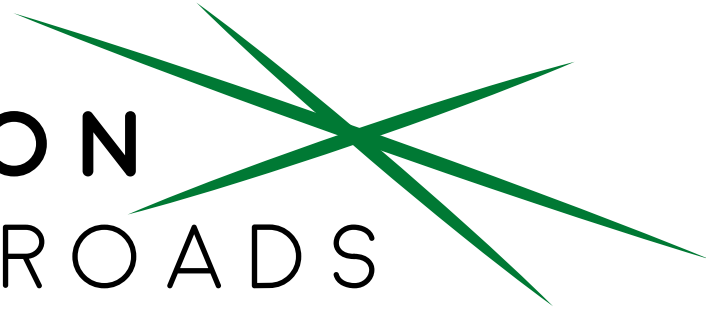
Spallation Neutron  
Source

Oak Ridge Leadership  
Computing Facility





# INNOVATION CROSSROADS



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# Innovation Crossroads Leadership Team & Mentors



**Mike Paulus**  
Director, Partnerships



**Jennifer Caldwell**  
Director, Technology Transfer



**Dan Miller**  
Program Lead



**Kelly Wampler**  
Business Specialist



**Karen Dunlap**  
Partnerships Communications  
Coordinator



**Gary Rawlings**  
Commercialization Consultant



**Angelique Adams**  
Business Solutions Consultant



**John Derrick**  
Strategic Consultant



**Mike Paley**  
Government Funding Consultant

# Leadership Council

## *Guidance from industry and investment leaders*

- **Brendan Abolins** - *External Innovation Manager, Eastman Chemical Company*
- **Coleman Adams** - *Partner, Clean Energy Venture Group*
- **Jason Blumberg** - *Chief Executive Officer and Managing Director, Energy Foundry*
- **Latane Brackett** - *Principal Manager, The National GEM Consortium*
- **Doug Buerkle** - *Chief Executive Officer, LTM Ventures*
- **Aaron Chockla** - *Venture Capitalist, True North Ventures*
- **Lindsey Cox** - *Chief Executive Officer, Launch Tennessee*
- **Eric Dobson** - *Sheltowee Angel Network*
- **Jonathan Goldman** - *Principal, Georgia Tech VentureLab*
- **Alison Gotkin** - *Associate Director of Business Development, United Technologies Research Center*
- **Maha Krishnamurthy** - *University of Tennessee Research Foundation*
- **Paul Leggett** - *Managing Director, Mithril Capital Management*
- **Eric McFarland** - *Professor of Chemical Engineering, University of California, Santa Barbara*
- **Vig Sherrill** - *Founder, General Graphene*
- **Grady Vanderhoofven** - *President and Chief Executive Officer and Board Member, Three Roots Capital*
- **Peter Winter** - *Program Manager, In-Q-Tel*
- **Johanna Wolfson** - *Principal, Prime Impact Fund*



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## Meet Our Innovators

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# Meet Our Innovators



## COHORT 2017

2017-2019

4 Innovators / 3 companies

Sponsors: AMO, ORNL



## COHORT 2018

2018-2020

5 Innovators

Sponsors: AMO, ORNL



## COHORT 2019

2019-2021

7 Innovators

Sponsors: AMO, ORNL, TVA



## COHORT 2020

2020-2022

5 Innovators

Sponsors: AMO, ORNL, TVA



## COHORT 2023

2023-2025

7 Innovators

Sponsors: AMMTO, ORNL,  
TVA, BTO, OE, SC



## COHORT 2022

2022-2024

5 Innovators

Sponsors: AMMTO, ORNL,  
TVA



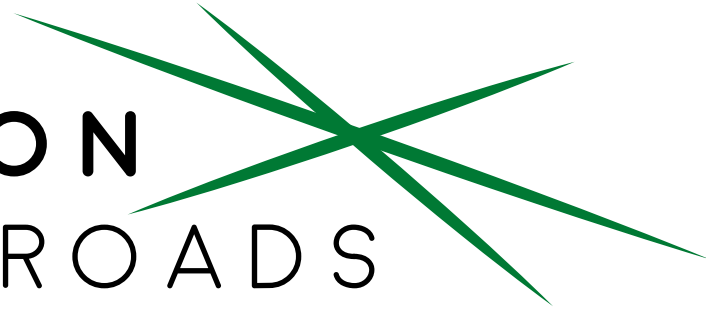
## COHORT 2021

2021-2023

6 Innovators

Sponsors: AMO, ORNL,  
TVA, BTO

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## Program Metrics

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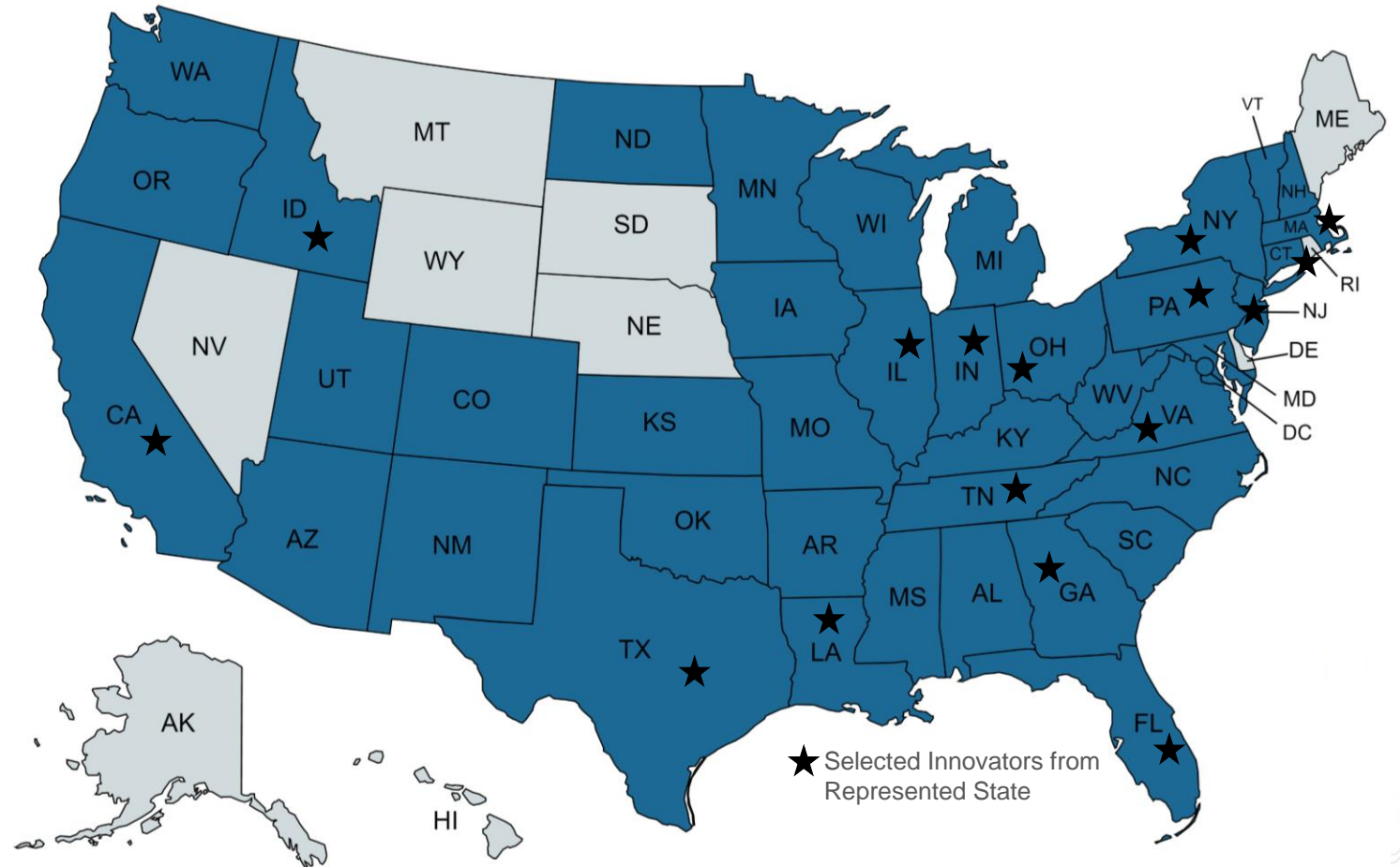
Lab-Embedded Entrepreneurship Program



# Nationwide: Attracted 357 Candidates from 40 States

STATE	#	STATE	#
Alabama	5	Mississippi	2
Arizona	6	Missouri	4
Arkansas	3	New Hampshire	1
California	38	New Jersey	8
Colorado	8	New Mexico	2
Connecticut	5	New York	30
District of Columbia	2	North Carolina	9
Florida	13	North Dakota	2
Georgia	15	Ohio	17
Idaho	1	Oregon	5
Illinois	20	Pennsylvania	6
Indiana	4	South Carolina	4
Iowa	1	Tennessee	56
Kansas	1	Texas	20
Kentucky	6	Utah	4
Louisiana	9	Vermont	1
Maryland	9	Virginia	11
Massachusetts	13	Washington	1
Michigan	9	West Virginia	1
Minnesota	2	Wisconsin	3

Plus: Brazil – 1, Canada – 1, Colombia – 1,  
Egypt – 1, France – 1, India – 1, Mexico – 1,  
Nuevo Leon – 1, Ukraine – 1



# Driving Impact by Embedding Entrepreneurs at ORNL

INNOVATION  
CROSSROADS

38

startups  
supported

\$74.4  
million

in non-dilutive  
funding received

200+

jobs  
created

\$81.7  
million

venture funding  
raised

16

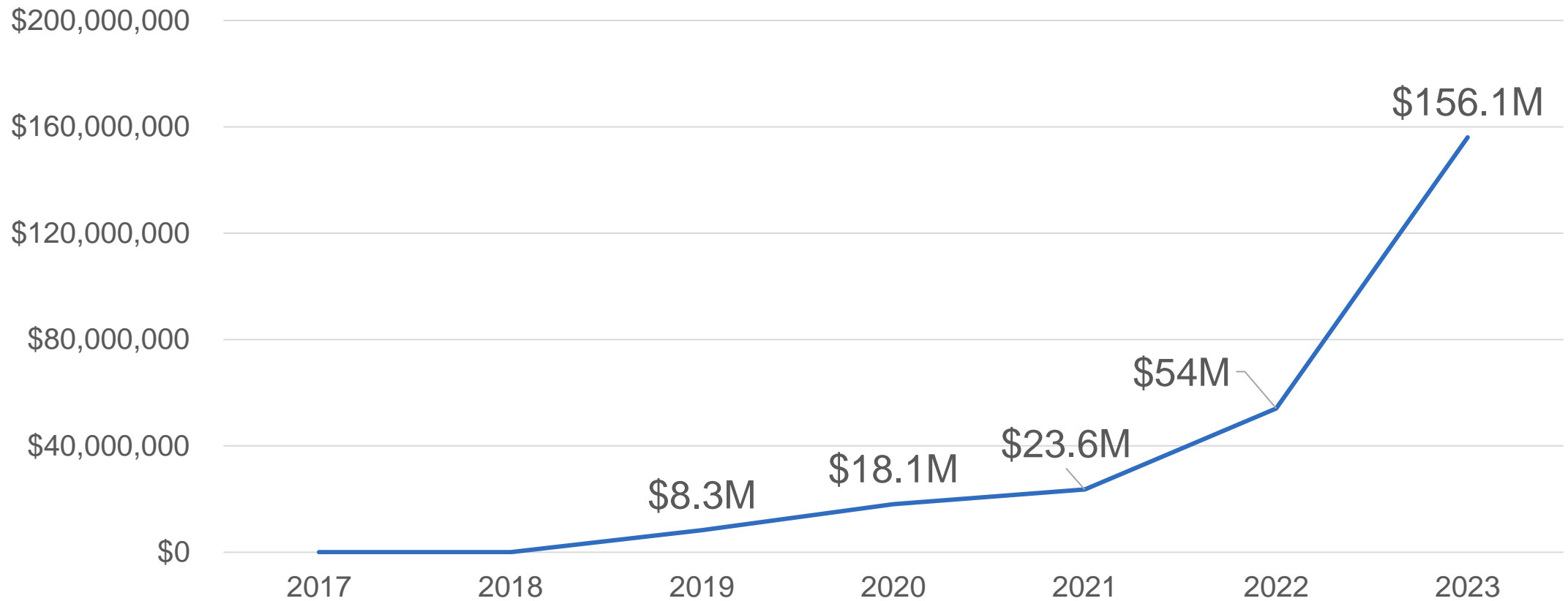
startups  
with sales

\$10.7  
million

in sales  
revenue



# Innovator Follow-On Funding Received



— Follow-On Funding Received

# Retaining Alumni Companies in the Region

## COHORT 1 ALUMNI

May 2017 – May 2019

2 of 3 companies  
remain in region



## COHORT 2 ALUMNI

May 2018 – August 2020

3 of 5 companies  
remain in region



## COHORT 3 ALUMNI

May 2019 – August 2021

4 of 7 companies  
remain in region



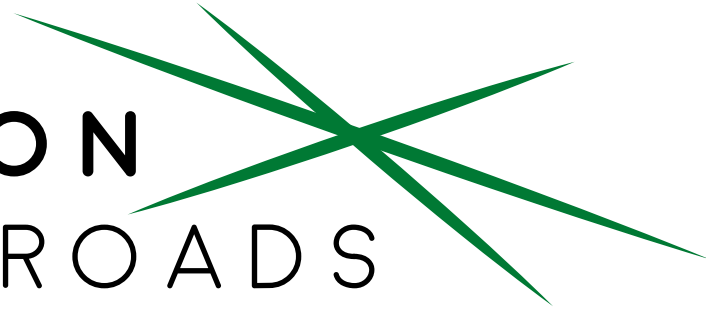
## COHORT 4 ALUMNI

June 2020 – June 2022

3 of 5 companies  
remain in region



# INNOVATION CROSSROADS



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## Alumni Spotlight

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# Cohort 2017 Alumni Spotlight: Anna Douglas

- SkyNano founded a low-cost manufacturing technique for high value carbon materials derived from CO<sub>2</sub>
- Named 2019 Forbes 30 Under 30 in Energy
- Secured \$200,000 DOE STTR Phase I to partner with ORNL's Battery Manufacturing Group on project titled "Conductive Carbons by Design: Electrochemically Tailored Carbon Nanotube Conductive Additives for High-Rate Battery Electrodes"
- Secured \$2.5M DOE Office of Fossil Energy R&D Award
- 2020 R&D 100 Award Winner
- 2021 TechConnect Defense Innovation Award Winner
- Producing a new type of carbon nanotube at a Tennessee Valley Authority (TVA) gas plant that could serve as a model for carbon reduction from fossil fuel power plants across the nation (January 2022)
- 1-of-60 finalists in Elon Musk's \$100M XPRIZE carbon removal competition
- 2022 Tennessee Governor's Environmental Stewardship Award Winner
- Secured \$2M DOE ARPA-E award with partners Endeavor Composites and the University of Tennessee, Knoxville
- Secured two Phase II SBIR awards from the U.S. Air Force totaling \$2.5M
- Opened a 2,000 square foot private lab/office space in Knoxville



# Cohort 2018 Alumni Spotlight: Megan O'Connor

- Nth Cycle founded a recycling technology that extracts critical metals from batteries, e-waste, low-grade ore, and mine tailings so they can be reused to make new clean energy products
- Named 2019 Forbes 30 Under 30 in Energy
- Secured \$3.2M in funding from investors led by climate tech venture capital firm Clean Energy Ventures (October 2020)
- Closed a \$13M Series A round, led by Clean Energy Venture (February 2022)
- The investments by Clean Energy Venture will allow Nth Cycle to scale its metal processing technology, an alternative to pyrometallurgy and hydrometallurgy processes
- Won a \$976K National Science Foundation (NSF) SBIR – Phase II award to continue working with ORNL on an electrochemical recycling technology for recovery of critical battery cathode metals
- Demonstrated technology to the Prince and Princess of Wales during visit to Greentown Labs
- Awarded \$2.15M grant from the DOE Battery Materials and Battery Manufacturing and Recycling Program
- Recognized by Forbes as a female founder making major impacts in the EV and critical mineral industry (January 2023)
- Announced production of Mixed Hydroxide Precipitate (MHP) domestically here in the U.S.
- Nominated for 2023 Earthshot Prize via category “Build a Waste World”
- Raised 40% of Series B round (\$20 million)
- Opening first-of-its-kind 21,000-square foot refining facility in Fairfield, Ohio

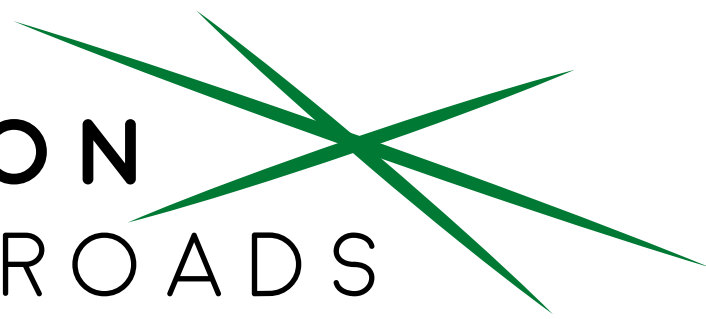


# Cohort 2021 Alumni Spotlight: Tommy Gibbons

- Hempitecture was founded with the idea that healthy, sustainable materials can help build a better world. These materials can help build a better world by contributing to our health, saving energy, and storing carbon dioxide.
- Named 1-of-101 U.S. green building startups
- Raised \$5.7M in seed funding from more than 1,700 investors, using online crowdfunding platform Wefunder
- Named 1-of-10 sustainable startups to watch in 2023 by Startup Savant
- Total sales revenue for 2022 - \$850K
- Opened first bio-based insulation manufacturing plant in the U.S. (January 2023)



# INNOVATION CROSSROADS



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## Ecosystem & Partners

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# Creating an Innovation Ecosystem

## Incubators and Accelerators



2017



2020

**techstars\_**  
**Industries of the Future**  
**Accelerator**

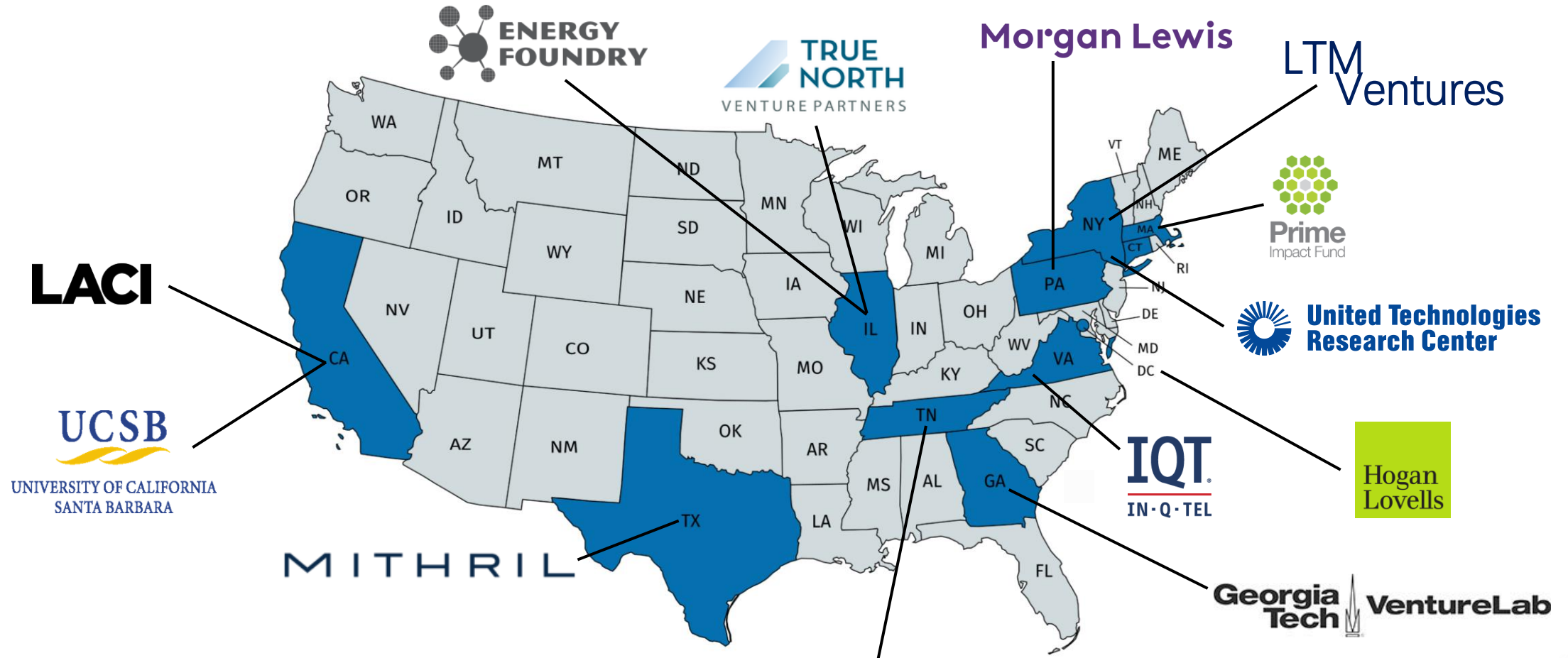
2022

## Local Supporters





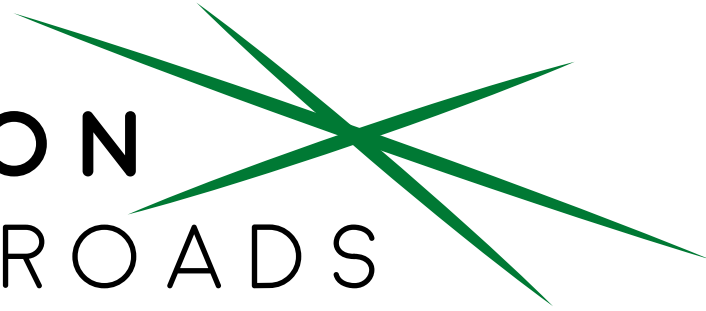
# Growing a Robust Advisory Network



A horizontal bar containing logos for various advisory organizations, including:

- BOLDSQUARE
- SHELTOWEE Angel Network
- FAIRVIEW TECHNOLOGY CENTER
- EASTMAN
- KEC
- KNOXVILLE ENTREPRENEUR CENTER
- TVA
- INNOV 865 ALLIANCE
- OAK RIDGE National Laboratory
- ENERGY NETWORK
- EPR2
- THE UNIVERSITY OF TENNESSEE KNOXVILLE
- THREE ROOTS CAPITAL
- sparkz
- PYA
- Launch Tennessee

# INNOVATION CROSSROADS



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# Programming & Curriculum

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# Partnering to Support Entrepreneurs

Entrepreneur-fellows in Innovation Crossroads, a Department of Energy Lab-Embedded Entrepreneurship Program at Oak Ridge National Laboratory, will complete the Spark Cleantech Accelerator, a 12-week program offered by the University of Tennessee, Knoxville, Spark Innovation Center at the UT Research Park.

“By combining the resources of Innovation Crossroads and the Spark Cleantech Accelerator, we are building a stronger program for entrepreneurs,” said Dan Miller, program lead for Innovation Crossroads. “Entrepreneurial ecosystems depend on relationships among early-stage companies. This new collaboration — a first between our two programs — is an intentional effort to grow Knoxville’s entrepreneurial community.”



# Spark Cleantech Accelerator (August – November)

## Week 1:

### **Orientation and Introductions**

- Welcome to Knoxville
- Accelerator Onboarding
- Mentor Introductions

## Week 2:

### **Business Model Canvas, Market Fit and Validation**

- Total Accessible Market
- Customer Discovery
- Ideal Customer Profile

## Week 3:

### **Product and Market Fit**

- Technology Description
- Customer Interview Findings
- Market Metrics

## Week 4:

### **Business Modeling and Value Proposition**

- Opportunity Assessment
- Business Model Concepts
- Sales Training

## Week 5:

### **Intellectual Property**

- Patenting
- Trademarking
- Trade Secrets and Copywriting
- Attorney Office Hours: Goodwin Procter

## Week 6:

### **Partners, Supply Chain and Engagement**

- Supply Chain Management
- Strategic Partnerships

## Week 7:

### **Organizational Design**

- Team Building
- Talent Recruitment
- Hiring/Firing
- Management and Leadership
- Building and Working with your Boards
- Creating Company Culture

## Week 8:

### **Financial and Valuation Modeling**

- Financial Modeling
- Valuation

## Week 9:

### **Funding, Non-D: Outside Investment**

- Funding Strategy
- Term Sheets
- Finding Investors

## Week 10:

### **Investor Week**

- Queen City Angels Bootcamp
- Pitch Practice and Investor Feedback

## Week 11:

### **Communications and Branding**

- Representing company
- Communicating value proposition
- Digital Communications and Social Media

## Week 12:

### **Pitch Prep**

- Best Approach to Pitching
- Audience Engagement
- Due Diligence Scoring

## Week 13:

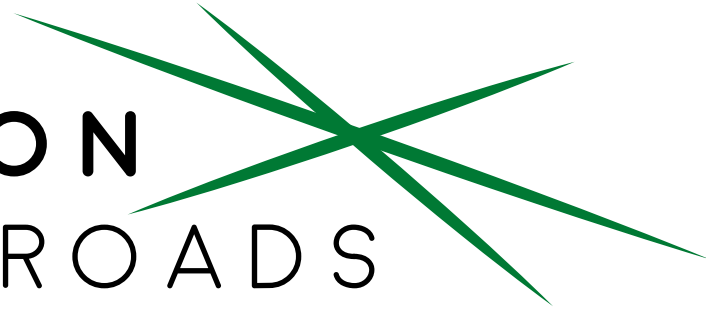
### **Final Presentations and Demo Day**

- Public presentation to investors, strategic partners and stakeholders

# Recurring Program Activities (2023 – 2024)

Activities	Description
Innovator's Institute	Educational seminars
Founders' Forum	Live Q&A with program alumni, community members, experienced startups founders, etc.
Pitch Practice	Innovators practice a particular pitch style and/or a pitch for a particular audience.
Monthly Technical Update	Innovator presents monthly status update (i.e., technical progress, business progress, awards/achievements, needs, etc.) to Staff/PI(s)/Mentors/Advisors.
Monthly Group Meeting	Review of program calendar, ORNL/IC updates and news, Q&A, networking, etc.

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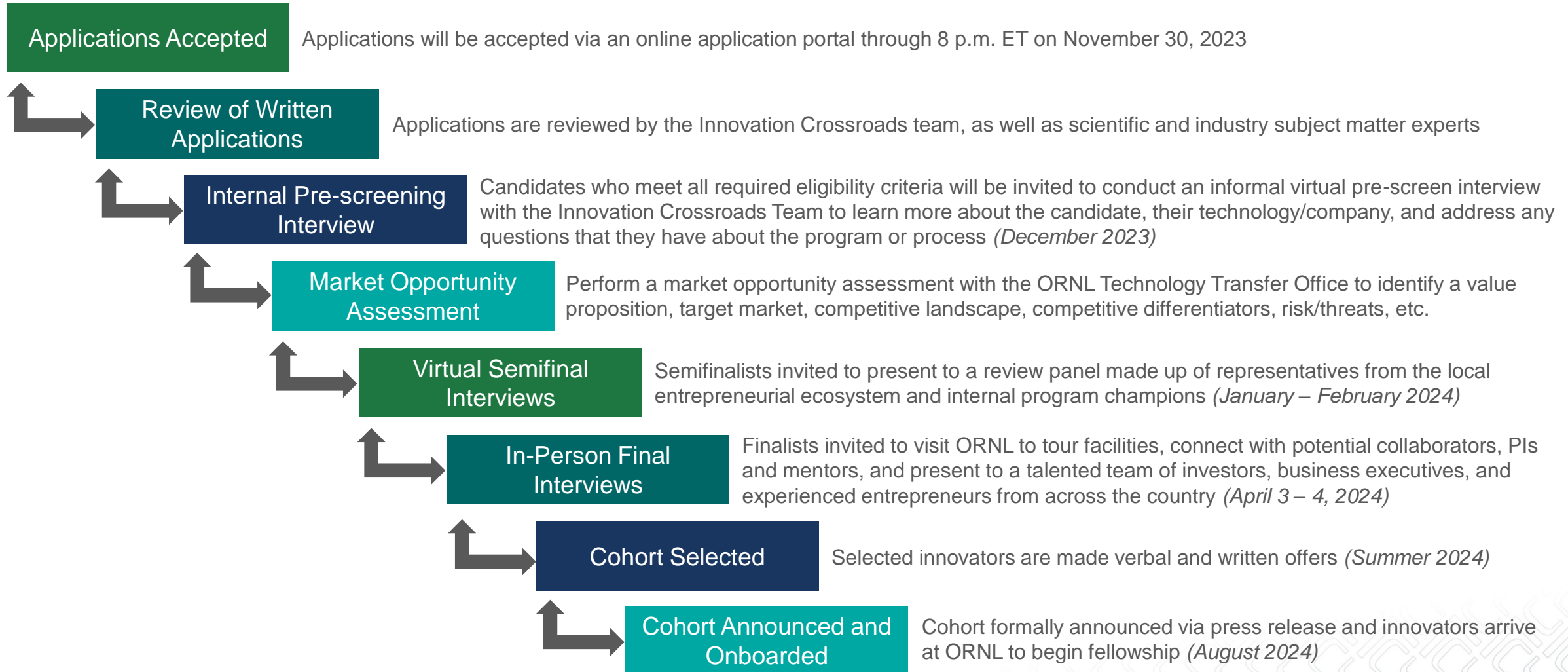
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# The Process



# Technology Areas of Interest

- Advanced materials
- Carbon capture, utilization, and sequestration
- Circular economy technologies and systems
- Data and networking systems and technology
- Energy storage and grid optimization
- Improving manufacturing efficiency
- Industrial decarbonization
- Lowering building carbon and energy footprints
- Negative emissions technologies and carbon dioxide removal (CDR)
- Nexus of energy, water, and agriculture
- Quantum computing
- Solar and wind energy
- Other



# Eligibility Criteria

- **For acceptance into the program, applicants:**
  - Must apply as an individual, not as a company or organization (if you are part of a team, each member of your team can apply as an individual)
  - Must have doctoral degree or equivalent experience
  - Must leverage ORNL R&D capabilities and have alignment with DOE's and/or TVA's mission
  - Must be willing to relocate to the Knoxville-Oak Ridge area for two years
  - Must be a U.S. citizen or lawful permanent resident at time of application
  - Must have raised no more the \$2 million USD in debt or equity funding from non-government sources within three years prior to program application
  - Must successfully execute a cooperative research and development agreement (CRADA) with ORNL
  - Must disclose background intellectual property rights, if necessary, that may be needed to freely operate on R&D-related tasks as outlined within the CRADA

# Application Information

1. Complete online application form
2. Attach requested application materials as a single PDF document containing the following information:
  - **Resume (*one page*)**
    - Please provide a resume highlighting your education, experience, and skills.
  - **Tell us about yourself (*one page*)**
    - Provide the back story on you and your project. Where did the idea originate? Why do you want to pursue this effort and what makes you qualified to do so? Explain why you have chosen to pursue an entrepreneurial career path.
  - **Tell us about your technology (*two pages*)**
    - Describe the technology you want to develop, including the current status of the technology. Provide an adequate amount of technical detail for a subject matter expert to fully understand your technology, and the methodological next steps required to scale the technology. Use the Heilmeier catechism as a guide. Please include links or references to supporting documents that back technology proof-of-concept (i.e., patents, publications, presentations, diagrams, etc.).
  - **Project abstract (*one page*)**
    - Briefly describe how you envision making your technology a market reality. Please describe the market you intend to reach, its customers, potential suppliers/distributors/manufacturers, relevant intellectual property (status of any licenses, etc.), barriers to entry, sophistication of market, market incumbents, etc.
  - **Tell us about your team (*one paragraph*)**
    - List current members of your team (i.e., co-founders, chief executive officer, chief operations officer, chief technology officer, business development manager, engineers, etc.).
  - **What is the potential impact on the DOE, TVA, and/or ORNL mission? (*one paragraph*)**
    - Comment on the potential for impact on US energy and manufacturing competitiveness. More specifically, comment on the potential for impact on the sponsor's mission area for your primary application track.
  - **Why ORNL and Innovation Crossroads? (*one page*)**
    - What most attracts you to Innovation Crossroads? Why is ORNL the ideal home for you and your project (vs. alternative paths)? Name the people, facilities, and/or equipment at ORNL that will be most valuable in supporting your work.
  - **What else? (*one page*)**
    - An extra page for anything else that you feel we should know.

# Heilmeier Questions

- What are you trying to do?
  - Articulate your objectives using absolutely no jargon.
- How is it done today, and what are the limits of current practice?
- What is new in your approach and why do you think it will be successful?
- Who cares?
  - If you are successful, what difference will it make?
- What are the risks?
- How much will it cost?
- How long will it take?
- What are the mid-term and final “exams” to check for success?

# High-Level Evaluation Criteria

- Candidate eligibility
- How innovative is the proposed approach
- Applicant's technical understanding of the problem and proposed solution
- Potential market impact
- Soundness of the business concept
- Evidence that ORNL capabilities can help advance the idea
- Likelihood that the idea can be matured in the 2-year program
- Weight of candidate experience and/or formal education from a premier institution in a technologically advanced field

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## Discussion

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NOW ACCEPTING APPLICATIONS FOR COHORT 2024

**APPLY TODAY!**

[INNOVATIONCROSSROADS.ORNL.GOV/APPLY](https://innovationcrossroads.ornl.gov/apply)

### PROGRAM

Innovation Crossroads, a Lab-Embedded Entrepreneurship Program, at Oak Ridge National Laboratory is the Southeast's only entrepreneurial research and development program based at a U.S. Department of Energy national laboratory. The unique program supports and mentors entrepreneurial researchers whose early-stage innovations are presently too challenging or technically uncertain to pursue in a venture capital-financed startup. Innovators are selected for the program through an annual competition. Innovation Crossroads embeds innovators at ORNL for up to two years for entrepreneurial mentorship and to conduct cooperative R&D with the intention of incubating and translating innovations from proof-of-concept to proof-of-product. This unique fellowship opportunity allows selected innovators to leverage ORNL's world-leading scientific facilities, equipment, capabilities, and experts to advance their early-stage discoveries into potential commercial opportunities within an accelerated period of time.

### ELIGIBILITY REQUIREMENTS

- Apply as individuals, not as companies or organizations
- Have doctoral degree or equivalent experience
- Leverage ORNL R&D capabilities and have alignment with DOE's and/or TVA's mission
- Be willing to relocate to the Knoxville-Oak Ridge area for two years
- Be a US citizen or lawful permanent resident at time of application
- Have raised no more the \$2 million USD in debt or equity funding from non-government sources within three years prior to program application
- Successfully execute a Cooperative Research and Development Agreement (CRADA) with ORNL
- Disclose background IP rights, if necessary, that may be needed to freely operate on R&D related tasks as outlined within the CRADA

### WHAT YOU GET

- **A two-year fellowship** – Innovators receive a yearly living stipend of \$115,000, along with a health insurance stipend and professional development allowance for travel funding, educational training and development, and customer discovery activities.
- **World-class lab access and research funding** – In addition to unparalleled access to facilities, research tools, equipment, and expertise at ORNL, innovators receive R&D funding to support collaboration opportunities with researchers across the lab.
- **Business mentors, entrepreneurial training, and networking** – Innovators receive access to experienced business mentors, entrepreneurial training programs, and exclusive networking opportunities. Innovators are also connected to a wide range of leaders from academia, industry, government, and finance that can serve as advisors and partners.

### KEY DATES

- October 16, 2023 – Applications open
- October 24, 2023 – Recruitment webinar
- November 9, 2023 – Recruitment webinar
- November 27, 2023 – Recruitment webinar
- November 30, 2023 – Applications close
- April 3-4, 2024 – In-person final interviews at ORNL
- August 2024 – Cohort 2024 starts at Innovation Crossroads

