

Institute for ADVANCED
Composites Manufacturing
INNOVATION

Institute Overview

Craig Blue, Oak Ridge National Laboratory
2015 AMO Peer Review – May 28, 2015

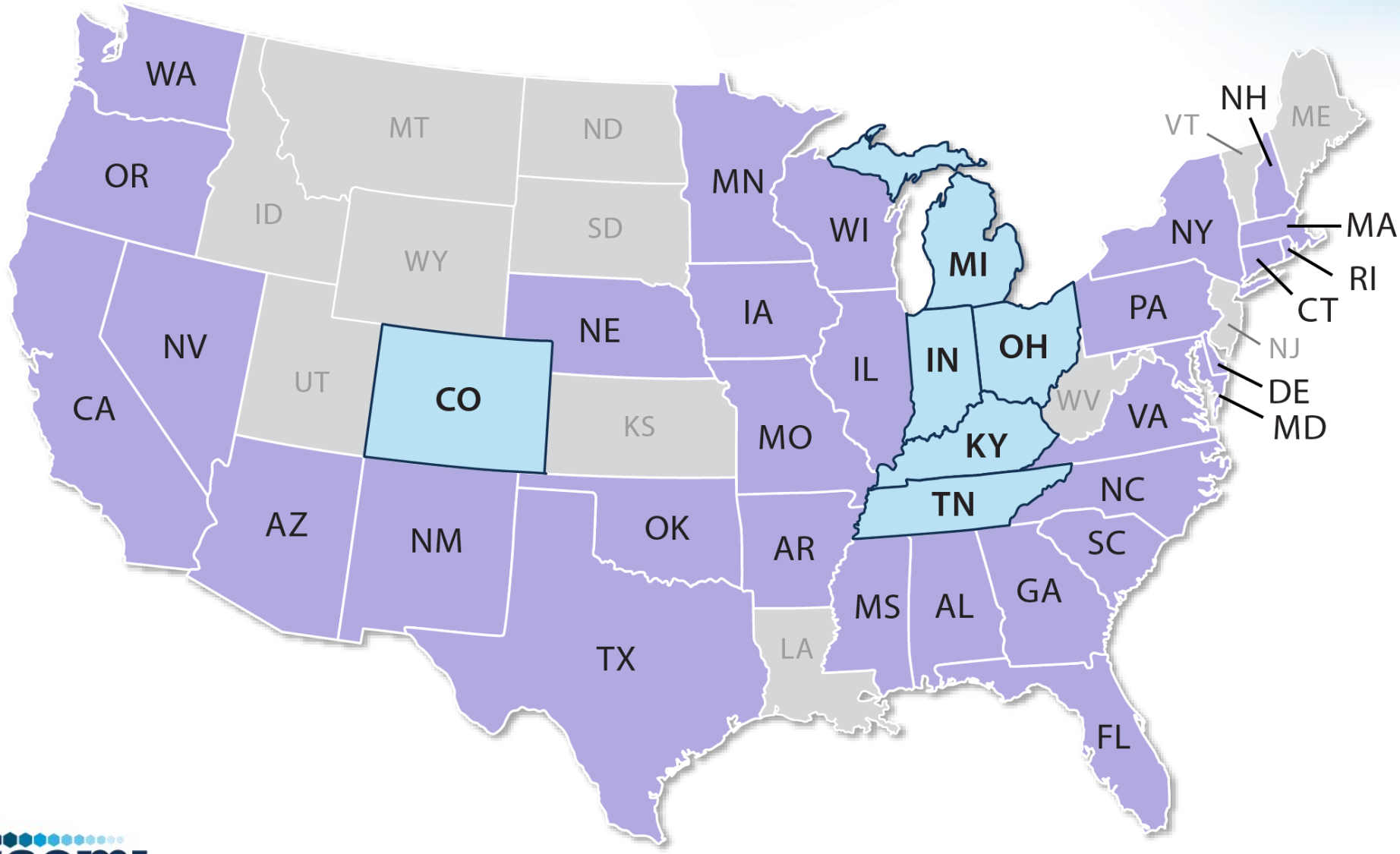
This presentation does not contain any proprietary, confidential, or otherwise restricted information.

iacmi

President Obama Announces New Innovation Manufacturing Institute
-Part of the National Network of Manufacturing Innovation

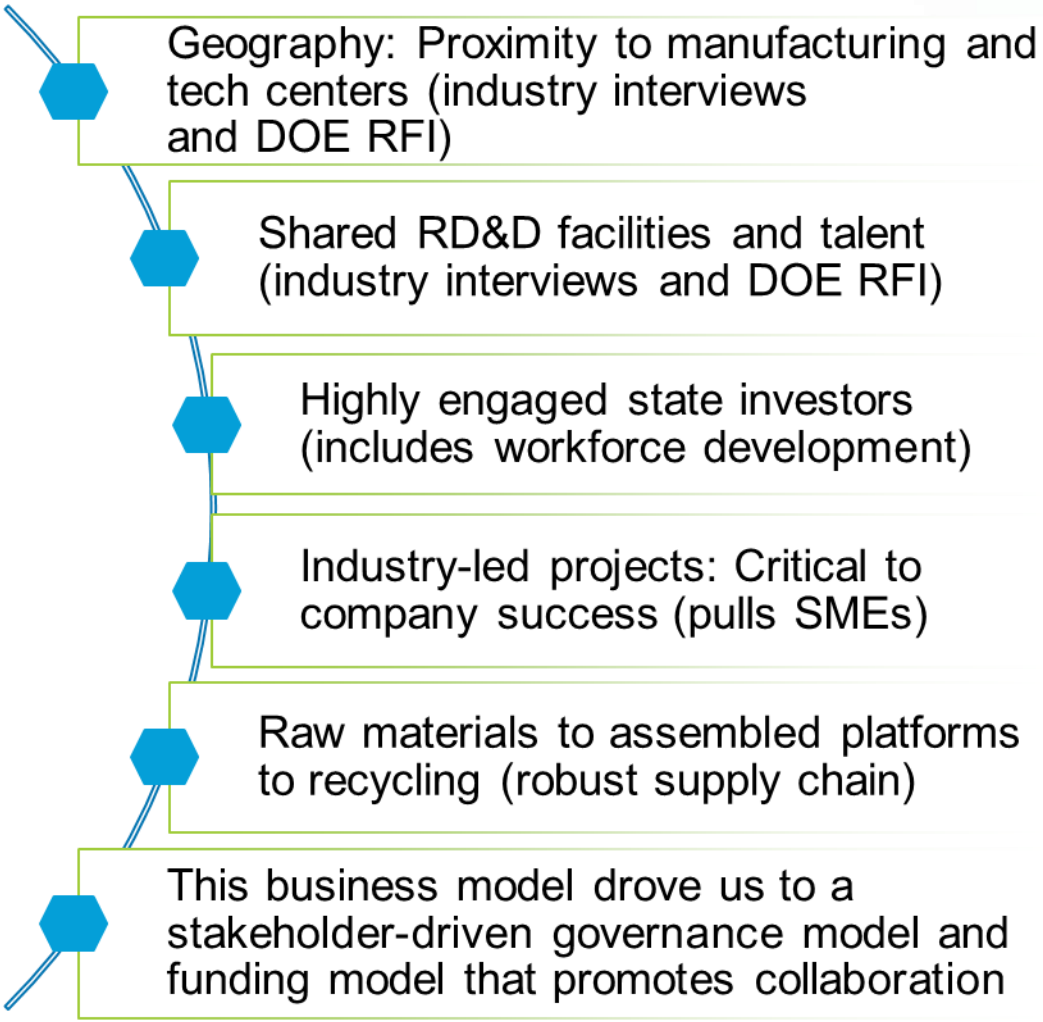
- IACMI was selected for negotiation by the Department of Energy.
- President Obama announced the selection on January 9, 2015 in Tennessee.
- IACMI is currently negotiating the Cooperative Agreement with DOE.
- IACMI can not begin operations until the Agreement is fully executed.
- IACMI as presented in this slide deck is how it was proposed in the application and is subject to change.

IACMI is a National Institute



Shared RD&D facilities will support industry

IACMI will accelerate adoption of advanced composites



Planning for an effective and sustainable institute

- Compelling Advanced Manufacturing Vision
- Local and Regional Economic Community
- Engaged Industry and Research Partners
- Focused and Capable Leadership and Governance
- Shared RD&D Infrastructure

IACMI Goals as stated in the Funding Opportunity Announcement

Focus Areas

- Vehicles
- Wind Turbine Blades
- Compressed Gas Storage (CNG, Hydrogen)

Five Year Technical Goals

- 25% lower CFRP cost
- 50% reduction in CFRP embodied energy
- 80% composite recyclability into useful products

Impact Goals

- Enhanced energy productivity
- Reduced life cycle energy consumption
- Increased domestic production capacity
- Job growth and economic development

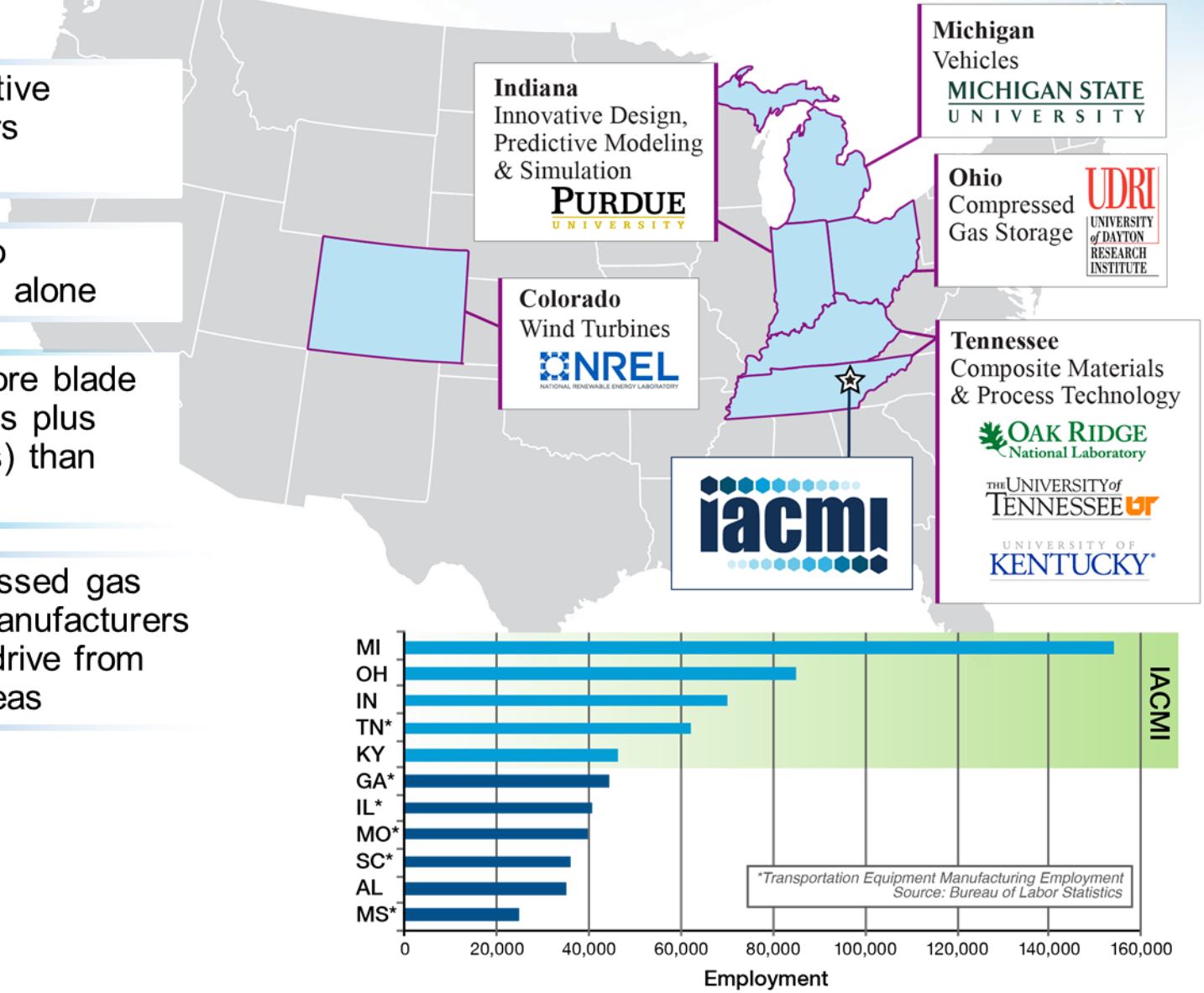
Core partners are capable and strategically located

>70% of automotive production occurs in IACMI states

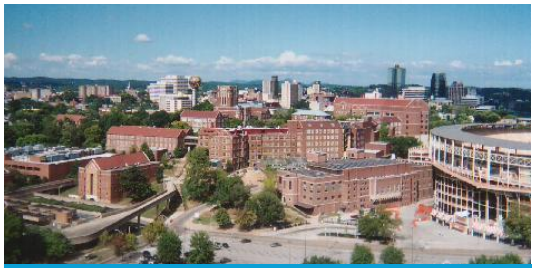
>70% of US auto R&D in Michigan alone

Colorado has more blade facilities (factories plus technical centers) than any other state

>60% of compressed gas fueled vehicle manufacturers with in half-day drive from IACMI Focus Areas

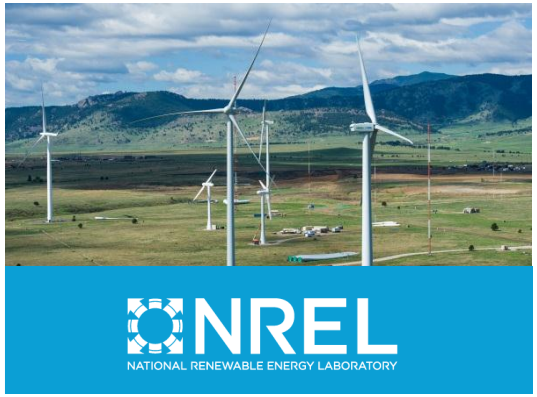


Leveraging World-Renowned Intellectual Resources



- 15-year history of advanced composites R&D
- Engaged SMEs for 20 years at Nonwovens Research Lab (formerly Textile and Nonwovens Development Center)
- Hosts leadership-class Joint Institute for Advanced Materials

Leveraging World-Renowned Intellectual Resources



- >30-year history of collaboration with every major wind turbine OEM and every blade manufacturer
- World-leading integration of wind turbine design, modeling, analysis, manufacturing, and testing capabilities

- ~50-year history of polymer composites manufacturing R&D
- Pre-eminent among DOE labs in advanced manufacturing R&D including carbon fiber, composites, and polymer additive manufacturing
- Largest US materials R&D portfolio

Leveraging World-Renowned Intellectual Resources

- Top-tier university composites center, founded and led by Lawrence Drzal
- 25+ years of composite materials and processing R&D, education, and technology transfer
- Rich history of collaboration with auto OEMs and suppliers

- >40 years experience in applied, advanced composites RD&D
- Uniquely combines industrial and aerospace composites capabilities
- #2 ranked university in federal funding for materials R&D

Leveraging World-Renowned Intellectual Resources

PURDUE UNIVERSITY

- Leadership-world class composites modeling and simulation HUBs founded and led by R. Byron Pipes, NAE
- Global leader in computing HUB technology and information security
- Renowned materials science & engineering program including advanced composites

UNIVERSITY OF KENTUCKY®

- Decades of experience in carbon materials research
- Largest US open access solution spinning lab
- Home of the Center for Applied Energy Research
- Trains students through hands-on research

Scale-up Across IACMI State Partners

Solution Spinning Line

KY

Carbon Fiber Technology Facility

TN

Pre-preg Production Pilot/Full Scale

TN OH MI

Pilot Scale PCM
1,000 ton press

OH

Full Scale PCM
3,000 ton press

MI

IN

IACMI members lead their markets

Vehicles

Global #1, 3, 5, 7; mainstream OEM's with >30% global and >45% US production share

TOYOTA

of America

Ford

HONDA

Wind

Top 3 US OEM's with >70% share of installed US wind generation capacity, US #1 blade manufacturer

Vestas

SIEMENS
Siemens Wind Power

tpi DELIVERING COMPOSITE SOLUTIONS

CGS

US #1 composite tank fabricator; 2 innovative new entrants; truck and auto OEM's

HEXAGON
LINCOLN

xperion

3M

OSHKOSH

IACMI members lead their markets

Design and Simulation

Worldwide leaders in simulation

Recycling

US leaders in CF recycling

Fibers

World's largest PAN fiber source and leading US furnace manufacturer for CF; top 3 US glass fiber producers

Resins

World Leading Thermoplastic & Thermoset Resin Providers

Membership levels promote wide stakeholder engagement

	Benefits
Charter	• Matching funds • Leverage capabilities • Influence direction of IACMI • Participate in governance • Rapid access to shared infrastructure
Premium	• Matching funds • Leverage capabilities
Resource	• Right to use mods to their products • Exposure to customers • Participate in projects to improve products
Consortium	• Consortium meeting • Networking • IACMI reports

Members

Charter:
11 members

DOW · Ford · Volkswagen · DASSAULT SYSTEMES · LOCKHEED MARTIN · DowAksa

Premium:
18 members

American Chemistry Council · BASF The Chemical Company · Continental Structural Plastics · CYTEC · DUPONT · fives · EVONIK INDUSTRIES · GE · HEIL TRAILER · HONDA · HUNTSMAN · LOCAL MOTORS · BOEING · PolyOne · PPG · sabic · xperion

>40 Resource Members

>60 Consortium Members

Supporters


ABCgroup
ACMA
American Composites Manufacturers Association
ADVANTAGE KENTUCKY ALLIANCE
ARKEMA
INNOVATIVE CHEMISTRY
AvPro
Technology Inc.
AZURE COMPOSITES, INC.
BAYER
Bayer MaterialScience
BWSC
BARGE WAGGONER SUMNER & CANNON, INC.
CABOT
CAMC
Capital Area Manufacturing Council
Centrus
Fueling the Future of Nuclear Power
cimv
THE BIOREFINERY CONCEPT
CITY AND COUNTY OF BROOMFIELD COLORADO
CITY of DETROIT
CITY OF KNOXVILLE
COMPOSITE APPLICATION GROUP
Con-way
CoorsTek
DEAKIN UNIVERSITY
DENVER INTERNATIONAL AIRPORT
Domtar
EASTMAN
E&L Enterprises Incorporated
Carbon Fiber Milling Specialist
Fibria
FLATE
GENERAL DYNAMICS
Land Systems
Georgia Tech
GP
Georgia-Pacific
GLOBAL COMPOSITE SOLUTIONS
GLOBE
Hanwha
HENDRICKSON
INDIANA AUTOMOTIVE COUNCIL
INNVENTIA
INOAC
IVY TECH COMMUNITY COLLEGE
JobsOhio
KCTECH
Korea Institute of Carbon Convergence Technology
KTM
KTM Industries, Inc.
KNOXVILLE OAK RIDGE
INNOVATION VALLEY
LeapInc
stronger together
LANSING COMMUNITY COLLEGE
Where Success Begins
LANSING REGIONAL CHAMBER
MCCA
ASSOCIATION
Michigan Community Colleges
MCL INC
Materials and Chemistry Laboratory, Inc.
Metalsa
MMTC
MOTT COMMUNITY COLLEGE
MICHIGAN STATE UNIVERSITY
Center for Community and Economic Development
OESA
ORAU
PELLISSIPPI STATE COMMUNITY COLLEGE
PneumatiCoat
TECHNOLOGIES
Commercializing "nano"
PRIMA CIVITAS
FOUNDATION

Supporters


PURDUE
UNIVERSITY
MANUFACTURING EXTENSION
PARTNERSHIP


res
AMERICAS
powering change


Renmatix


Roane State


RMX
TECHNOLOGIES


Mat
Edu
National Resource Center


NACK
NETWORK


NASA


NEW Techs, LLC


SENVION


SGL GROUP
THE CARBON COMPANY


SIEMENS
Siemens Wind Power


SINCLAIR
COMMUNITY COLLEGE


SÖDRA


SOUTHERN
UNIVERSITY
Agricultural & Mechanical College


SpaceTEC


SSOE


ST. CLAIR COUNTY
community college


Steelcase


TARDEC


TENNERA


TMI
AUTOTECH, INC.


TohoTenax
Toho Tenax America, Inc.


TRILOGY
ENGINEERED SOLUTIONS


TRU
DESIGN


THE UNIVERSITY of TENNESSEE
UT RESEARCH FOUNDATION

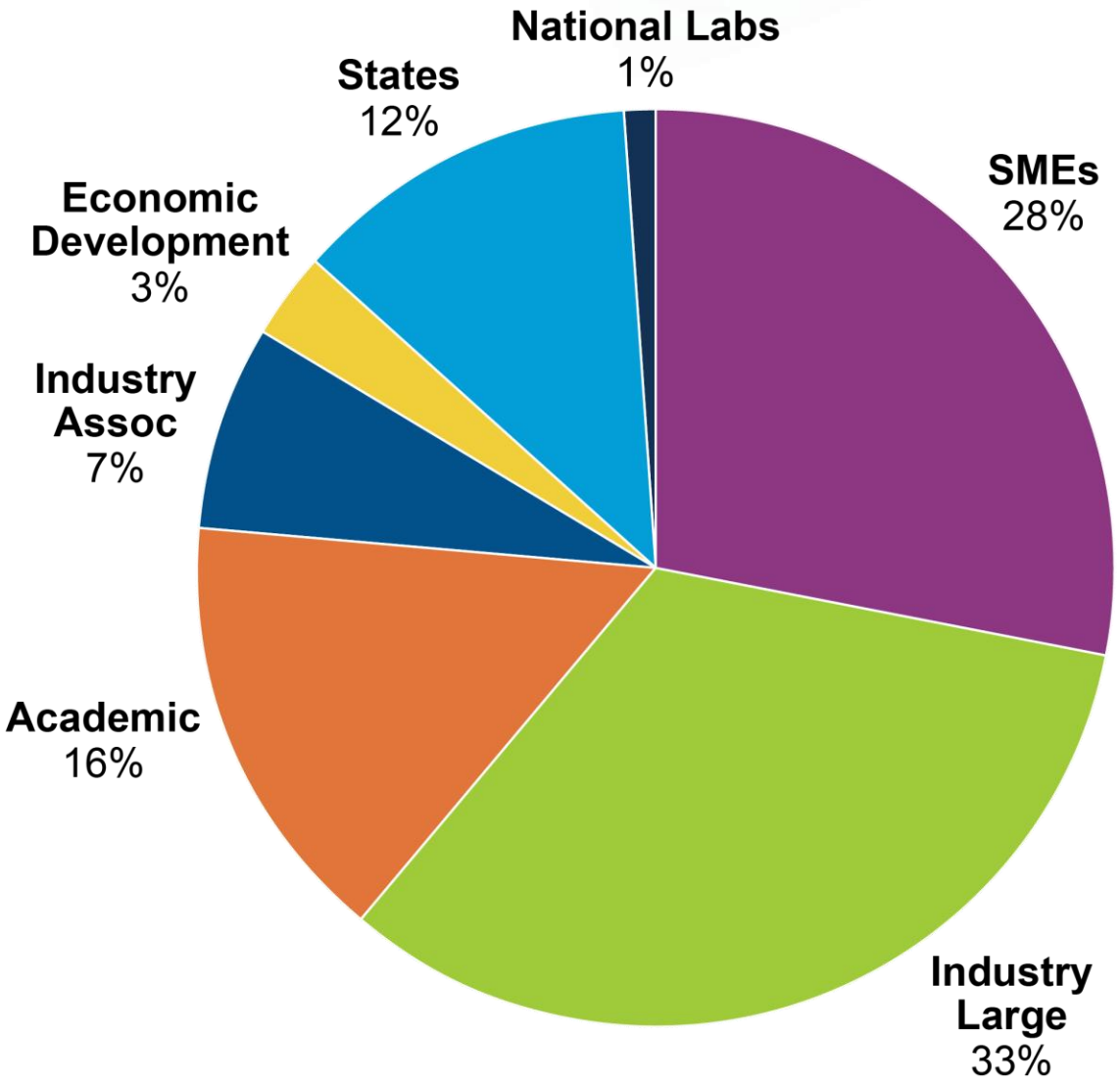

MICHIGAN


virdia


Valmet
FORWARD


vcamm

IACMI has >190 supporters and growing



Economic Development Council

A Platform for State Economic Collaboration

JobsOhio

COLORADO innovation network

THE STATE OF INDIANA SHOVEL READY PROGRAM

Collaboration of state development leaders seeding economies worth $2 trillion

PURE MICHIGAN® Michigan Economic Development Corporation

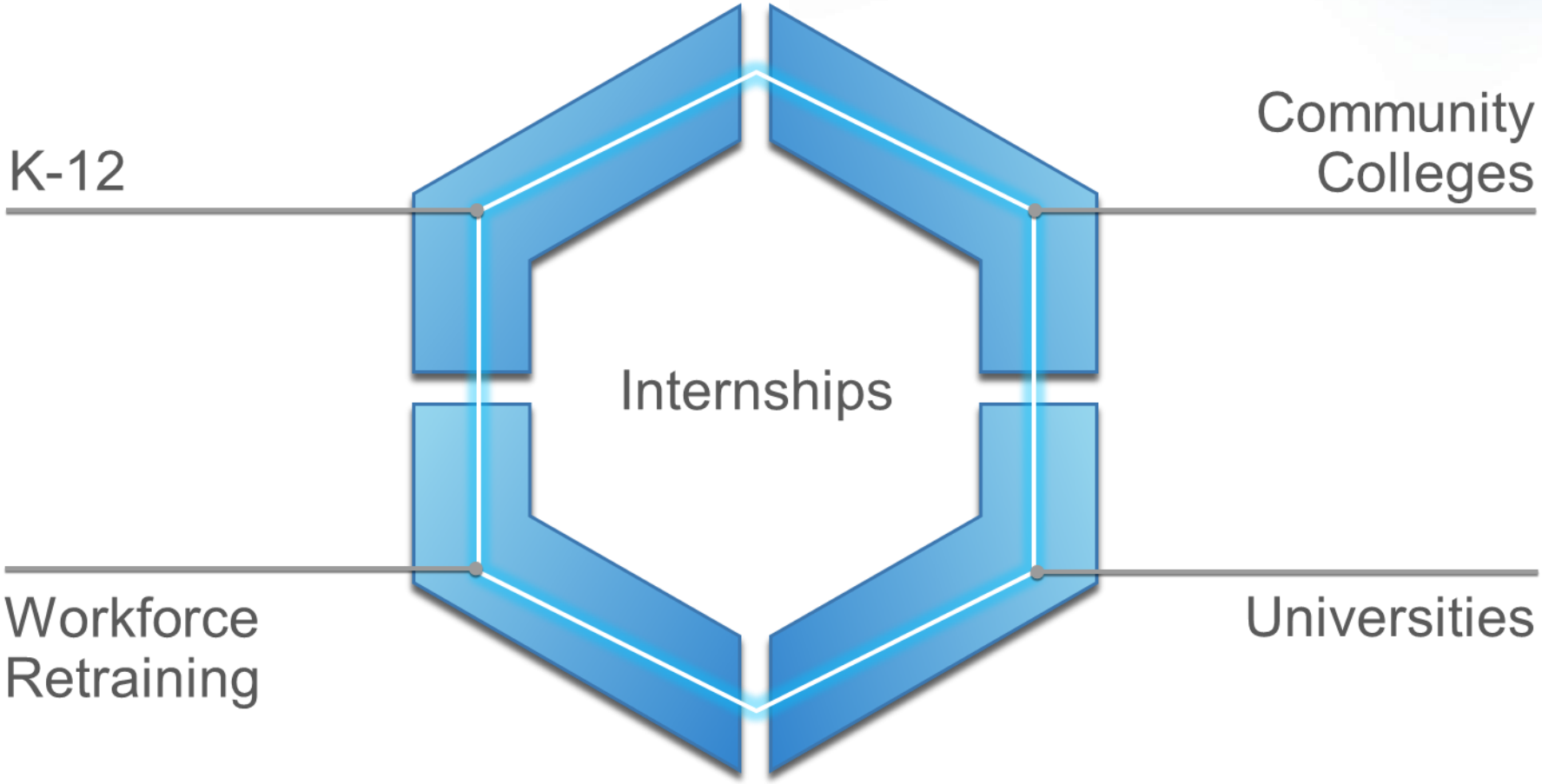
Kentucky Innovation Network

TN Economic & Community Development

Each state deploys **hundreds of millions of dollars annually** to create jobs and investment through:

- Business Services/ Incentives
- Venture Funds
- Workforce Training
- Innovation Incubation

Leveraging core state partnerships for STEM and workforce development



K-12 STEM

ACMA
American Composites Manufacturers Association

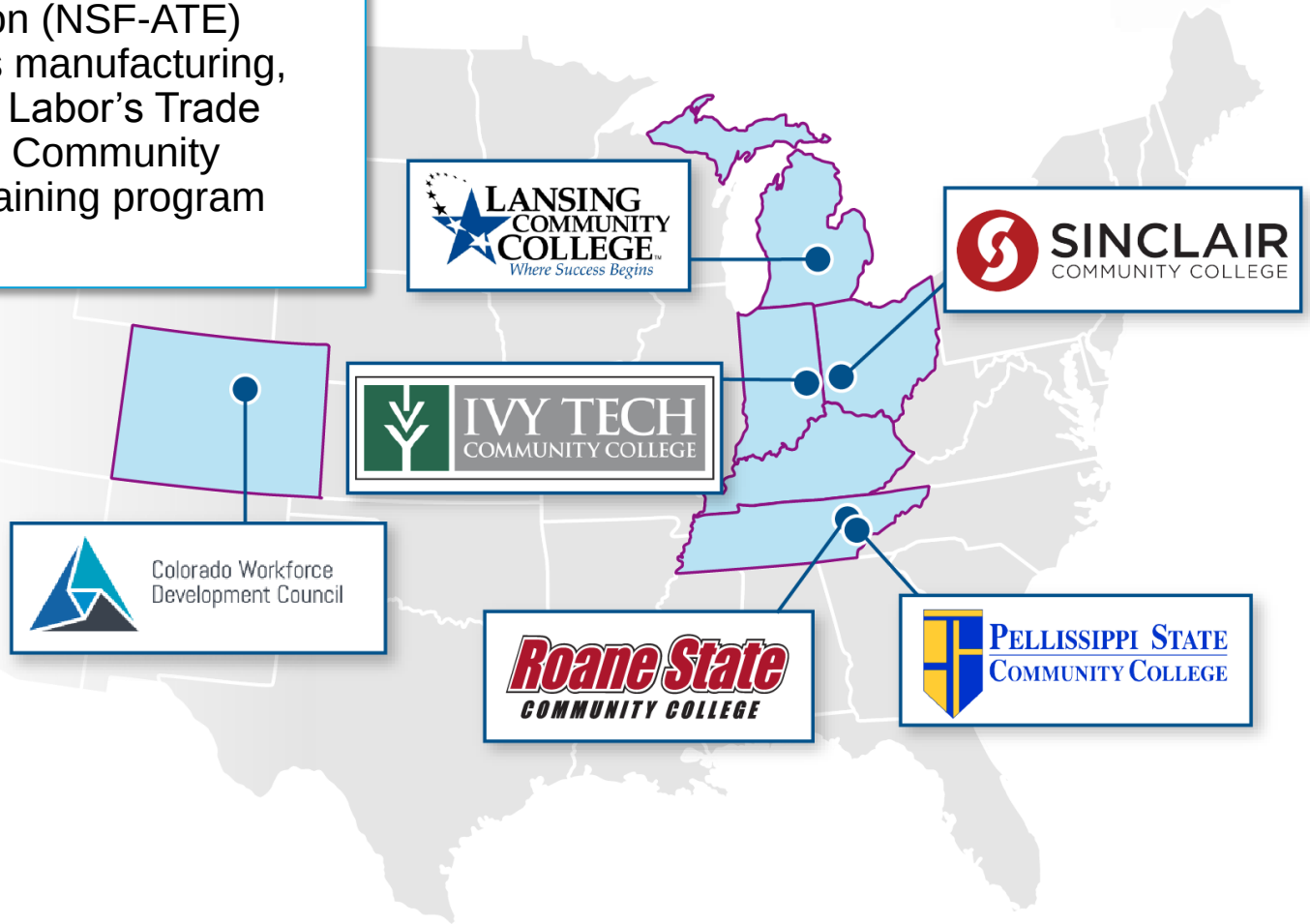
FIRST®

FLL®
FIRST® LEGO® League

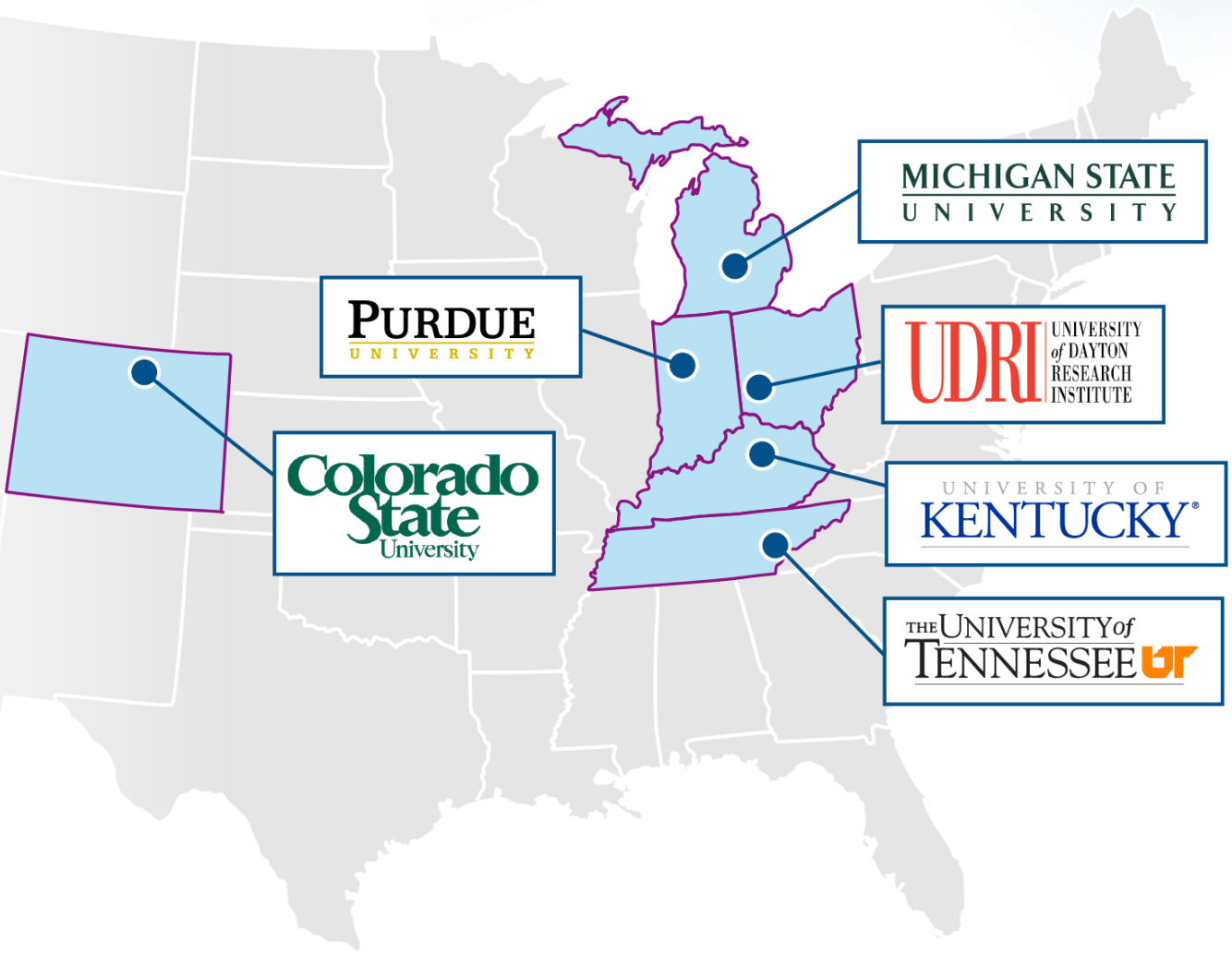
NanoDay at Impression 5 Science Center, Lansing Michigan

Community college network

Community colleges will capitalize on existing programs, e.g., National Science Foundation Advanced Technological Education (NSF-ATE) program in composites manufacturing, and the Department of Labor's Trade Adjustment Assistance Community College and Career Training program (TAACCCT)



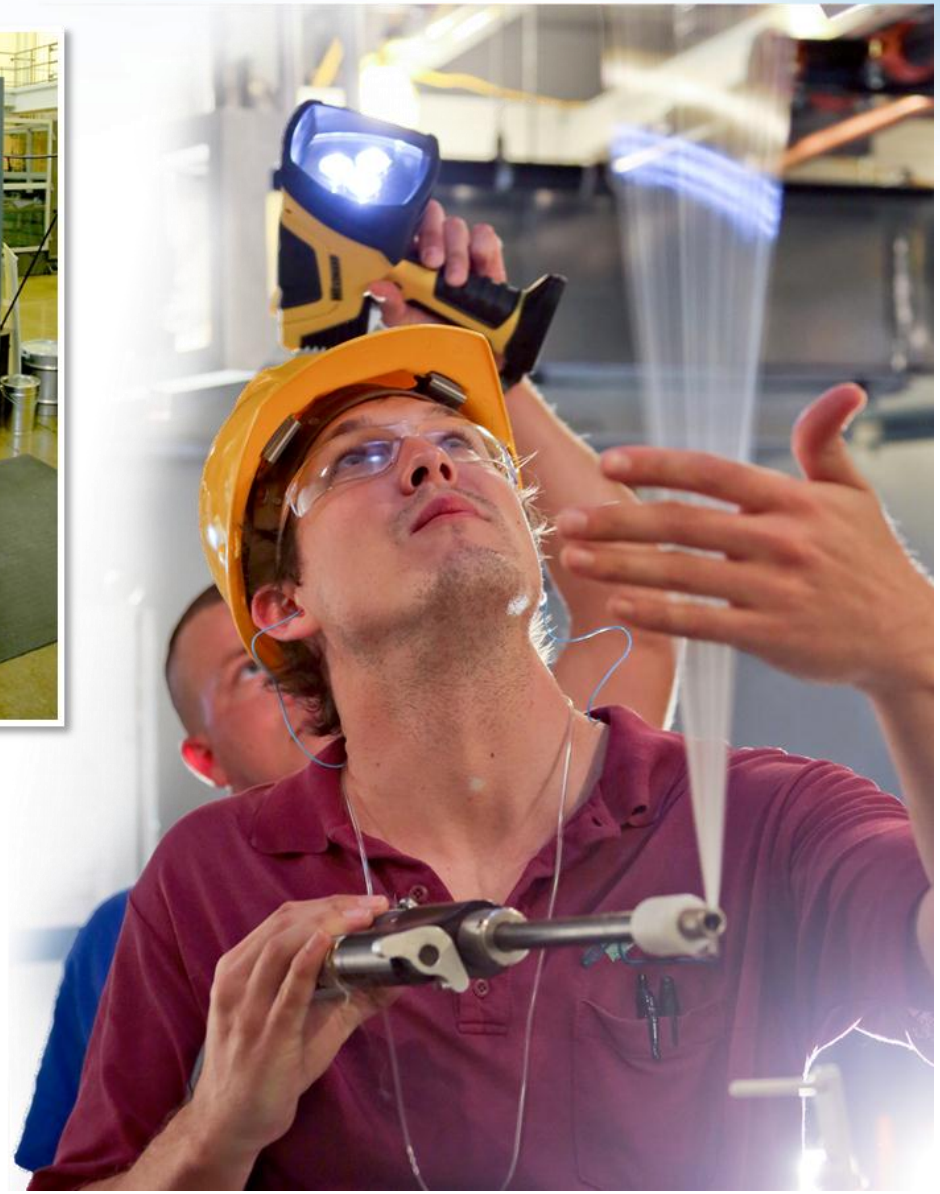
University training network



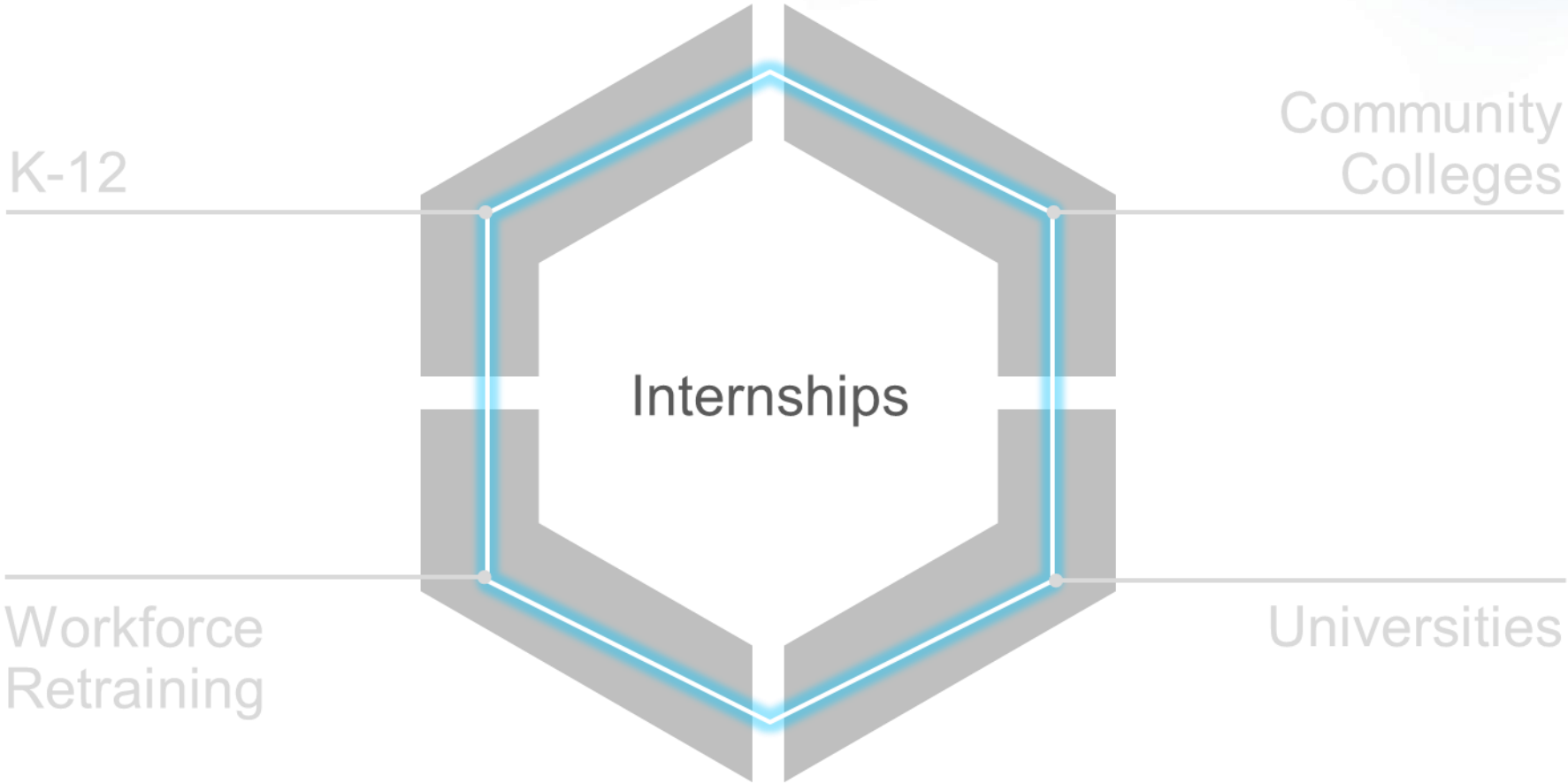
- Undergraduate
- Graduate
- Post-graduate

Skills enhancement for the workforce

- Roane State Community College Advanced Materials Training Education Center
- ACMA Certified Composites Technician Program
- EERE Advanced Manufacturing Internship Program



Internships deliver hands-on experience for STEM and workforce development



Internships will be available at all centers

Federal investment will catalyze a composites ecosystem in the heart of US manufacturing