

U.S. DEPARTMENT OF
ENERGY

Office of
**ENERGY EFFICIENCY &
RENEWABLE ENERGY**

AMMTO & IEDO JOINT PEER REVIEW

May 16th-18th, 2023

Washington, D.C.

IACMI – The Composites Institute | AMMTO

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DE-EE0006926 | June 2015-June 2022

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Project Overview



IACMI-The Composites Institute

The Institute for Advanced Composites Manufacturing Innovation
Knoxville, Tennessee

- Established in 2015 DOE Advanced Manufacturing Office
- One of 16 Manufacturing USA Institutes
- **IACMI Mission:** Convene, connect and catalyze the composites community to accelerate advanced composites design, manufacturing, technical and workforce solutions to enable a cleaner and more sustainable, more secure and more competitive U.S. economy
- Founding partners: **University of Tennessee, Oak Ridge National Laboratory**
- Additional core partners: **Purdue (IN), National Renewable Energy Laboratory (CO), Michigan State University (MI), University of Dayton Research Institute (OH)**
- Extensive ecosystem of core partners, state economic development agencies, trade associations, professional societies, workforce partners and multiple industry participants



Project Outline

Innovation: Reduce cost and embodied energy, and advance recycling of polymer composites

Project Lead: Institute for Advanced Composites Manufacturing Innovation

Project Partners: Over 90, including small and large industry, universities and national labs

Timeline: June 2015 to June 2022, initial cooperative agreement complete

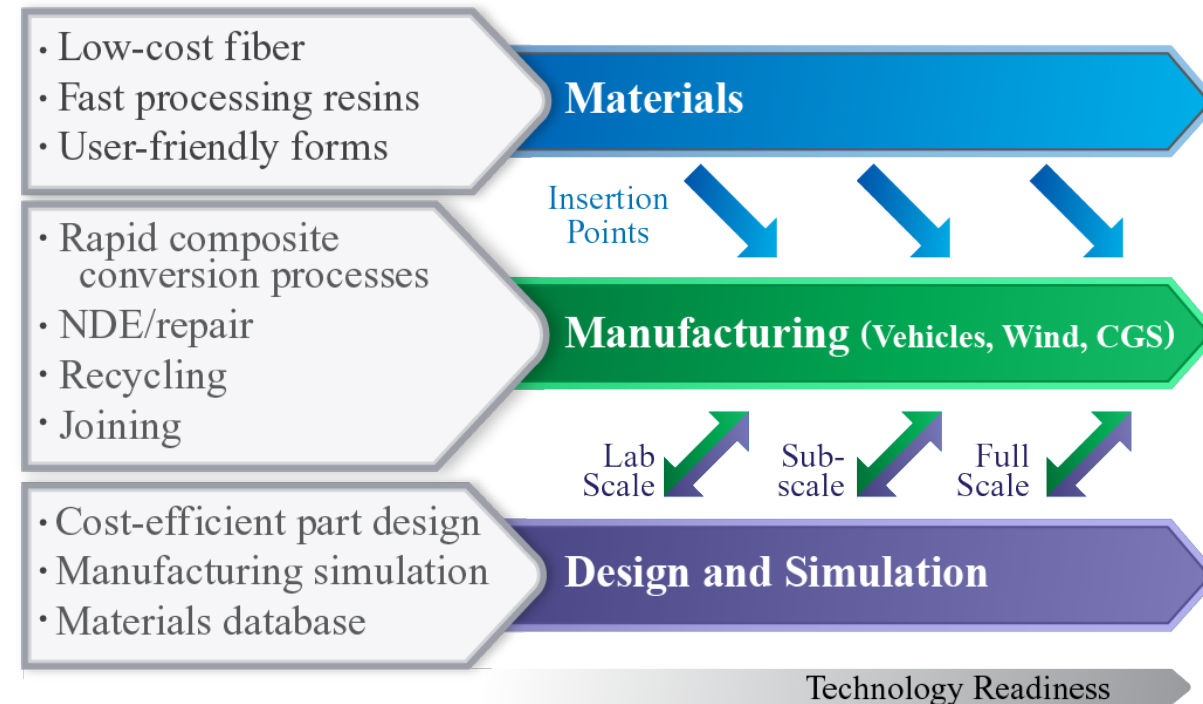
Budget:

DOE Funded	\$70M
Project Cost Share	<u>\$130M</u>
Total	\$200M

End Project Goal: Demonstrate composites applications with more than 25% lower costs than the 2015 baseline, 50% lower embodied energy than the 2015 baseline and demonstrate greater than 80% recyclability of composites on a path to 95% recyclability.

Background & Strategic Approach

- Initial vision for IACMI driven by “How do we catch and surpass Germany and the UK?”
 - Fraunhofer Institutes –Pioneer in high volume composites processing for 20+ years
 - National Composites Centre UK created 2009, facility operations 2011 – early focus aerospace, then automotive
- Barriers to Composites Growth
 - High price of carbon fiber and intermediates
 - Slow manufacturing processes
 - How to design to true minimum mass
 - Confidence in manufacturing processes and performance
 - Carbon fiber manufacture is energy intensive
 - Traditional processes are high scrap
 - Inefficient recycling technologies and infrastructure



Background & Strategic Approach pg.2

Ecosystem of Innovation

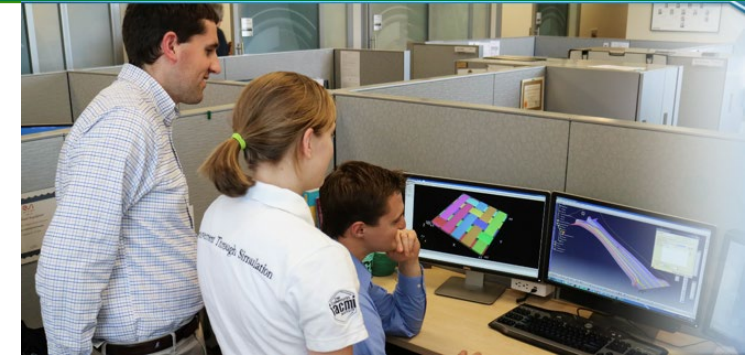
- **Core Partnerships** with leading universities, national laboratories, gov't agencies
- Leveraging existing networks across technical, professional, and economic development organizations
- Driving R&D, commercial outcomes, economic growth, and supporting national security

Extensive Industry Network

- 120+ Active members in 39 states
- 100 Industry members (68% SMEs)



Background & Strategic Approach pg. 3



PURDUE
UNIVERSITY




MICHIGAN STATE
UNIVERSITY



Manufacturing assets at relevant scale



 University of Dayton
Research Institute



 **OAK RIDGE**
National Laboratory

 **THE UNIVERSITY OF
TENNESSEE**
KNOXVILLE

 **NREL**
NATIONAL RENEWABLE ENERGY LABORATORY



Results and Achievements

IACMI – The Composites Institute

2015-2022

\$70M
of DOE
funding was
matched by
\$130M
of industry,
university,
and state
cost share

TN, IN and MI ea
invested \$15M
CO, OH invested
\$5M ea

Technology

\$150M portfolio
>60 R&D projects
25+ commercial
products

Partnerships

120+ Members
Industry, Universities,
National Labs,
Gov't Agencies

Infrastructure

\$400M Value

Tennessee (4 facilities)

Michigan (2)

Ohio (1)

Indiana (2)

Colorado (1)

Pipeline

100 Internships
100% placement rate

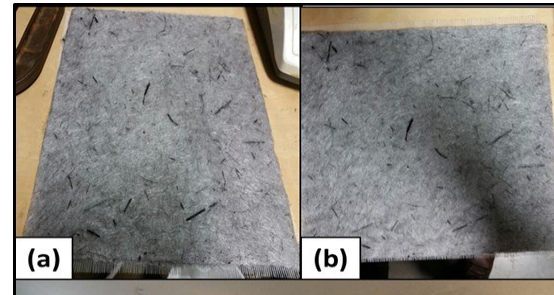
15,000 Trainees
K-12, post-secondary
& adult workers

Jobs

**3,000 Manufacturing
Job Commitments**
by IACMI members
partners

Results and Achievements pg. 3

Seven years of Recycling Innovation



- Nine projects
- Multiple technologies
- New and growing commercial entities

Embodied Energy

	Baseline	Recycled fiber	
Carbon fiber @10%	115 MJ/kg	5 MJ/kg	← 96% reduction
PA 6/6 @90%	52 MJ/kg	52 MJ/kg	
Compounding	8 MJ/kg	8 MJ/kg	
Injection Molding	<u>11 MJ/kg</u>	<u>11 MJ/kg</u>	
Total energy	186 MJ/kg	76 MJ/kg	← 60% reduction



April 27, 2021
Braskem Launches Carbon Fiber Reinforced Polypropylene Filament for Additive Manufacturing



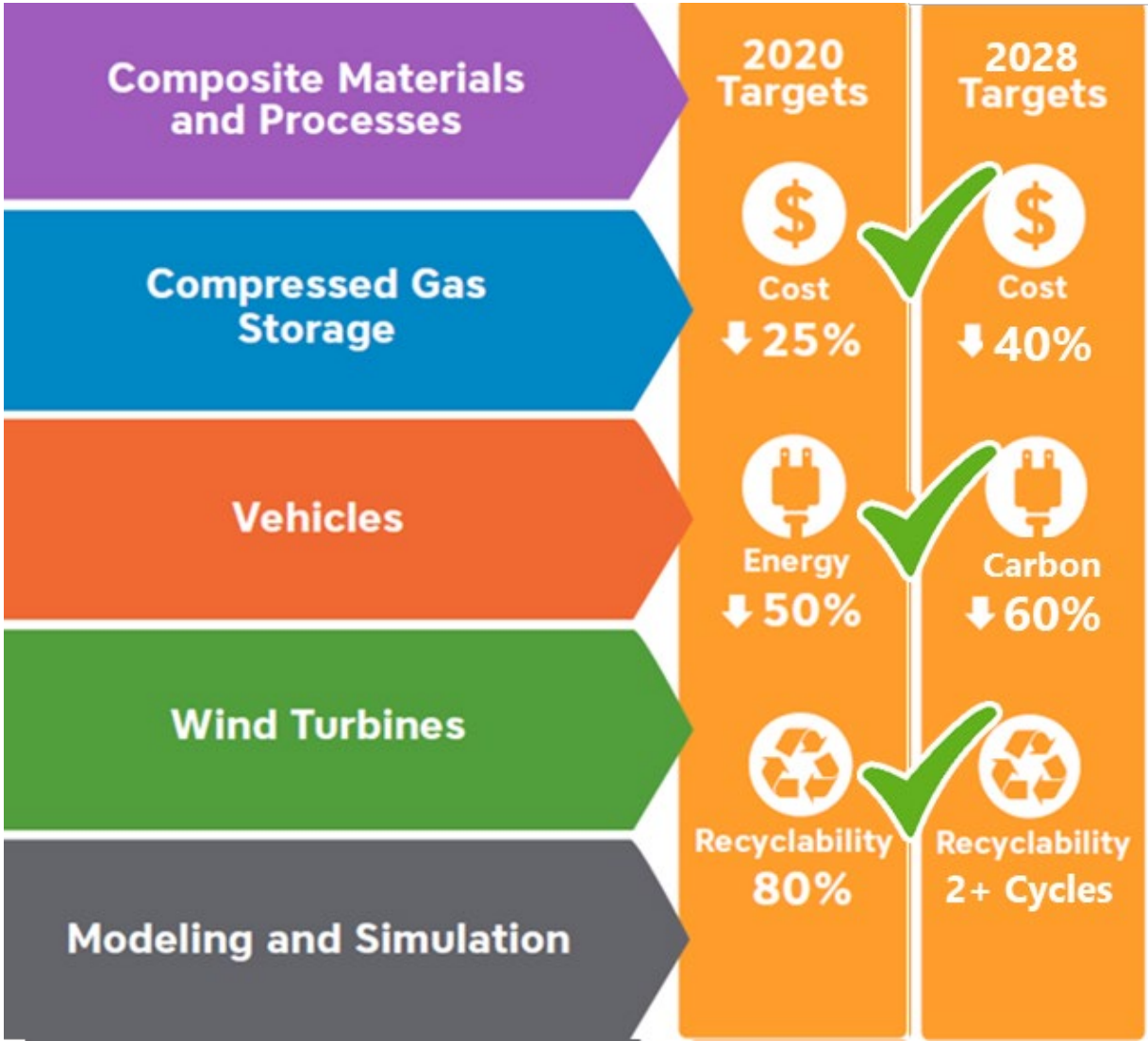
Future Work, Technology Transfer, & Impact

Advanced Materials & Manufacturing Technologies Office

DOE Furthers Commitment to Advancing Composites Manufacturing Through Innovation Institute Renewal

APRIL 11, 2023

IACMI Priorities 2023-2028	
Clean Energy Markets	Wind Energy, EVs, Hydrogen Storage
Cross-cutting Technologies	Circular Economy, Digitalization, Materials & Processes
Workforce of the Future	Education and Workforce Development, DEIA
Industry health	Small & Medium Enterprises; Robust, Resilient Supply Chains; Regional Partnerships/Clusters



Questions?

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