



Let's Talk Projects: IACMI Research Direction

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Chief Commercialization Officer
August 14, 2025

Convene. Connect.
Catalyze.

IACMI – The Composites Institute

2015-2021

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

Technology

\$200M portfolio
>60 R&D projects
25+ commercial
products

Partnerships

140+ 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

Manufacturing Assets at Relevant Scale



PURDUE
UNIVERSITY.



MICHIGAN STATE
UNIVERSITY



University of Dayton
Research Institute

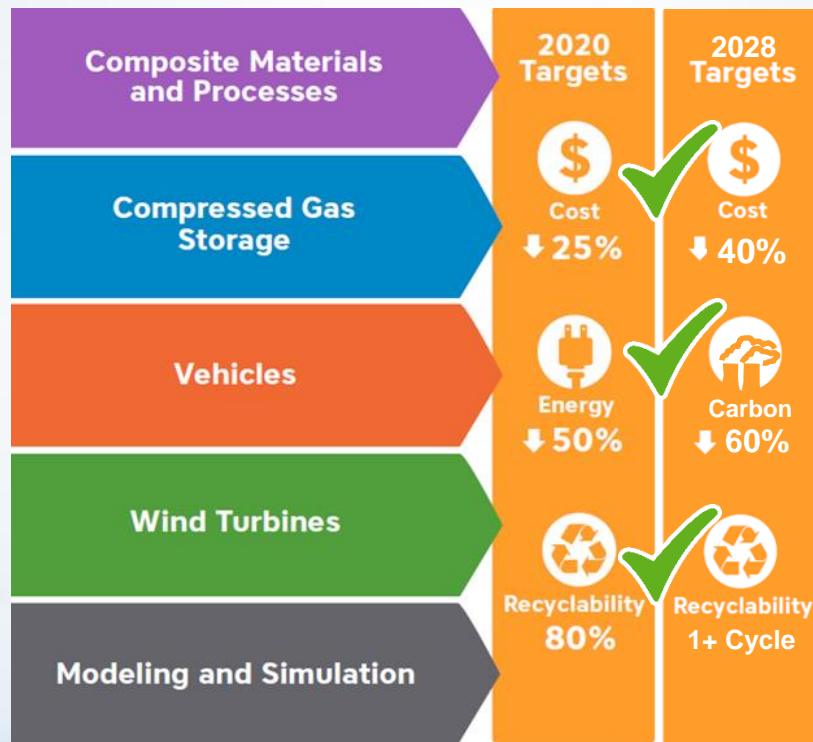
NREL
NATIONAL RENEWABLE ENERGY LABORATORY



OAK RIDGE
National Laboratory

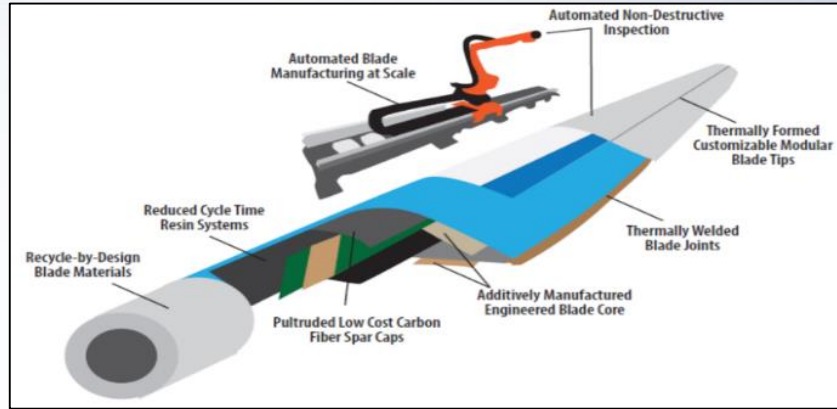
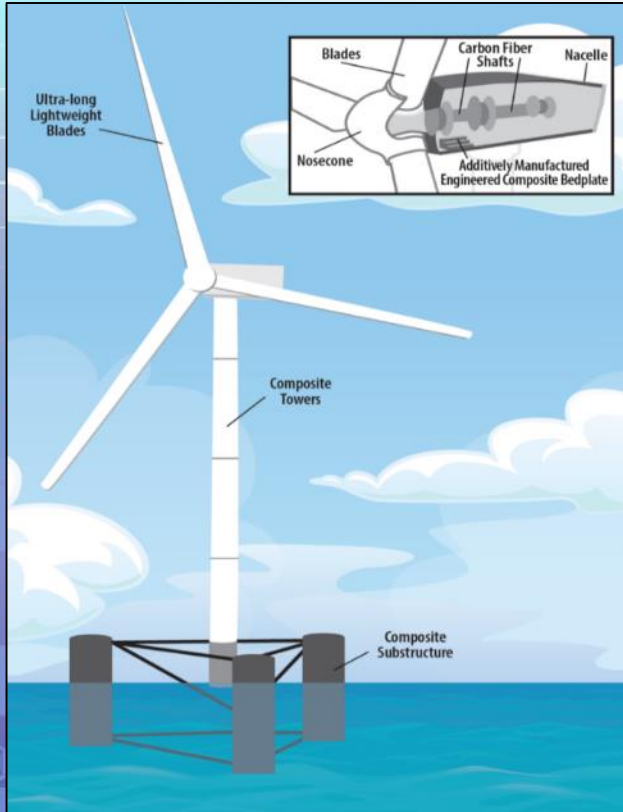
THE UNIVERSITY OF
TENNESSEE
KNOXVILLE

IACMI Technical Goals under DOE Funding



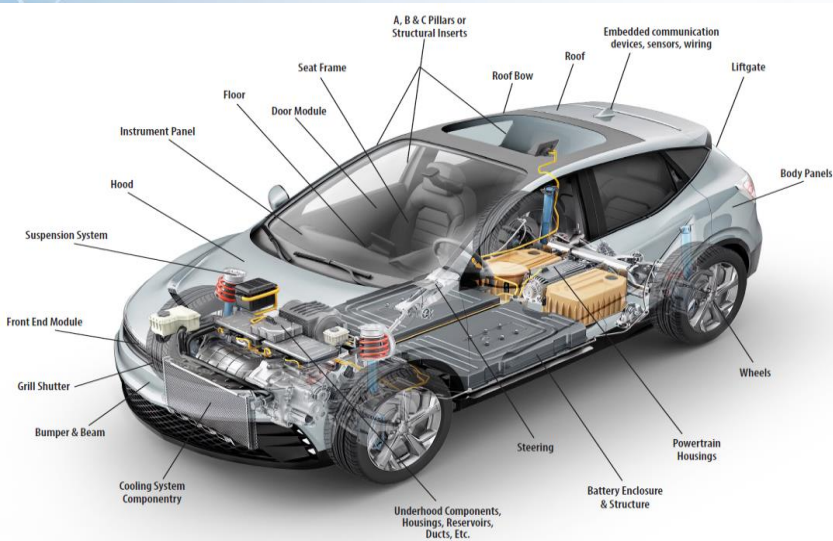
Targets are relative to 2015 baseline

Wind Energy



- ◆ **Needs:**
 - **Materials and processes** that **reduce** the overall cost of fabrication, inspection, and maintenance
 - **Novel blade designs** and other wind energy harnessing devices
 - Materials that are inherently **circular** and easy to recover and **recycle**
 - **Recycling solutions for existing blades** due to retire in coming years

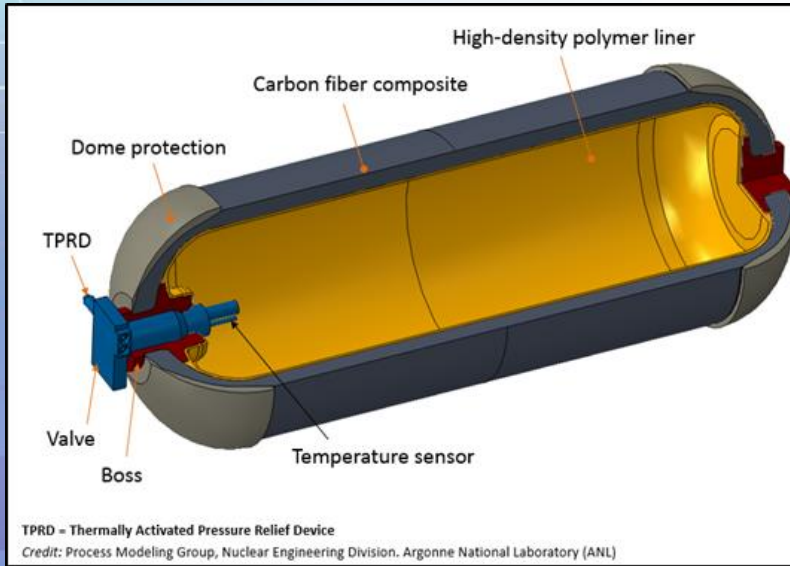
Electric, Connected and Autonomous Vehicles



Needs:

- **Materials with lower overall carbon footprint**, including bio-based and inherently circular polymers
- **Hybrid materials and manufacturing processes** like co-molding, overmolding and insert molding to reduce part count
- **Multifunctional structures** that eliminate steps or secondary components
- **Digital integration** to optimize design, incorporate sensors and monitor part health

Hydrogen Transport and Storage



Needs:

- **Lower cost, high strength carbon fiber** or additives that reduce the amount of carbon fiber required for pressure vessels
- **Materials that reduce permeation** and leakage, especially in liquid hydrogen storage
- Incorporation of **structural health monitoring** to enable lower factors of safety

Cross-cutting R&D Needs

◆ **Circular Economy and Life Cycle Analysis:**

- Sustainable materials (bio-derived, CO₂-derived, up- and/or re-cycled, etc.)
- Efficient manufacturing techniques (electrification of manufacturing, near-zero waste)
- Design for Sustainability

◆ **Digitalization and Industry 4.0:**

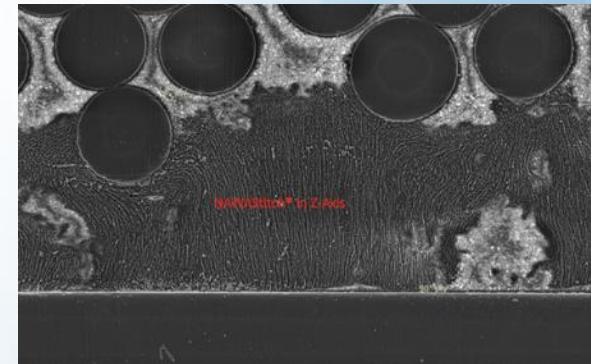
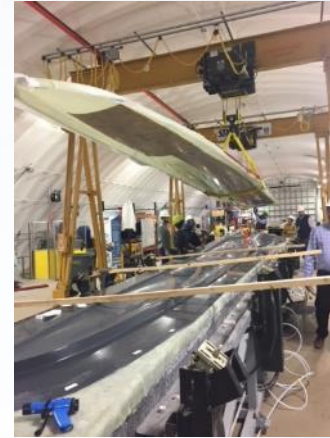
- Digital process twins via simulation, incorporating real time life cycle analysis (LCA) into the design process
- Integration of smart sensing and AI/ML into composite manufacturing processes, supported by digital twins.

◆ **Materials and Processes (in addition to those mentioned previously):**

- Low cost, rapid tooling approaches for composites
- Joining technologies, including bonding, fastening and welding
- NDE techniques

IACMI 2.0 – Initial Projects Nearing Kickoff

- Robotics for Automated Wind Blade Finishing (NREL)
 - Automated feedback control for cut, grind, sand
 - 36 months duration
 - LM Wind
- Adhesive Deposition for Wind Blade Mfg (ORNL)
 - Digital scanning bond line gap for half shells
 - 12 months duration
 - LM Wind, TPI, UT, NREL
- Cryogenic H₂ Storage (UDRI)
 - Use VACNT's to suppress onset of micro cracking
 - 12 months duration (Phase 1)
 - Teijin, NAWA, Faurecia, Airbus
- Other projects in review



Project Development Steps



***Proposal lead must be IACMI member in good standing**

Develop Idea Paper

Ways to Get Involved

Convene, Connect & Catalyze

- IACMI Website
- Working Groups
- IACMI Leadership
- Technology Area Directors



- IACMI Newsletter
- Members Meetings
- Social Media
- Innovation Insights

Develop Idea Paper

Engage IACMI Core Partners

- ✓ Identify the opportunity
- ✓ Work with IACMI Technology Area Directors, Working Groups, and IACMI Leadership
- ✓ Complete Idea Paper & submit to IACMI

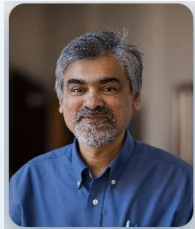
World Leading Resources in Composites Manufacturing



Chad Duty
IACMI CEO



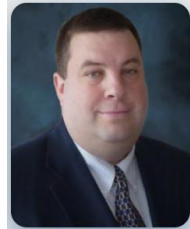
Dale Brosius
IACMI EVP, CCO



Uday Vaidya
IACMI CTO



Ray Boeman
Vehicles TAD



Derek Berry
Wind TAD



Brian Rice
High-Rate Aero
& CGS TAD



Byron Pipes
DMS TAD



Vlastamil Kunc
M&P TAD

Develop Idea Paper

Write & Submit the Idea Paper

IACMI Idea Paper

It is strongly recommended for proposers to work with an IACMI core partner(s) to formulate a project idea. Upon completion, please submit this Idea Paper to IACMI's Chief Operating Officer at ebrophy@iacmi.org with the Subject Line---"Idea Paper" + Project Title

Date:

Project Title:

Project Partner Lead Organization:

POC Name:

E-mail:

Phone:

Core IACMI R&D Partner(s)

POC Name:

E-mail:

Phone:

Additional Project Partners:

Project Summary (2-3 paragraphs):

Provide a short summary of the project (i.e., problem to be solved, need for a solution, market opportunity that will be addressed).

Please answer the following questions (1-2 pages total):

Which IACMI goals does this project idea support (cost, carbon footprint, recycling, new materials)?

Provide a high-level technoeconomic analysis (TEA) that supports this project idea. *detailed TEA showing calculations will be required at the next stage of the project.*

Examples:

The use of recycled carbon fiber instead of virgin fiber is estimated to reduce the carbon footprint of the finished part by 50% and reduce costs by greater than 15% versus virgin practice.

The combination of a 50% reduction in cycle time and reduction of material waste by 5% is estimated to reduce recurring part cost by 25% and tooling investment cost by 10%.

The use of a high strength glass SMC, augmented with local continuous reinforcement, in cycle times of 120 second, will result in a part that is cost competitive to welded steel with a similar mass as aluminum.

What is new or innovative about this project idea (i.e., How is it different than what has been done before)?

Template available on IACMI
Website under
Innovation/Submit a Project



Team Members

Project Description

Targeted IACMI goals

Initial TEA/LCA

ROM Budget Summary

***Expected Duration: (months):**

***Rough Order Magnitude Budget Summary (this is not a formal budget):**
Estimate each funding type on a "per partner" basis. If all partners are not known in a specific funding category, please note.

IACMI Federal Funding:

State Funding:

Industry cash cost share:

Industry in-kind cost share:

*The Expected Duration and Rough Order Magnitude Budget Summary are not formal declarations, but rather estimates to give the project some general boundaries during the review of this Initial Idea Paper (IIP).

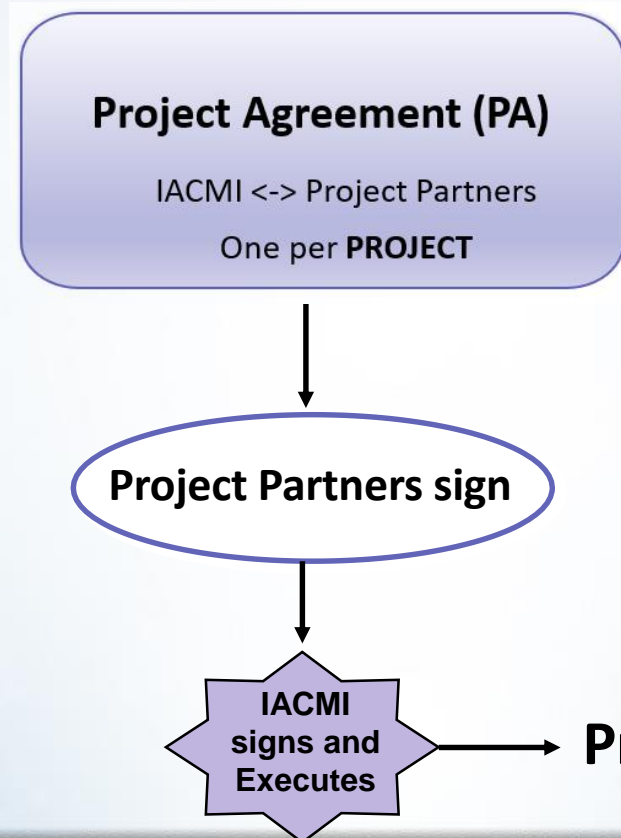
Develop Full Project Plan

FULL Project Plan Includes:

- Relevance
- Broader impact
- Technical merit
- Required resources
- Partnering strategy
- Consent to IP Terms
- Commercialization Plan
- Task descriptions & Milestones
- Budget (including CS)
- TEA, LCA

The Full Project Plan will be used to directly populate the Project Agreement (contract) between IACMI and the Project Partners.

Contracting



PA contains contract information
such as:

- Partners & Period of Performance
- SOW & Budgets
- IP Terms
- Commercialization Plan
- Equipment Purchases
- Payment terms
- Termination terms
- Flow-down Ts&Cs

IACMI Wants Your Input and Ideas!

- **Projects will require industry cost share, nominally 1:1 against federal funds**
 - Most will be in-kind (personnel, materials, etc.)
 - Cash cost share may be required depending on need for tooling or equipment
 - Projects with multiple industry partners provide greatest leverage on cost share
- **If you have an idea for a full project, including potential core IACMI R&D and industry partners:**
 - Download and fill out the Initial Idea Paper for consideration (from IACMI website)
 - Be prepared to engage with IACMI headquarters and various R&D partners to more fully flesh out the details
- **If you have products or technologies that you believe can help IACMI achieve the DOE goals, and are looking for help identifying a project and potential partners:**
 - Download and fill out as much of the Initial Idea Paper as you can
 - Note your interest in participating in a future project
 - Identify where your product or service can bring value, including market applications



Thank You!

**Convene. Connect.
Catalyze.**