

# UMERC Materials and Manufacturing Workshop

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# NREL at-a-Glance



2,926

## Workforce, including

219 postdoctoral researchers  
60 graduate students  
81 undergraduate students



## World-class

facilities and renowned  
technology experts

More than  
900

## Partnerships

with industry,  
academia, and  
government



## Campus

operates as a  
living laboratory



# Flatirons Campus

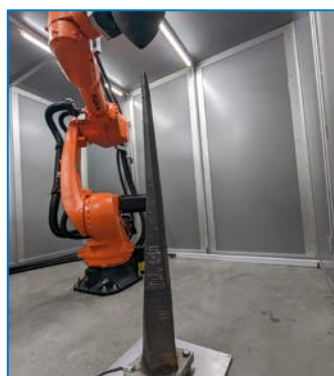
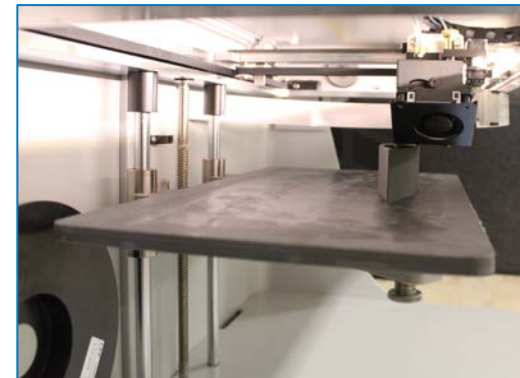
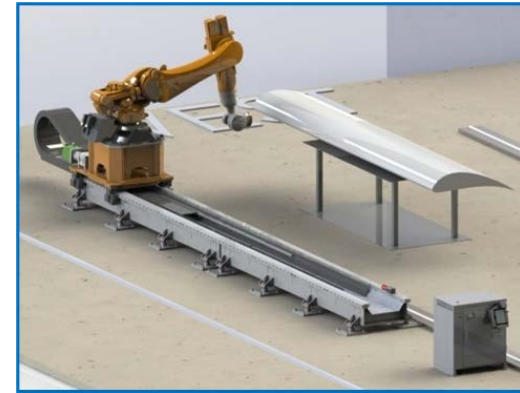
Photo by Josh Bauer, NREL 61821

The 307-acre Flatirons Campus, home of the National Wind Technology Center, is approximately 25 miles north of the main NREL facility.

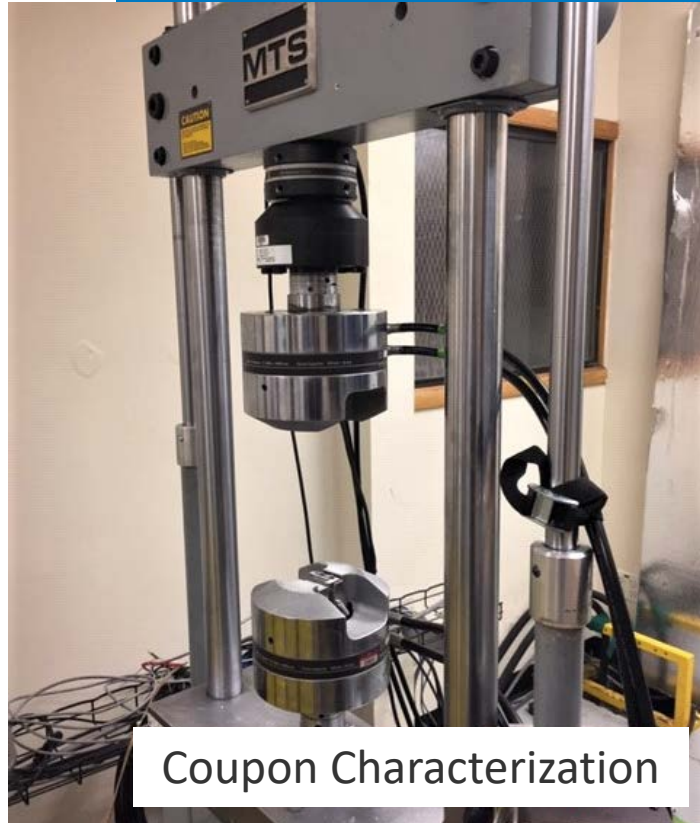
- **Advanced Research on Integrated Energy Systems and Integrated Energy Systems at Scale**
- **Structural Research:** Characterization and validation of turbine blades and components
- **Dynamometer Research:** Validation on drivetrains and generators 1 kW–5 MW
- **Field and Technology Research Validation:** Field research pads, expert engineers, specialized facilities
- **Composites Manufacturing:** Industrial-scale workspace, research and education center



- Composite Manufacturing Education and Technology (CoMET) facility
  - Established fall of 2016
  - 10,000 square feet of advanced composite materials and processing research
  - Megawatt-scale wind turbine blade tooling
- Network of public-private research partners
  - Academia, wind industry OEMs and composite materials suppliers
- Broad capabilities across multiple applications
  - Large-platform composites
  - Manufacturing automation
  - Circular economy materials
  - Scale-up (coupons) to full-scale products (13 m blade)
  - Additive manufacturing



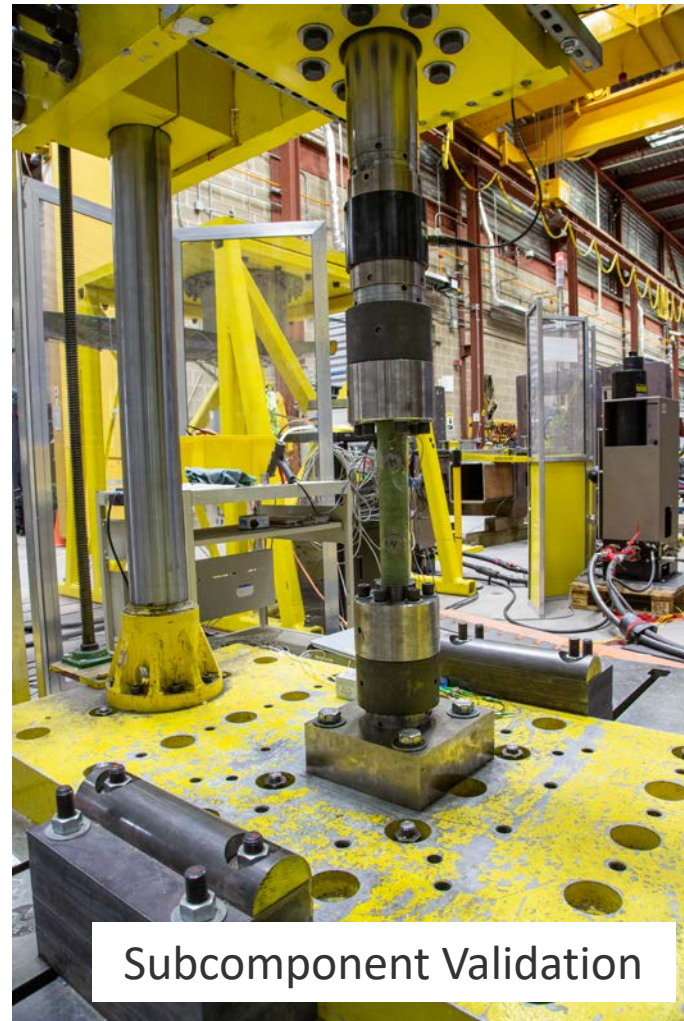
# Structural Validation



Coupon Characterization

Photo by Paul Murdy, NREL

- ISO 17025 accredited
- Range of test stands
- Hydraulic infrastructure
- State-of-the-art data acquisition, sensor, and nondestructive test equipment.



Subcomponent Validation

Photo by Taylor Mankle, NREL 67493



Full-Scale Validation

Photo by Taylor Mankle, NREL 67467

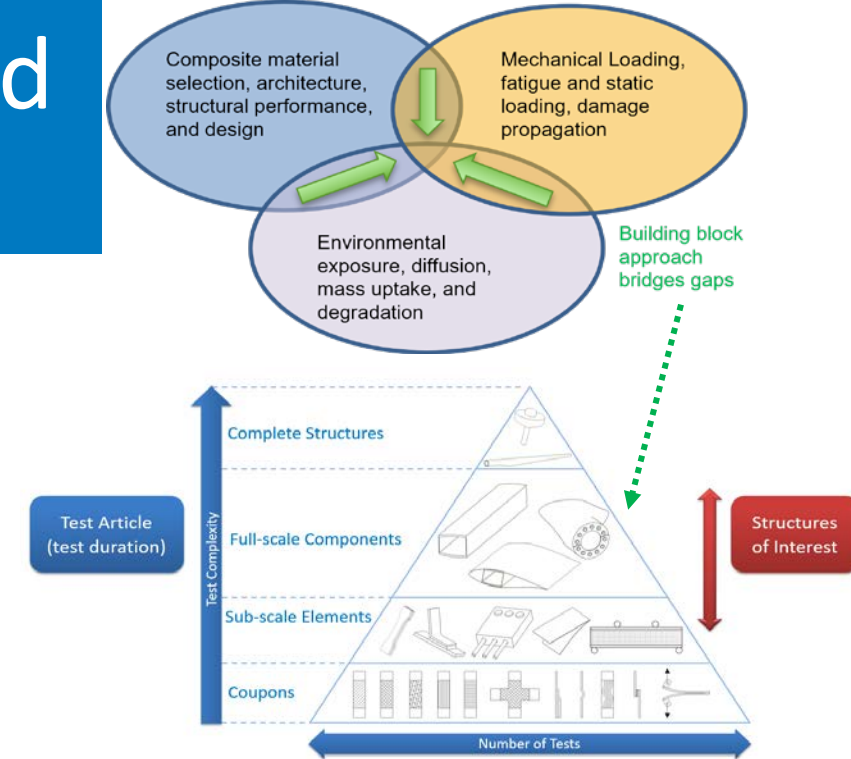


Full-Scale Validation

Photo by Scott Hughes, NREL 14708

# Perceived Industry M&M Needs and Projects

- Understanding how coupon-scale material data should be applied to full-scale structural design
  - Marine Energy Advanced Materials Project
- Rapid prototyping for deployments
  - Additive manufacturing for Powering the Blue Economy™ applications
  - Advanced materials additive manufacturing task
- Reducing uncertainty and risk of deployments
  - Standards development
  - Modeling and validation capabilities
- Development of recyclable composites
  - Elium 13 m wind blade and Verdant thermoplastic rotor
  - Recyclable-by-design epoxy-anhydrides



Illustrations by Scott Hughes, NREL



Verdant Power – Photo by Paul Komosinski, NREL 64565

# Partnerships and Key Contacts

## Ways to Partner:

- FOAs, TEAMER applications, SBIR awards, lab calls, strategic partnerships
- FOA 3097—joint WPTO and WETO effort—TA4 highlights materials and manufacturing, and we can support universities
- Internships, joint appointments, fellowships, guest researchers, and workforce development

## Key Contacts:

- Paul Murdy ([paul.murdy@nrel.gov](mailto:paul.murdy@nrel.gov)), material characterization, structural validation, additive manufacturing
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*Photo by David Dawkins – NREL 64629*

# Thank You

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[www.nrel.gov](http://www.nrel.gov)

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