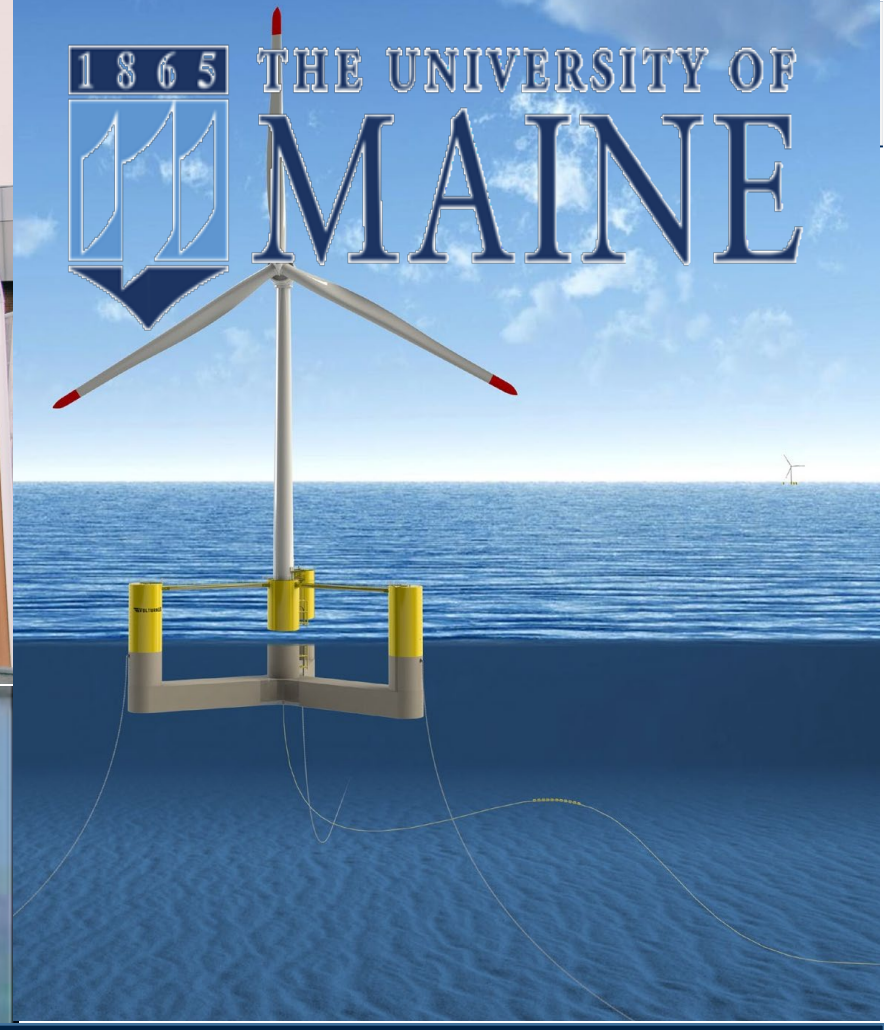


Innovating Maine's Future

Dr. Habib Dagher, Executive Director

Advanced Structures and Composites Center, UMaine

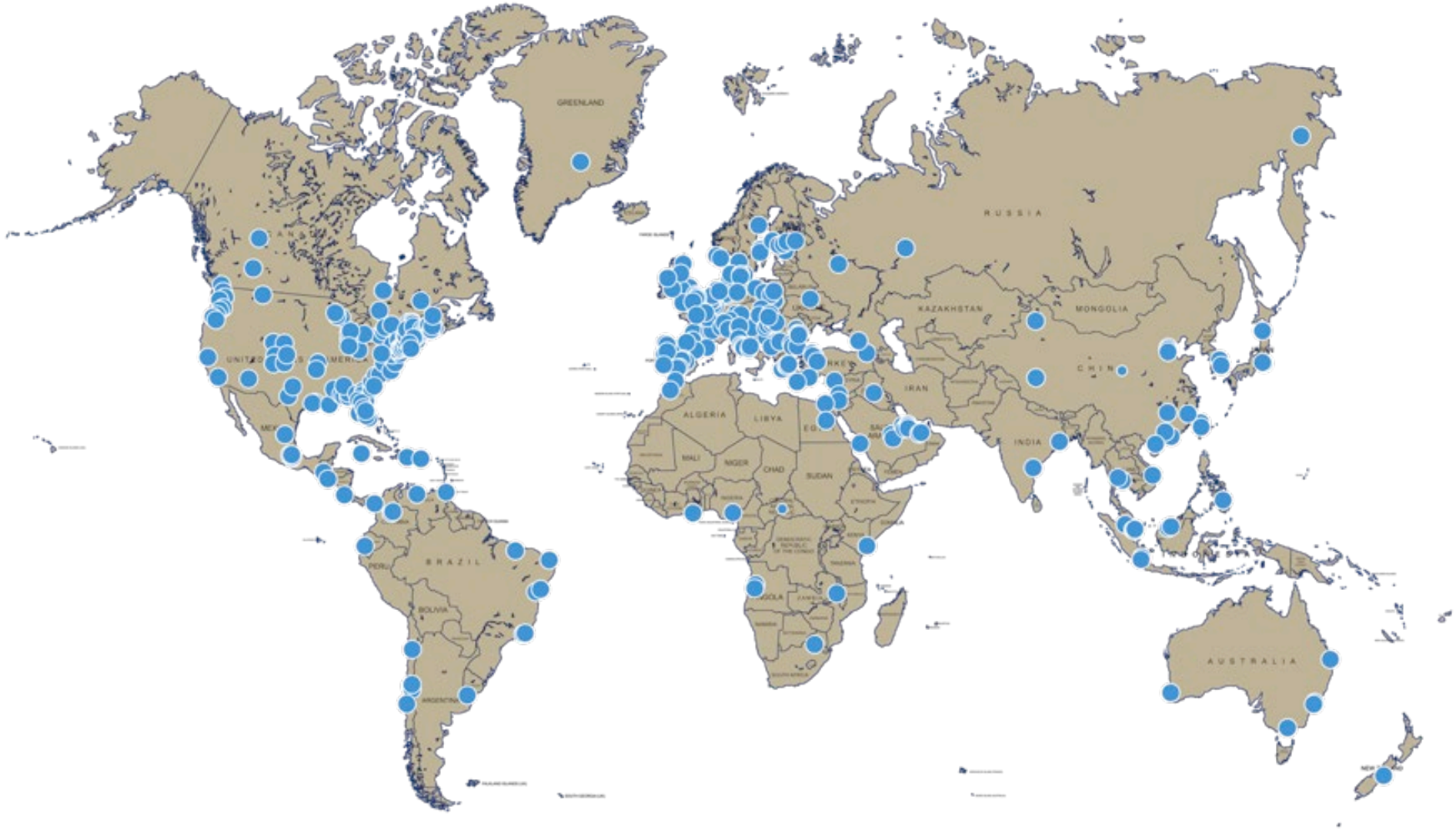
MEREDA 2024 Annual Real Estate Forecast Conference

Portland, Maine Feb 29, 2024

ASCC

- Largest Univ.-based research Center in Maine
- Founded through the NSF in 1996
- 2,700+ students funded from 35 majors
- Over 400 Personnel
- 100,000 ft² lab
- 10+ spinoff companies
- 1,000 publications
- 130+ patents
- 30,000 Visitors
- 1,600 media stories

ASCC Partners and Clients



THE UNIVERSITY OF MAINE

Awards & Honors

Over 40 state, national and international excellence awards

2015 Transportation Champion of Change

2011 Engineering Excellence

2008 “Champion of Economic Development”

2019 Transportation Champion

Innovator 2017

2017 Innovator of the Year

2021 Academic Pioneer Award
2010 Most Creative Product
2007 People’s Choice
2007 Best of Show

Three 2019 Guinness World Records

2016 Top 25 Newsmakers

2011 Charles Pankow Award for Innovation

GEM - *Green Energy and Materials*

Developing the Technologies and Educating the Leaders

Application Space

Civil Infrastructure, Renewable Energy, Defense, Marine and Aerospace

- Some steel strands replaced with carbon composite strands

Grist Mill Bridge Construction

NASA Hypersonic Inflatable Aerodynamic Decelerator

The HIAD is a nose-cone-mounted inflatable structure consisting of multiple, concentric, nitrogen-filled tori that is designed to decelerate and protect spacecraft during atmospheric re-entry.

NASA successfully demonstrated HIAD on a small-scale, but their models were not aligning with expectations. The ASCC was engaged by NASA to validate a model that will facilitate optimized HIAD designs to deploy on critical missions with confidence.

NASA HIAD

MAINE

MAKO is an 83 foot, all-composite hull, special operations vessel.

Maine Fossil Fuel Expenses = $3.6-5.8 billion/yr

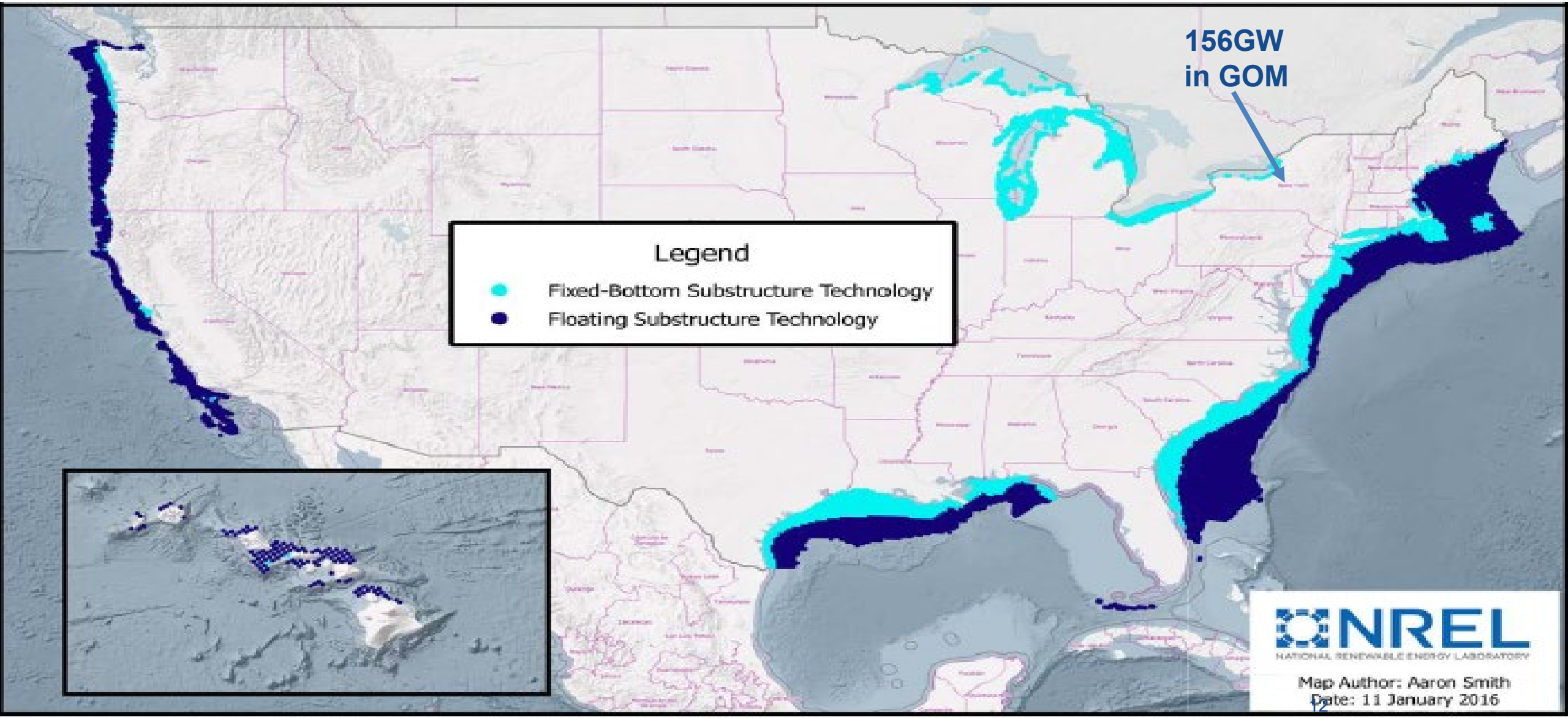
3% of Offshore Wind Resource

Electrifies Heating and Transportation = 5 GW

US Potential for Floating Wind

60% of US resource requires floating technology **US Earth Shot**

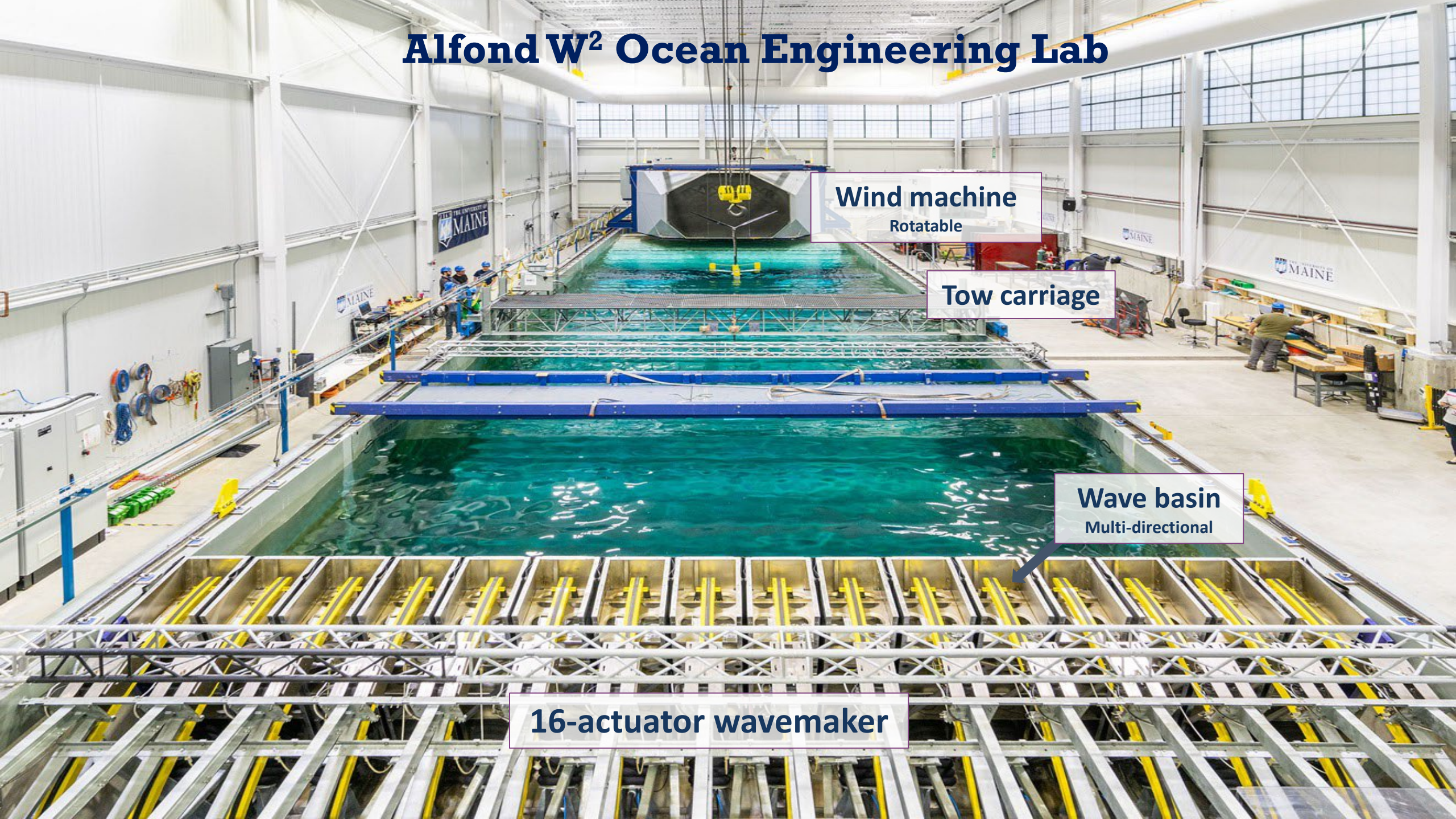
BOEM awarded CA leases: GOM & Oregon next

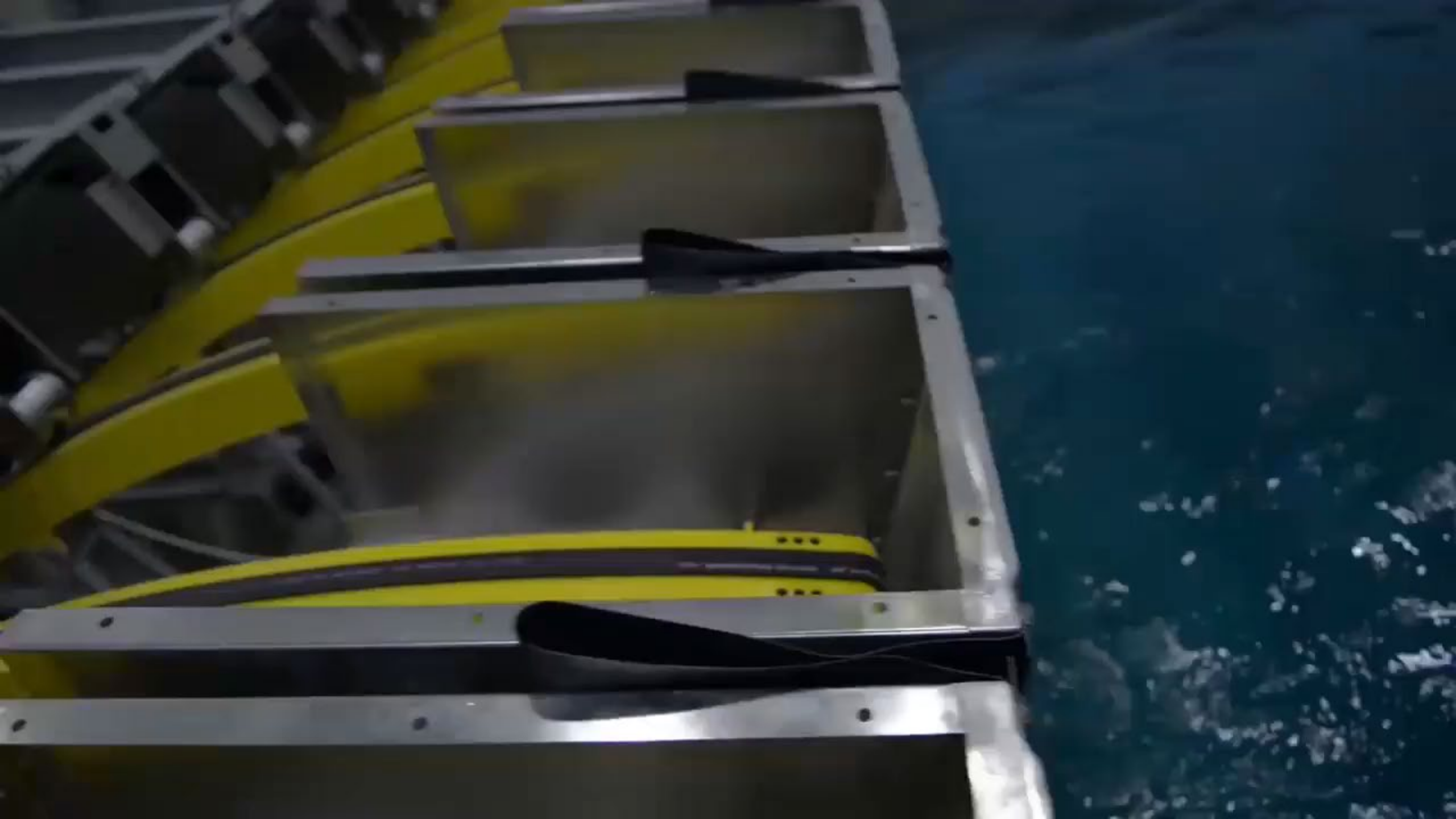


Structural and Material Testing

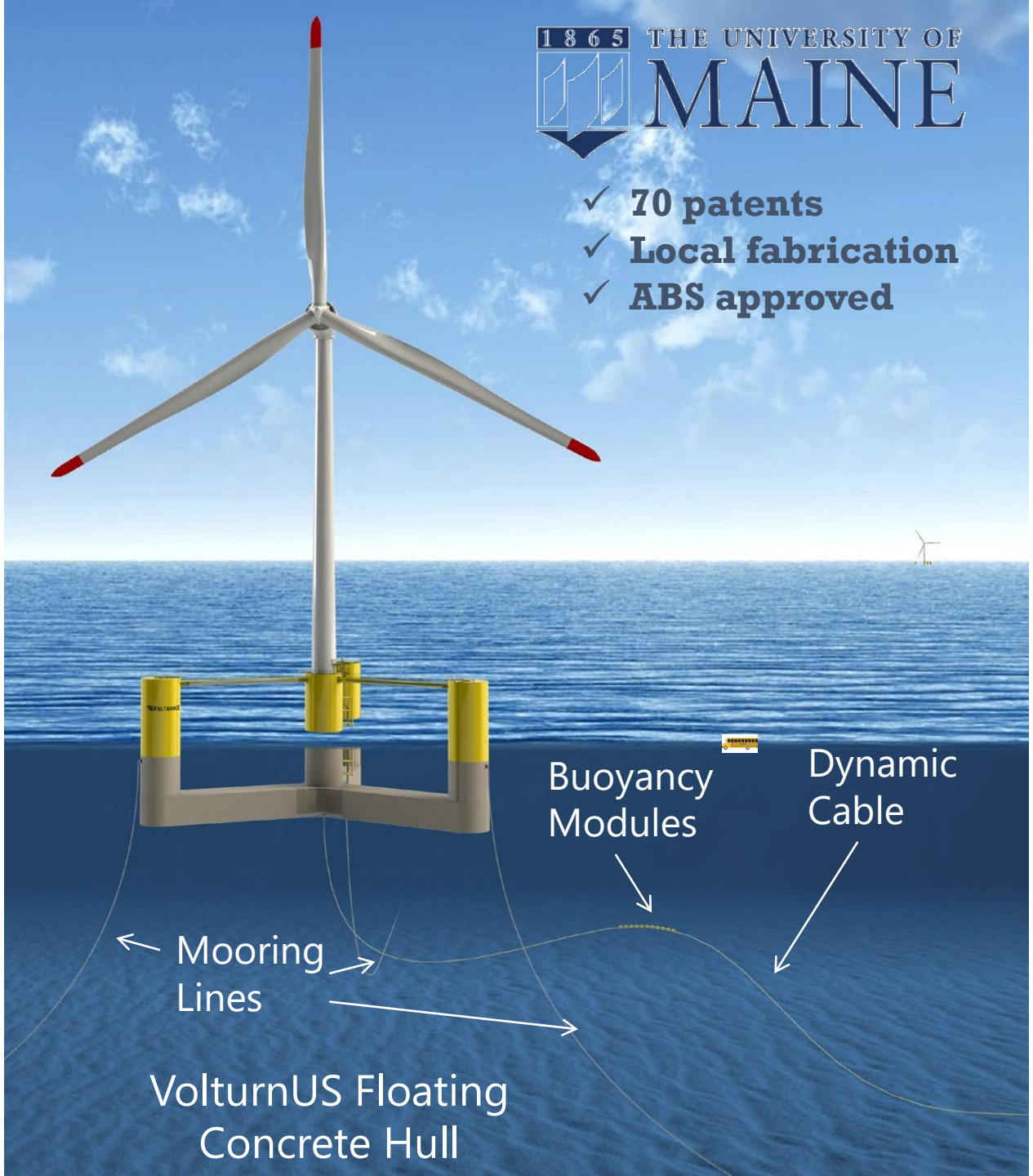
December 21, 2016

Alfond W² Ocean Engineering Lab





Floating Offshore Wind



1865 THE UNIVERSITY OF MAINE

ADVANCED STRUCTURES & composites center

VolturnUS 1:8 Launch

May 31, 2013

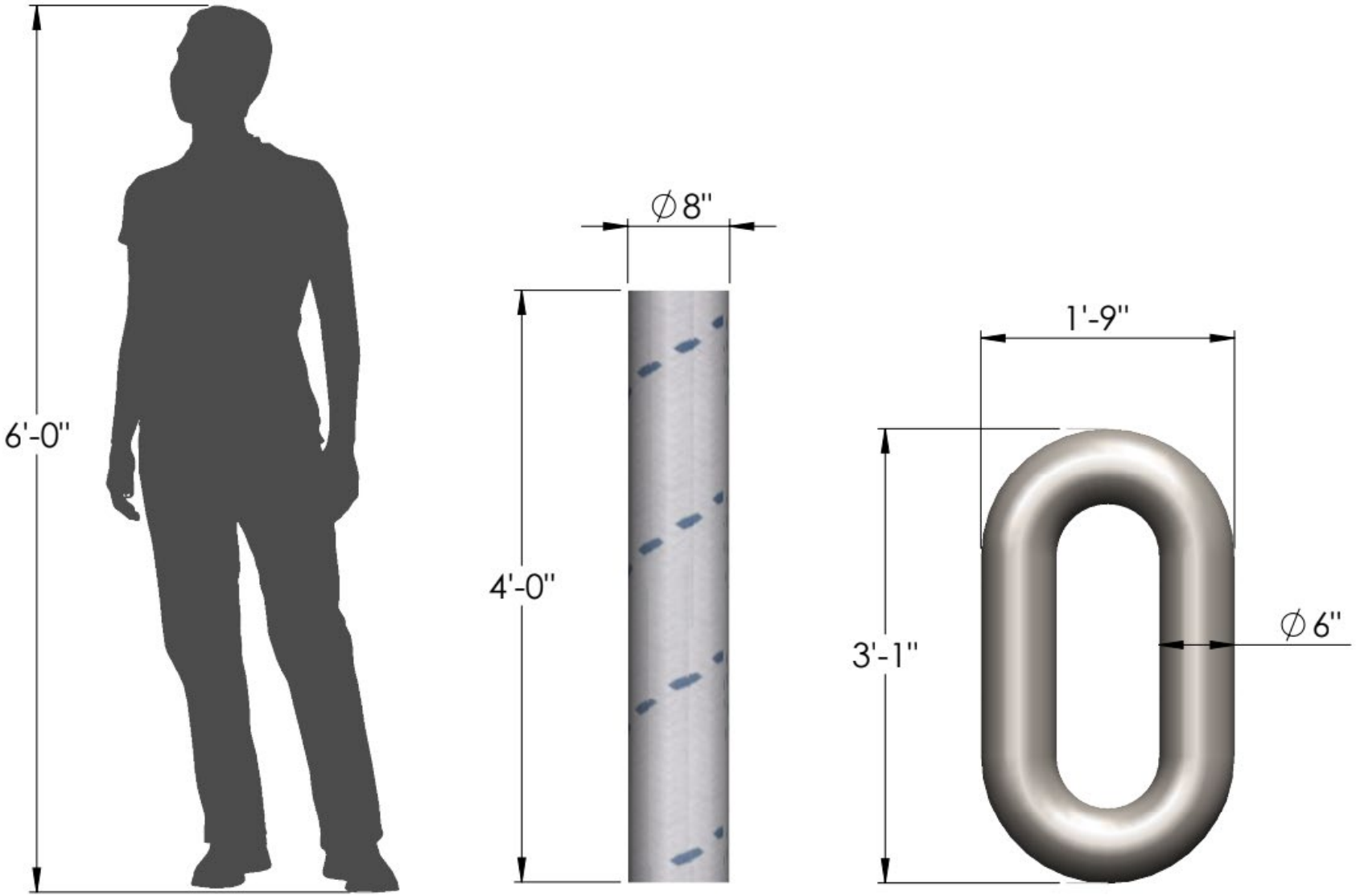
Tow-Out Testing

THE UNIVERSITY OF MAINE

Castine, Maine (2013)

50-Year
Return Period Storm

Mooring Lines: Synthetic or Chain



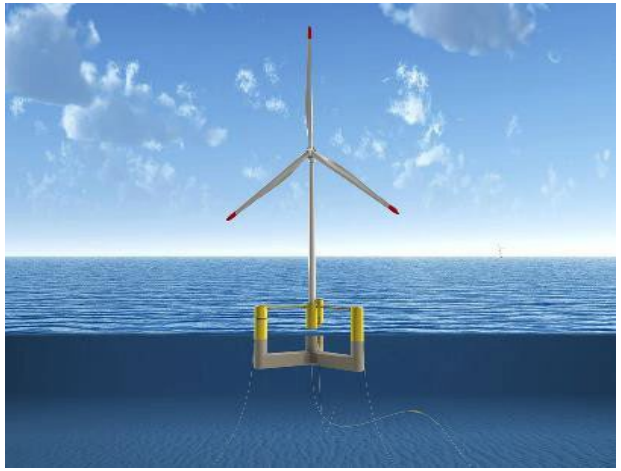
UMaine
Floating Technology Roadmap 1:10:100

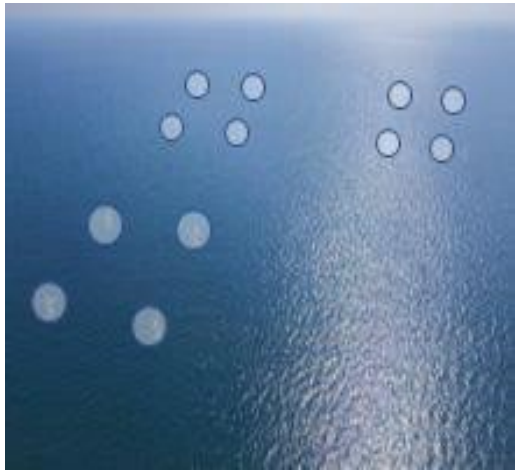
2013 2024
Pilot (Castine)

2026
Demonstration (Monhegan)

2029-2030
Maine Research Array 10 turbines

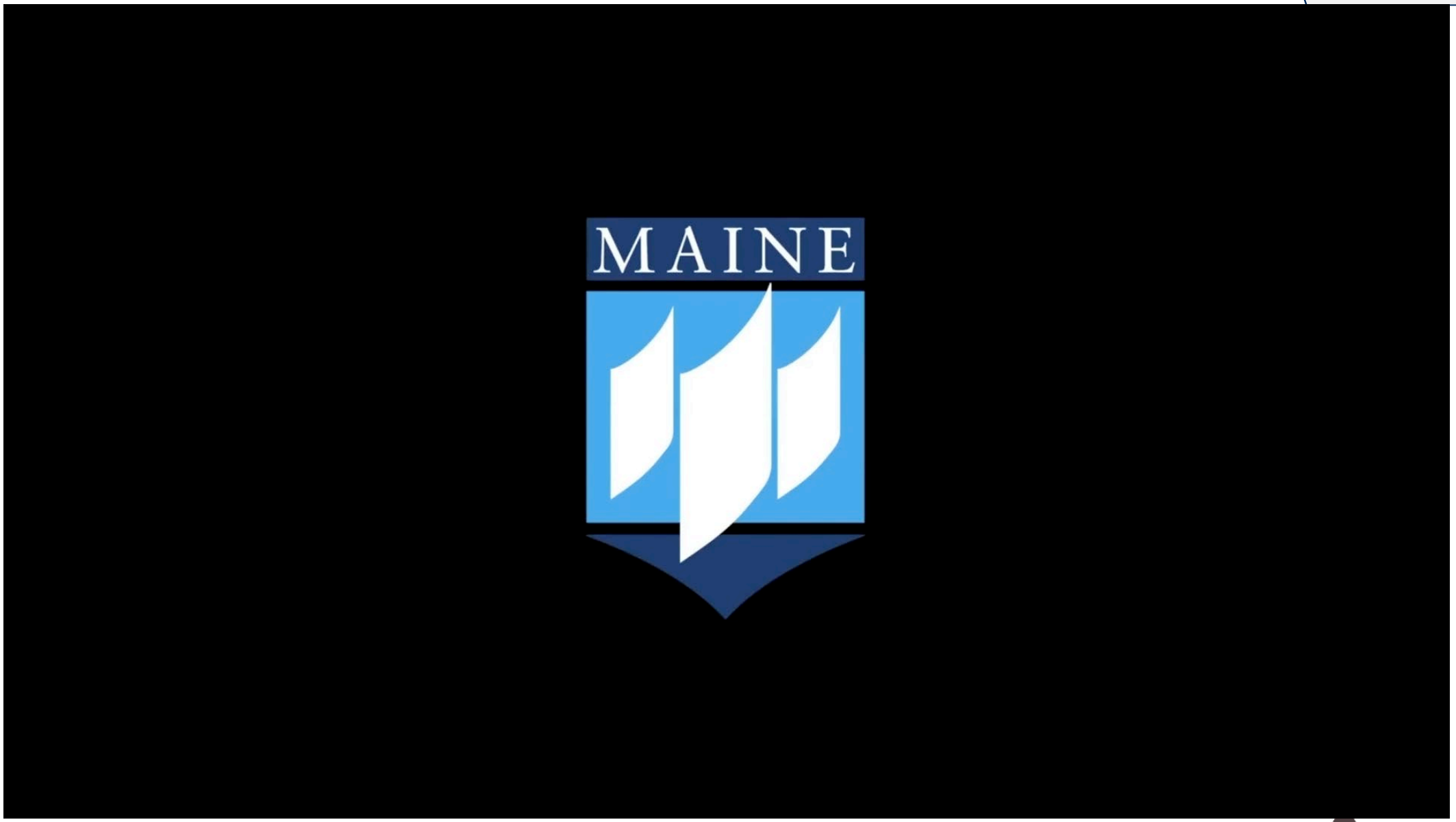
2030+
Commercial Development





Additive Manufacturing Opportunities

3D Printed Patrol Vessel



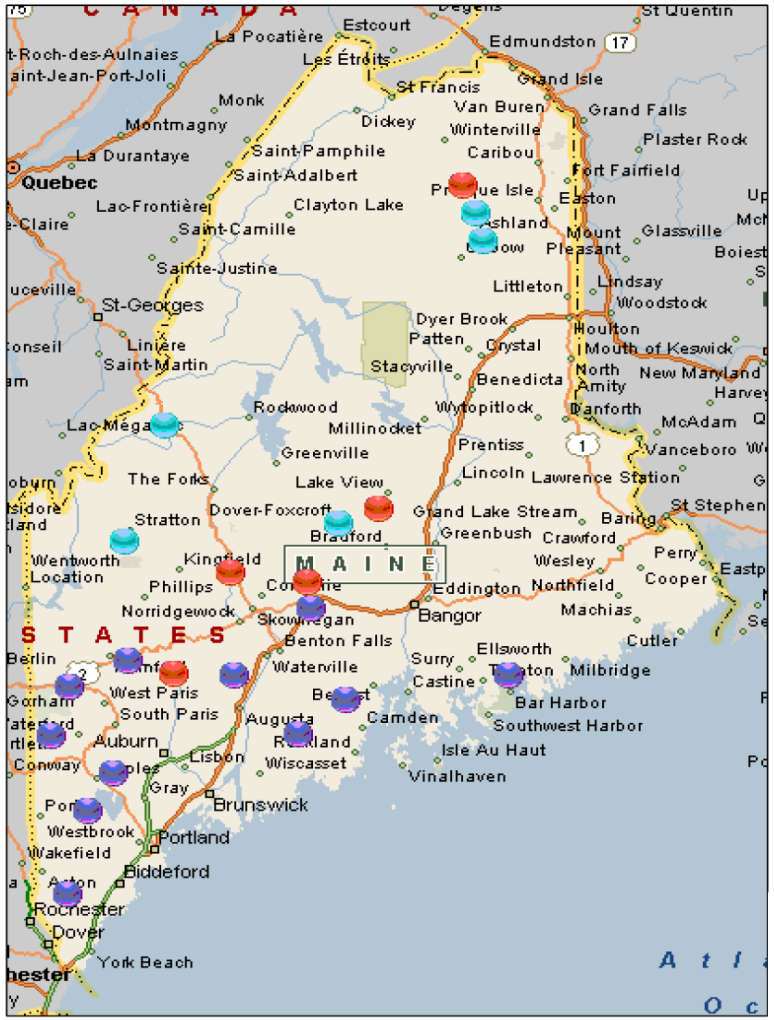

1865
THE UNIVERSITY OF
MAINE

Can we Use Wood Residuals to Print Homes?

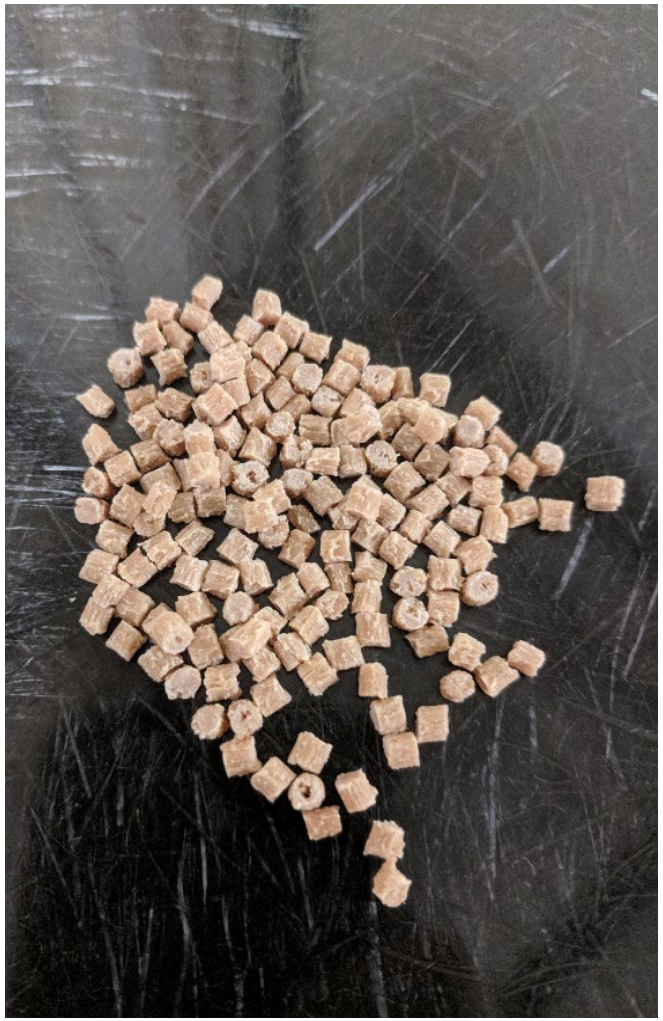
1 million tons/year

600ft² home needs 10 tons

Sawmills Residues



Stronger than Concrete



THE UNIVERSITY OF MAINE

ADVANCED STRUCTURES & composites center

Bio 3D

The world's first entirely bio-based 3D printed home

U.S. DEPARTMENT OF ENERGY

OAK RIDGE National Laboratory

MaineHousing MAINE STATE HOUSING AUTHORITY

mti Maine Technology Institute Investing in Innovation

BioHome3D Going Through "A Good Old Maine Winter"

Contributors

9-Units Development with Penquis, KeyBank

GEM

Green Engineering & Materials

Factory of the Future

Industry 4.0

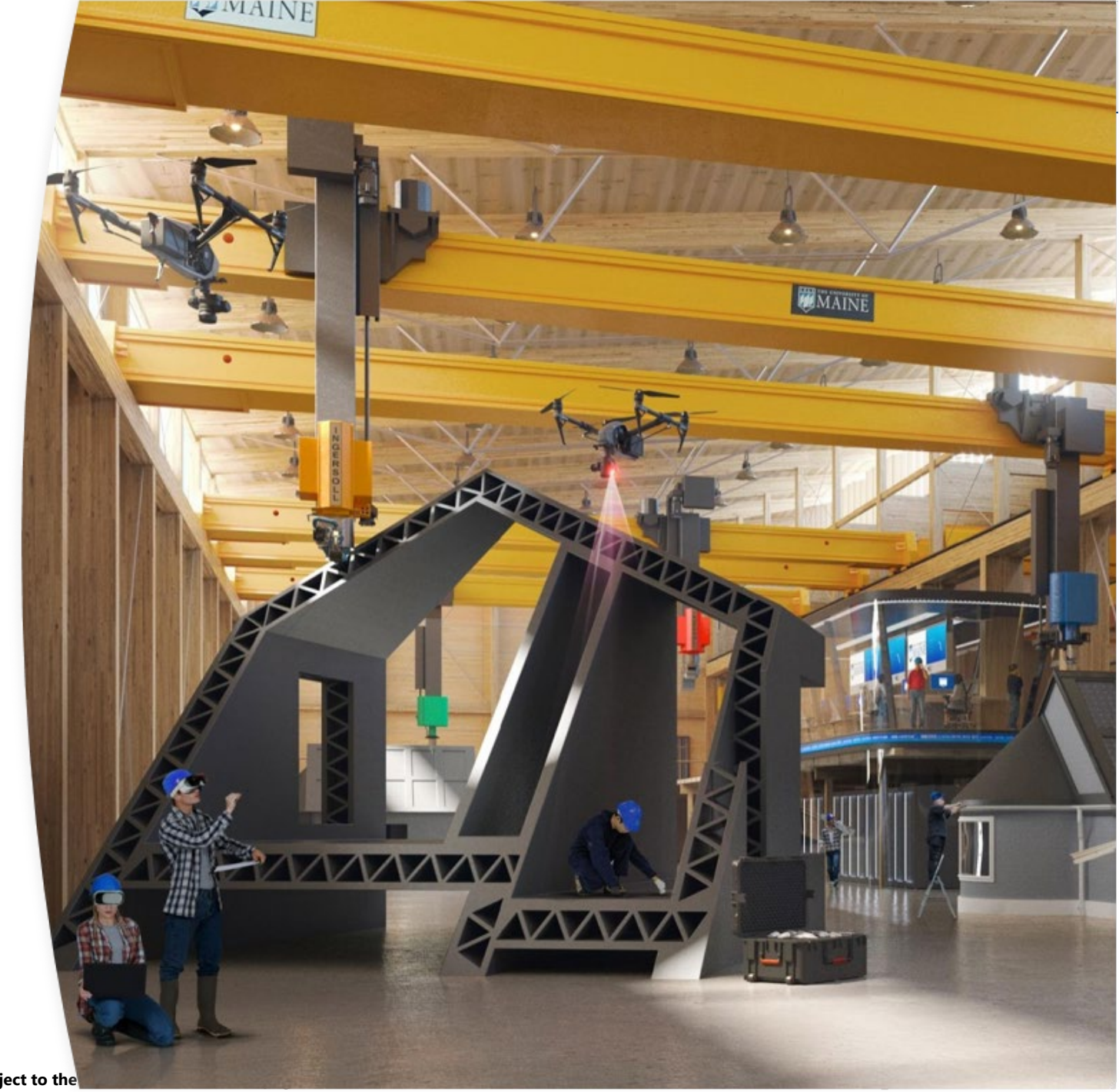
THE UNIVERSITY OF MAINE

ADVANCED STRUCTURES & composites center

Workforce of the Future

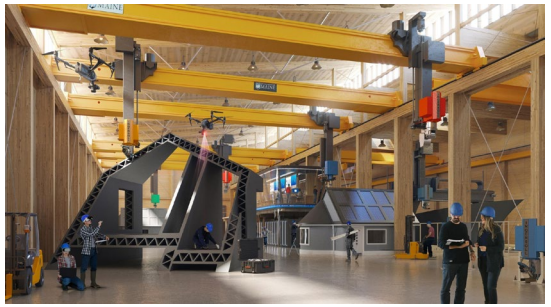
GEM Factory of the Future prepares students to succeed at the frontiers of engineering, computing and information science

1. 200+ paid experiential learning opportunities offered annually
2. Immersive learning environment for students to experiment with hardware, software and computational resources
3. Fully-digitized, adaptive learning factory relies on computational methods and tools including optical-based analytics, augmented reality, real-time monitoring, digital twin, etc.



Technology Roadmap for Biobased Modular 3D Printed Homes

BioHome3D



2022

150lb/hr

100% biobased feedstock

2023

500lb/hr

Integrated chases, R-value

2024

FoF 1.0

Flame retardant chemistry

2025

Scale up feedstock with flame retardant

2026

Factory of the Future

BioHome3D 2.0

9 Units Penquis

GEM Factory of the Future
Façade Study

1865 THE UNIVERSITY OF MAINE