

College of Engineering

SUSTAINABLE ENGINEERING LABORATORIES



Conceptual external view of proposed engineering building.

We seek to build a vibrant national hub to accelerate clean energy research and educate tomorrow's sustainable engineering workforce. This living laboratory will catalyze bold discoveries and user-centric solutions that improve our region, nation, and world.

A sustainable future requires innovative use-inspired solutions in the areas of energy, materials, transportation, climate adaptation, and human system interactions. UMass Amherst engineers are already leaders and path-breakers in these critical fields. A new building will provide immersive labs and learning spaces that prepare the next generation, foster collaboration, enable discovery and design, and serve as a test bed for technologies that address real-world sustainability challenges.



Professor Krish Sharman, Endowed Chair in Renewable Energy, and research team in the ocean renewable energy/wave lab.

Massachusetts: Leading the Way on Clean Energy

3.6% Annual growth in the Commonwealth's clean energy sector, which represents over 3% of the workforce.

>2,100 Clean energy jobs added in Massachusetts (2019). The sector has grown 86%, or 52,000 jobs, since 2010.

\$14 billion The industry's contribution to the Gross State Product in 2019.

#7 Among all states for clean jobs overall, **#4** in renewables as well as smart grid and storage; **#7** for energy efficiency.

(Sources: MassCEC, Massachusetts Clean Energy Report, 2020; E2 Clean Jobs Massachusetts Report, 2019; U.S. News and World Report)

An engine for innovation, this state-of-the-art sustainable building will anchor cross-cutting research to advance our nation's net zero goals, address environmental justice, and propel the clean energy workforce and economy—for Massachusetts and beyond.

Examples of centers, institutes, and programs that may live within the new facility:

- Energy Transition Institute
- Wind Energy Center
- Ocean Renewable Energy/Wave Lab
- Transportation Research Center
- Center for Energy Efficiency and Renewable Energy
- Northeast Climate Adaptation Science Center
- Materials Science and Engineering Program



Proposed sustainable materials and energy devices clean room facility.

Revolutionary Infrastructure for the Future

The Sustainable Engineering Laboratories building will leverage and attract public and private sector investment. It will be an exemplar of solutions prioritized by the federal Infrastructure Investment and Jobs Act and the Commonwealth's Clean Energy and Climate Plan for 2030.

A cutting-edge living laboratory, this building will be designed to explore and demonstrate novel energy technologies that can be replicated and scaled to deliver real-world solutions.

The building is envisioned to feature:

- Sustainable construction, achieving net zero carbon emissions.
- Test beds for efficient and just methodologies to generate, distribute, use, and store energy.
- A smart microgrid to couple new renewable energy generation and storage technologies to real-life use.
- An energy operations center that integrates data from campus and the surrounding region—a living lab to study and implement sustainable solutions.
- A clean room campus core facility to enable new sustainable materials and energy storage/conversion device research.
- Collaboratories with industry partners and connections to organizations such as the Massachusetts Green High Performance Computing Center.



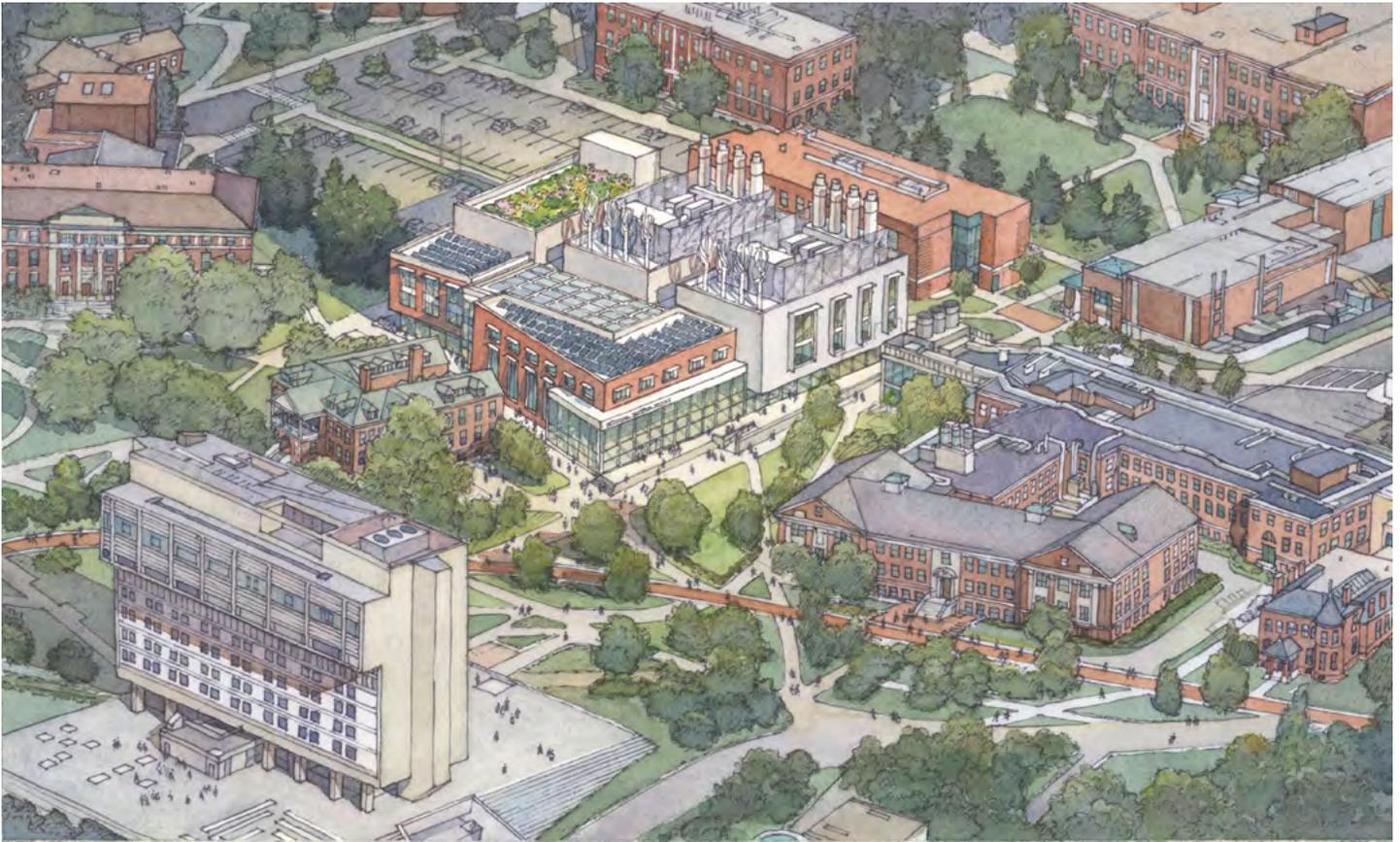
Cielo Sharkus, PhD student and ELEVATE Fellow, explores the impacts of climate change on water resources and society.

Equitable Access to Energy

We can't talk about the new energy economy without talking about equity. Programs such as UMass Amherst's Energy Transition Institute (ETI) set the standard for using cross-disciplinary teams to solve critical technical and public policy challenges that emerge as nations shift to green energy. Our envisioned Sustainable Engineering Laboratories building will serve as a campus and regional hub to strengthen these types of invaluable collaborations.

Community-Engaged Research

Elevating Equity Values in the Transition of the Energy System (ELEVATE) is a PhD program within ETI that focuses on community-engaged research to find optimal energy solutions with local and global scale benefits. The National Science Foundation is supporting this program through two grants totaling \$6.3 million.



Conceptual aerial view of proposed engineering building. Proposed location subject to change.



Sustainable Materials

Researchers in the Nanoscale Interfaces Transport & Energy (NITE) Lab investigate novel materials for renewable energy conversion and storage. In the new building, our energy and materials engineers will develop sustainable materials and devices that can be incorporated into next-generation batteries, electronics, and other clean energy solutions.



Low-Carbon Transportation Solutions

The UMass Transportation Center advances research in micro-mobility and flexible transit; zero-emission vehicles; self-driving cars; and infrastructure management.



Pioneering Wind Power

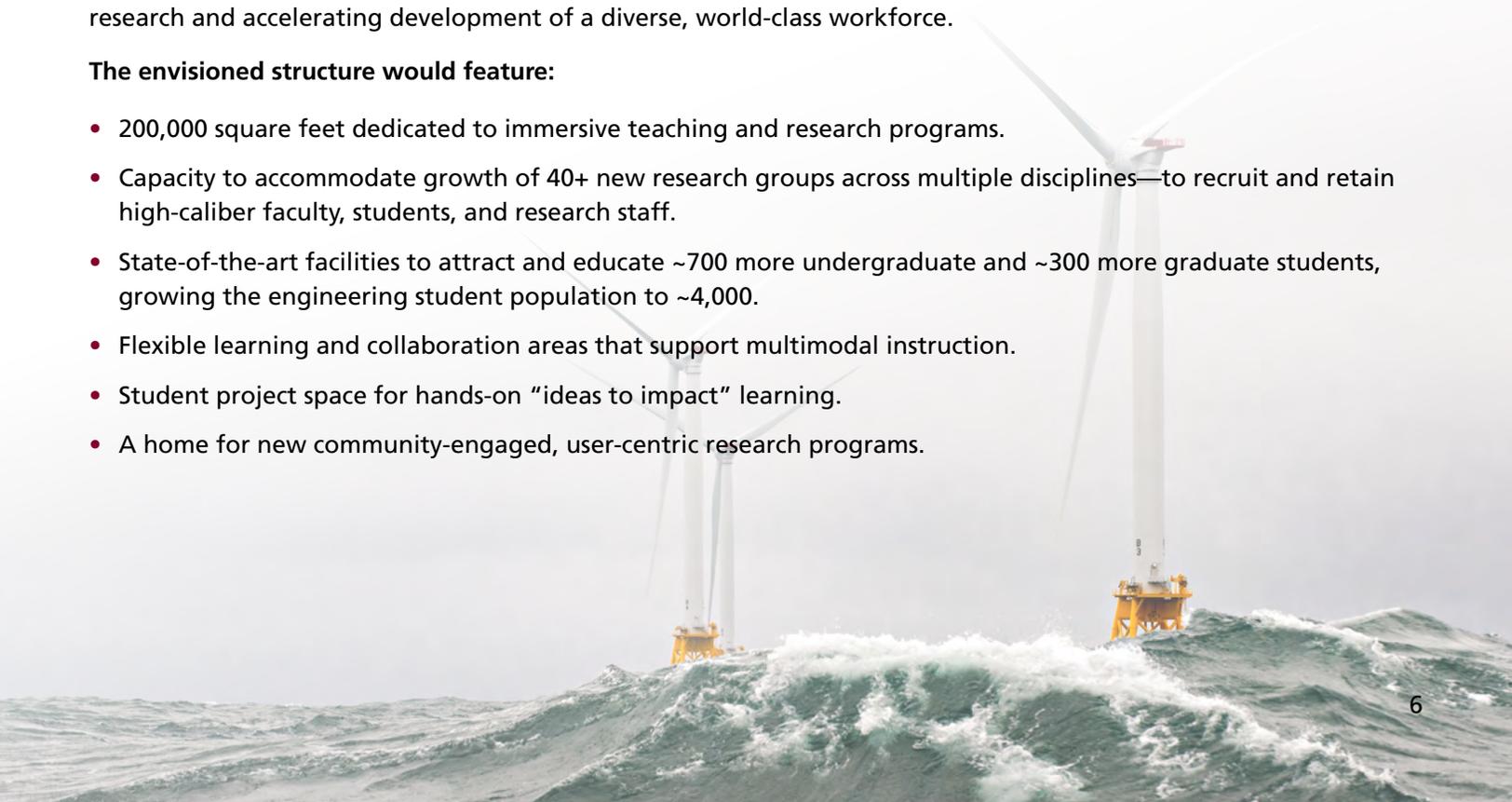
The Wind Energy Center is a global leader in renewable energy and a pioneer of scalable offshore wind power. The center is also a key partner in training programs across the Commonwealth aimed at creating an inclusive clean energy workforce.

An Exciting Outlook for Growth and Impact

A new interdisciplinary College of Engineering laboratory building will be the platform for dramatic growth in UMass Amherst's clean energy and sustainable materials programs—increasing the impact of its revolutionary research and accelerating development of a diverse, world-class workforce.

The envisioned structure would feature:

- 200,000 square feet dedicated to immersive teaching and research programs.
- Capacity to accommodate growth of 40+ new research groups across multiple disciplines—to recruit and retain high-caliber faculty, students, and research staff.
- State-of-the-art facilities to attract and educate ~700 more undergraduate and ~300 more graduate students, growing the engineering student population to ~4,000.
- Flexible learning and collaboration areas that support multimodal instruction.
- Student project space for hands-on “ideas to impact” learning.
- A home for new community-engaged, user-centric research programs.





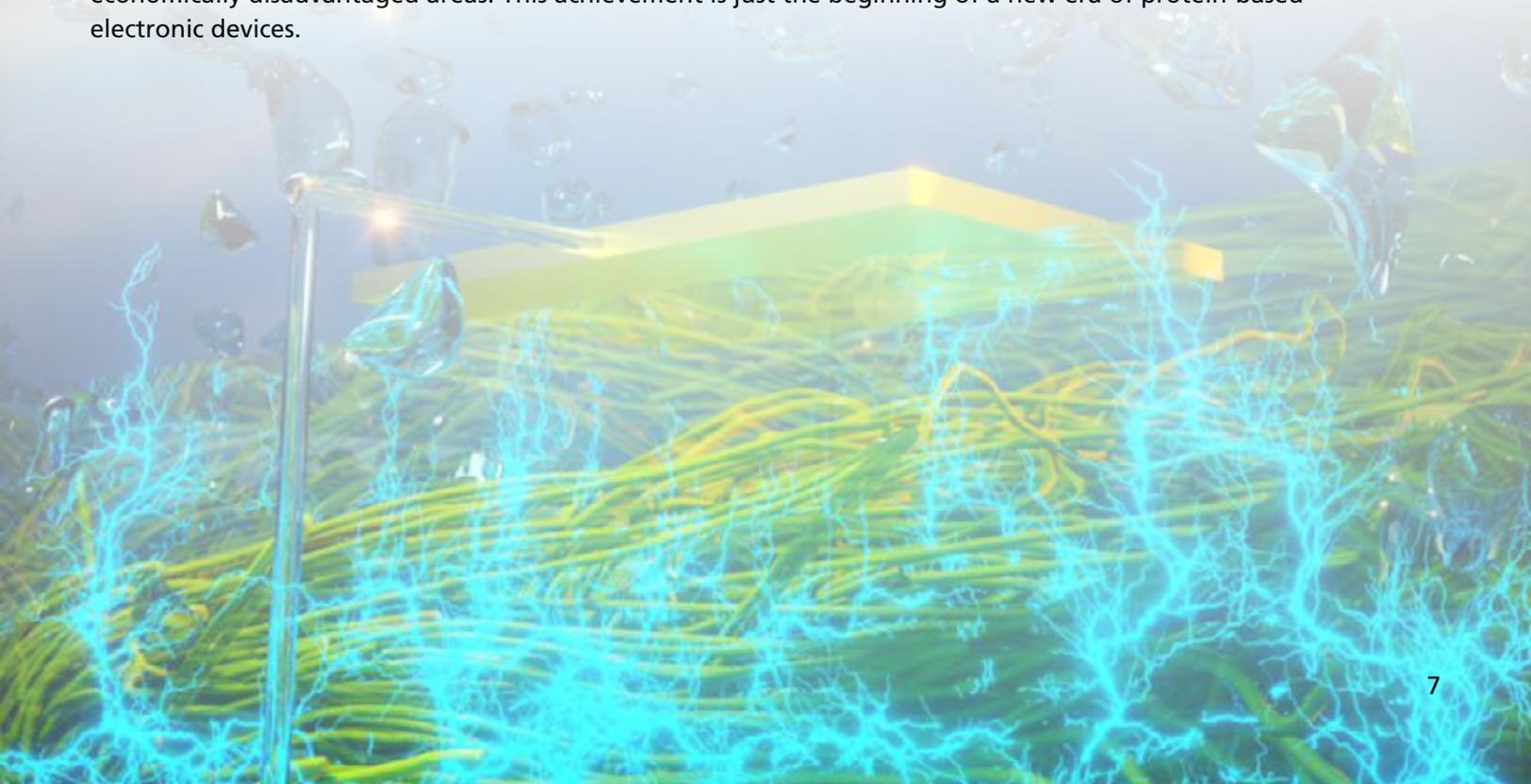
Students design and build a single-person vehicle to achieve the highest fuel efficiency in the annual SuperMileage competition.

Building the Sustainability and Clean Energy Workforce

This new research and innovation hub and living laboratory will not only drive equitable and solutions-based sustainability research for the world, but our graduates will directly infuse that expertise into every sector of the Commonwealth's growing clean energy and sustainability workforce. Our students engage in hands-on, experiential learning activities and design projects that directly connect to real-world industry problems.

Green Energy Devices

UMass Amherst engineers have developed an "Air-gen" or air-powered generator—a renewable device that uses a natural protein to create electricity from moisture in the air. This technology addresses some of the world's most vital problems, such as producing clean energy for self-sustaining systems and generating low-cost electricity in economically disadvantaged areas. This achievement is just the beginning of a new era of protein-based electronic devices.





Conceptual image of atrium, featuring the proposed energy operations center and wave energy lab.

Revolutionary Engineering

In the College of Engineering, we aim to provide a world-class, accessible engineering education; foster innovative research that advances knowledge and services the economic needs of the Commonwealth and the nation; and contribute to solving complex societal challenges.

Rankings

#28 among public engineering graduate schools

60% of engineering graduates stay in Massachusetts

#1 public engineering college in New England

\$50M+ in engineering research expenditures annually

(U.S. News and World Report Graduate School Rankings, 2022; NSF HERD 2020)

We train, educate, and mentor students at all levels to confer the knowledge, diverse perspectives, and depth of expertise requisite of the future clean energy and sustainability workforce.