

The MIT Energy Initiative

LOW-CARBON ENERGY CENTERS

Accelerating key technologies for addressing climate change
and meeting global energy needs



MIT Energy Initiative



Massachusetts
Institute of
Technology

MITEI Low-Carbon Energy Centers: Overview and Mission

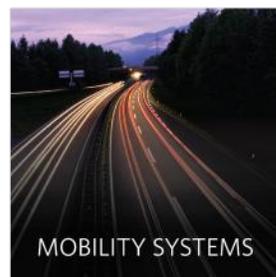
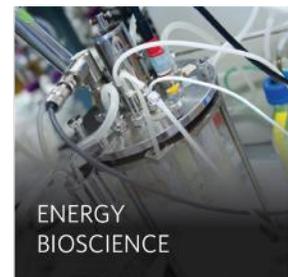
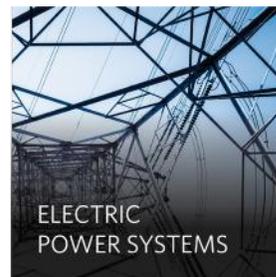
In the coming decades, global energy demand is expected to rise dramatically, driven by worldwide population growth and increasing standards of living in the developing world. At the same time, greenhouse gas (GHG) emissions must be drastically reduced to stave off the worst effects of climate change. Addressing this dual challenge requires simultaneous action on multiple technology and policy fronts—which in turn calls for a broad, sustained collaboration among stakeholders from academia, industry, government, and the philanthropic and NGO communities.

Recognizing this, the MIT Energy Initiative (MITEI) has launched a suite of research centers focused on tackling the world's most pressing energy challenges from every possible angle.

The Low-Carbon Energy Centers employ a uniquely inclusive model that draws partners from many sectors to develop deployable solutions that can meet global energy needs sustainably. Each Center works to advance research in a specific technology area. These areas include: carbon capture, utilization, and storage; electric power systems; energy bioscience; energy storage; materials in energy and extreme environments; advanced nuclear energy systems; mobility systems; and solar energy.

The Centers were first announced in October 2015 as a core element of the Institute's Plan for Action on Climate Change.

MITEI Low-Carbon Energy Center Areas of Focus:





Photos: Justin Knight

Collectively, the purpose of the Centers is to:

- **convene members** from a diverse set of global businesses, government entities, and other organizations to identify the most pressing real-world needs for research within each of its targeted low-carbon energy areas;
- **promote collaboration** between and among members and MIT researchers united by a common desire to advance specific low-carbon energy technology pathways;
- **draw connections** between and among MIT researchers from a variety of disciplines whose work can advance research along those pathways;
- **tap expertise** from Center members on market and policy issues and bring this knowledge to bear on concepts and technologies being developed in the laboratory;
- **synthesize knowledge** within each Center through ongoing dialogue between and among researchers and members;
- **disseminate insights**, findings, and recommendations to members and to society, informing R&D directions as well as public policy debate and design efforts; and ultimately
- **speed the advancement** of technologies and solutions in each low-carbon energy area—far more rapidly than could be achieved by any single entity working alone.

MIT's Advantage

Over the last decade, the Institute, through MITEL, has worked hand-in-hand with a diverse group of stakeholders from industry, government, and the philanthropic and NGO sectors to take on major energy and climate challenges. Thanks to our close collaborations with these partners, MIT has developed unmatched depth and breadth of expertise across a wide range of disciplines critical to the advancement of energy-related innovation.

Approximately 30 percent of MIT's faculty works with MITEL on energy and climate topics, and MITEL has helped channel more than \$600 million in contributions into energy-related research and education—much of which has contributed to advancing the development and deployment of low-carbon energy technologies and to increasing the efficiency of conventional energy systems. As a result, MIT is uniquely positioned to drive major initiatives forward in these areas.

MITEL also has a significant track record of working in developing countries—notably through its Tata Center for Technology & Design, which zeroes in on the challenges of resource-constrained communities. Since both absolute and relative growth in energy use and GHG emissions will be dominated by the developing world in the coming decades, our ability to find solutions that work there is crucial. MIT offers much-needed expertise in addressing the unique energy and climate challenges of the developing world—characterized by rapid demand growth and severe cost sensitivity—as well as proven leadership in forging the kinds of international research partnerships necessary to move the needle on a global scale.



Photo: Christopher Harting / AboveSummit

Structure of the MITEI Low-Carbon Energy Centers

The Low-Carbon Energy Centers combine MIT's proven consortium approach with tailored research programs that team MIT faculty with Center members. On campus, these Centers seek to concentrate and amplify the Institute's innovative energy research while promoting interdisciplinary collaboration and inspiring new research directions for the benefit of society. MITEI brings faculty and students together from across all Centers under a shared administrative umbrella to ensure resources are used efficiently for maximum real-world impact.

As MITEI has developed a proven record of cultivating collaborations among industry, academia, and government to move research forward, we have learned that uncertainty is one of the greatest inhibitors of progress. To address and mitigate the uncertainties inherent to an ever-changing market and regulatory environment, each Low-Carbon Energy Center is supported by a dedicated research team focused on monitoring, tracking, and reporting on the evolving performance and economic potential of emerging technologies. This team provides guidance and definition to the opportunity space that each Center is exploring.

Faculty co-directors lead each Center with the support of a Faculty Steering Committee and a dedicated Advisory Committee comprised of the steering committee plus representatives from each of the Center's members. With input from these committees, the directors set major research themes, build a portfolio of projects—from necessary advancements in basic science to deployable innovations in engineering—and commission policy and technology reviews focused on moving low-carbon energy systems into everyday use.

Membership

To attract broad participation for the new Low-Carbon Energy Centers, MITEI has created a membership structure that removes many of the barriers common to other research endeavors. The Low-Carbon Energy Centers enable smaller private and public stakeholder institutions to participate—along with larger companies and government agencies—and to work with MITEI's existing members. Our goal is to welcome new entrants into MIT's innovation ecosystem to elicit new perspectives and ideas that can boost these efforts. In keeping with the scale and urgency of the challenge before us, our initial goal is to bring \$8 million to \$10 million of new support into each Center. Our experience has been that this initial funding will build on itself over time.

At maturity, each Center will have between 15 and 20 members. An annual minimum commitment of \$400,000 is required of each member with an initial three-year term. A portion of the commitment (\$150,000) will be used to support shared activities described below (ongoing technology tracking and assessment; research workshops; and interactions with faculty, postdocs, and students). This portion will also provide seed funding for new projects and equipment purchases that will benefit all members. The MITEI team will continue to raise research support from government programs to amplify private funding, leveraging the investment from our members, when appropriate.

The balance of the commitment (minimum of \$250,000) will be used on sponsored research projects that are specific to one or more members. Because research is the heart of our mission, this sponsored research commitment is designed to ensure that the Centers only attract members committed to research. Our hope is that many of our members will develop robust research portfolios that far exceed this threshold and that companies will join forces to pool their resources to fund collaborative, multidisciplinary projects with Center investigators. Research funds may also be used to join the MIT Joint Program on the Science and Policy of Global Change or the MIT Center for Energy and Environmental Policy Research.

Members will also be able to support pilot programs and other in-field deployments of technology.

Consortia Activities and Deliverables

A primary goal of MITEI's Low-Carbon Energy Centers is to promote research through in-depth interactions between industry and academia and to significantly shorten the time required to make early-stage breakthroughs, deploy and scale new technologies, and improve or develop new applications for existing technologies, products, and services. To facilitate this, the Center undertakes a series of activities to illuminate specific energy technology landscapes to help members and MIT investigators focus their research efforts.

Onboarding Call: One-on-one call with each new member and the Faculty Directors of the Center to review the member's strategic objectives and research interests.

Semi-annual Consortia Research Development Workshops: Conducted on the MIT campus, these workshops feature presentations from MIT principal investigators on research areas identified by the faculty and member companies. An area of emphasis at these workshops is to identify a set of topics that lend themselves to joint funding by two or more members. The objective of these workshops is to significantly shorten the development time it takes to produce a scope of work and to move forward with a project.

Ongoing Technology Assessment: A dedicated research team monitors, assesses, and reports on technology, economic, and policy developments in the field.

Seed Funding: A portion of the annual fees given to each Center seeds early-stage projects and supports the commission of white papers in low-carbon energy areas of interest to members. While funding decisions are made solely by MIT, the results of such work are shared first with Center members. Members also have the opportunity, where appropriate, to frame key business challenges, specific areas of need, and provide input into requests for proposals.

Seat on the Center Advisory Committee: Each Member will have one seat on the Center Advisory Committee, which will be chaired by the Faculty Directors and will also include participating faculty and MITEI senior leadership. The Advisory Committee provides the Center directors with guidance on research directions and priorities.

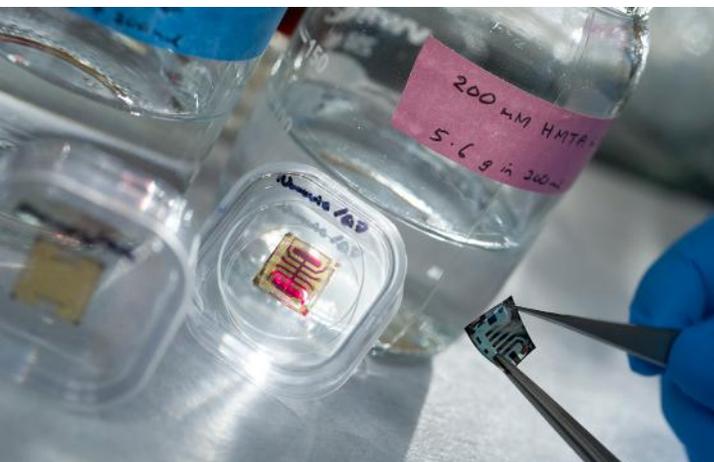


Photo: Stuart Darsch



Photo: Dominick Reuter



Photo: Elizabeth Boxer

MITEI Annual Research Conference and Spring Symposium: All Low-Carbon Energy Center members are invited to participate in these invitation-only MITEI events.

Limited Access to Other Low-Carbon Energy Centers: As previously noted, the Low-Carbon Energy Centers focus on carbon capture, utilization, and storage; electric power systems; energy bioscience; energy storage; materials in energy and extreme environments; advanced nuclear energy systems; mobility systems; and solar energy. Each represents a critical part of a low-carbon future, and each benefits from closer collaboration with academic, industrial, governmental, philanthropic, and NGO stakeholders. To ensure that we take advantage of the obvious synergies between and among individual Centers, members of each are allowed to sit in on designated portions of semi-annual research development workshops conducted by other Centers.

Joining the MIT Energy Initiative Low-Carbon Energy Centers

To discuss membership in one or more of the Centers, please contact:

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Photo: NASA

