

## The Search for Our Energy Future

Mattia Ferraresi (June 06, 2017)



Visiting MITEI Labs, a research center established nine years ago in a collaboration between MIT and several energy-sector companies, including Italy's Eni. MITEI (or MIT Energy Initiative) has become an incubator for energy ideas and research projects, an across-the-board enterprise involving hundreds of professors and thousands of students. Its goal is to meet the growing demand for energy in an environmentally responsible way.

In the "infinite corridor" of the [Massachusetts Institute of Technology](#) [2], everyone is in a hurry. A noisy stream of students hustles from labs to seminars and from interviews to study groups. Everyone has a clear objective in mind, even the brass band improvising a Ska concert in the western atrium. As they say, "Work hard, play hard."

MIT is one of the most important technological centers in the world, an incubator for innovation that



runs on a continuous loop. Students looking for a ride will be out of place here. Every detail—from state-of-the-art buildings to bulletin boards flyers—proves that excellence isn't just a word floated at academic conferences.

You understand why Robert Armstrong, Director of the MIT Energy Initiative (MITEI), thinks human energy is a fundamental asset in the marriage between academia and industry. [MITEI](#) [2] is a collaborative research center established nine years ago with several energy-sector companies. One of its founding members is [Eni](#) [3]. MITEI is an across-the-board enterprise involving around three hundred professors and thousands of students from the university's five schools. Engineers work closely with physicists and geologists as well as policy and urban planning experts. It would be hard to find a more academically prepared, cutting-edge team. "Energy permeates all areas, and an interdisciplinary approach is essential," says Armstrong. An affable southern gentleman who can barely contain his passion for his job, Armstrong is one of the cornerstones of MITEI.

When the partnership was created, the university sought to collaborate with the private sector "because they have a longer-term vision than governments and direct knowledge of the problems and avenues to explore." Then as now, the initiative was based on three fundamental pillars: addressing issue of energy reserves, security, and the environment. "How can we meet the growing demand for energy in an environmentally responsible way?" says Armstrong. "Today, that is the most pressing question."

MITEI recently organized "Solar Day," a day of seminars and interdisciplinary meetings to share and present ideas on solar power. "It's an area where Eni has been working a lot with a forward-looking and diversified approach," says Armstrong. "Eni even brought the orchestra of La Scala here to Cambridge!" That's one advantage of being allied with Italians.

Robert Stoner, the Deputy Director for Science and Technology and Director of the [Tata Center for Technology and Design](#) [4], gained clarity on how best to respond to global challenges while working for the Clinton Foundation on development projects in Malawi, Tanzania, and Rwanda. In Africa, Stoner saw first-hand that energy is at the heart of development, but that the people in charge often face challenges of capacity.

"Multilateral organizations like the [World Bank](#) [5] and the UN, but also small NGOs working bilaterally, have a very limited engineering capacity and can't really operate as developers and promoters of new technologies," Stoner explains. Convinced that more could and should be done, he wrote a letter to then-Director of MITEI [Ernest Moniz](#) [6] offering his ideas about opportunities for improvement. As it turned out, Moniz had recently attended a meeting with MITEI's advisory board. One of the topics highlighted at that meeting was the need to focus more resources on developing countries. "My letter found very fertile ground," said Stoner.

A physicist and inventor with a business-like approach, Stoner would prefer to make breakthrough innovations rather than incremental improvements to existing technologies. "I'm not saying that it is exclusive to MIT," he says, "but certainly we have a disproportionate number of professors and students engaged in this type of high-risk, solution-oriented research, and they benefit enormously from MIT's history of collaboration with government and the private sector."

"How many watts am I carrying on my back?" asks [Vladimir Bulovic](#) [7], co-director of the [Solar Frontier Center](#) [8]. "This is the fundamental question people in remote villages in the poorest countries in the world ask when talking about solar panels." Bulovich and his team are working to produce more efficient solar cells to transport to the four corners of the world. "People underestimate the weight factor of solar technology, but it is critical, especially in developing countries where it is probable that a solar panel will be transported and carried by a person."

In collaboration with Eni, MIT laboratories have produced solar cells printed on thin sheets of plastic. Professor Bulovich shows me a form with cells about two microns thick—one-fiftieth the width of a human hair. "This can be a solution to applying solar cells to all sorts of things," he says. To demonstrate, he pulls out a pair of sunglasses that power a table clock with the little light that filters into the office on a typical Boston day.



While some hunt for a eureka moment, others attempt to advance traditional techniques. Ruben Juanes, a professor in MIT's Department of Civil and Environmental Engineering, studies the flow of fluids in porous media, such as rock or sand layers—the natural environment for extracting hydrocarbons. He and his researchers are looking for more effective ways of getting oil to flow in traditional extraction processes. It may not sound mind-blowing at first, but then Juanes talks percentages. “On average,” he says, “the amount of oil that can be extracted from oil fields [is 30%]. Thanks to three-dimensional models, we know there is a lot more underground, but 70% is trapped. Even a marginal increase in our ability to recover oil from wells would have a huge impact on extraction.”

Below us are vast treasures that technology can identify and map but that remain inaccessible. Each extra barrel recovered would reduce the need to go looking for new wells, perhaps in environmentally-sensitive areas. “What we do can have an important economic impact for the oil companies,” he says, “and at the same time it is advantageous in terms of the environment.” Juanes is just one of the many brilliant minds at work in the place where our energy future is imagined. w

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