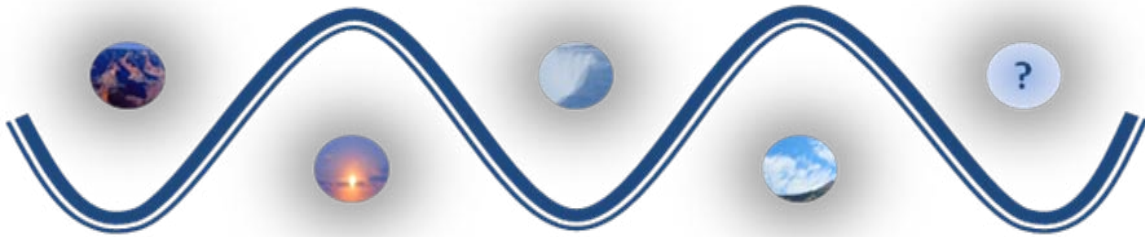


mitenergyclub



# The Joule

A biannual newsletter from the MIT Energy Club,  
a student-run energy technology, policy and  
business community at MIT

Vol. 2, No. 2, Spring 2009

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SPRING 2009

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## *Letter from the editor:*

Wow! What a year it's been and it's only March! The Energy Club has been even busier than usual, if you can believe it, and that means we have tons of small and big events going on from across the entire spectrum of energy technology, policy and business topics! It's impossible to fit all of the newsworthy events into a single 10-page newsletter, so check out the website, [www.mitenergyclub.org](http://www.mitenergyclub.org), in order to stay up to date on the latest club activities and initiatives.

This newsletter is dedicated to some of the larger events the Energy Club sponsored in the fall of 2008 as well as some of the new initiatives that the club has recently taken. Firstly, we have Energy Night, which for the fourth straight year had record breaking numbers of attendees and presenters. The MIT Museum was practically overflowing with energy enthusiasts! Then, in conjunction with MIT Energy Initiative, the Energy Club sponsored a first for MIT campus: a presidential debate on energy policy featuring representatives of both the Obama and McCain campaigns. Solar activity on campus has reached an all time high and so in this newsletter we are featuring two separate solar programs: the first ever technical symposium at MIT on solar energy and the debut of the Solar Electric Vehicle Team's latest car.

In addition to all these large-scale events, the executive committee continues to work tirelessly behind the scenes to promote energy education and community. Part of this involves our energy 101 series and 2008-2009 has had more 101 events than any prior year. The Collegiate Energy Association, formed last year, continues to grow and build the collegiate energy club community worldwide. The entrepreneurship chair has been especially active in integrating activities from the Clean Energy Prize with Energy Club events. Finally, we were lucky enough to catch two of our alumni so that they could share their perspectives with us on the "real world" of energy (i.e. life after MIT). Thanks to all so much for reading and being part of this awesome community of energy enthusiasts!

Katherine Dykes  
Newsletter Chair, MIT Energy Club

## Origins of the MIT Energy Club

(by Katherine Dykes)

In 2009, there is undeniable interest in solar photovoltaic research on MIT's campus. However, back in 2001 when Dave Danielson joined the MIT community as a graduate student in course 3, Material Science, things were quite different. As a new student to campus, Dave wondered where all the "clean-tech rock stars" of the MIT community were hiding. Later, in the spring of 2004, that he found Dr. Jeff Tester's class on sustainable energy. Soon enough, he found that the other members of his class were just as enthusiastic about energy as he was. As the class came to an end, Dave recommended the students get together over the summer for weekly discussions. This was the modest beginning of the MIT Energy Club.

Initially, the meetings consisted of a handful of students meeting weekly at the Muddy to discuss various energy topics (PV, wind, hydro, alt-fuels, geothermal, etc). By the end of the summer, the group had grown to over 20 people. In the fall of 2004, they began a series of lectures and socials in addition to the discussions. An important centerpiece to the entire series of events was maintaining a "fact-based" approach which remains a central value in the MIT Energy Club's mission to this day.

Though discussions, lectures and socials continued to serve as the "heartbeat" of the club, the growing interest in energy helped to shape the future of the club in ways that Dave and the original membership had never anticipated. For instance, at one point, there came an opportunity to host an energy night for graduate students at the MIT museum. Everyone was astounded when the turnout for first Energy Night in the fall of 2005 turned out to be over 600 people! Daniel Enderton, former Energy Club president, remembers at that first energy night when Andy Peterson and Kurt

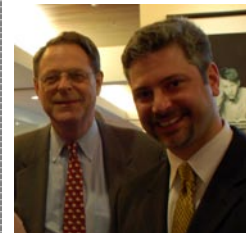


**Above: Dave Danielson (left) talking to a participant of the first Energy Conference**

Fischer presented their work on chemical engineering and how they met a business student from Harvard who eventually went on to become their business partner. The Energy Club was really beginning to be something special. Coincidentally, this first flagship event for the club took place around the same time that President Hockfield announced MIT's new energy initiative and the rest, as they say, is history.

## MIT ENERGY CLUB'S FIRST ENERGY CONFERENCE

Nolan Browne, Sloan '06, joined the newly formed MIT Energy Club in the spring of 2005. Having helped organize an energy track for the Sloan school's venture capital conference, he was encouraged by Ken Morse, MIT Entrepreneurship Center Director, to look into doing something big in energy on MIT's campus. The club was skeptical at first of their capacity to organize such a large scale event, but by a democratic vote, the leadership decided they would give it a go. They decided to aim for 6 panels with specific questions that centered on a common theme: "solving the energy crisis." Throughout the entire process, Dave Danielson and Nolan worked together to find common ground between a purely technical conference and one more oriented to business.



**Left: Ken Morse (left) and Nolan Browne (right) at the first MIT Energy Conference**

In general, Nolan recalls everyone working really hard to make the conference happen. Most of those who contributed were never fully recognized for their efforts. To this day, the energy conference remains the premier student-run energy conference in the world. Many thanks to Dave, Nolan and all the other early-members who helped start the MIT Energy Club and organized the first conference!

## **Energy Night 2008** (by Melissa Webster)

On October 10, 2008, 1,200 people from the MIT energy community and beyond gathered at the MIT Museum for the Energy Club's flagship fall event, the fourth annual MIT Energy Night. The automotive display, located outside the museum entrance, immediately engaged visitors with a Honda FCX fuel cell vehicle and two eye-catching models from the MIT Solar Electric Vehicle Team. Indoors, jazz music from the Troglodytes, an MIT alumni band, welcomed visitors to the first floor, where they viewed posters in wind, geothermal, green buildings, sustainability, and transportation, plus displays by the MIT Energy Club and the MIT Energy Conference. Exhibitors included Agrivida, an agricultural biotechnology company founded in 2002 by MIT researchers Jeremy Johnson and Michael Raab, and the Retrofit project from Sustainability@MIT, among others. Throughout the first and second floors, visitors enjoyed refreshments and appetizers as they learned from the presenters and each other.



**Above: Troglodytes entertain Energy Night guests**



**Above: Energy Night filled the MIT museum to capacity with its record attendance of 1200!**

When students, faculty, staff, alumni, and the general public made their way to the second floor, they found 31 more posters in the energy grid, institutional initiatives and competitions, solar, coal, nuclear, and energy resources. This year's Energy Night offered eight nuclear topics, six more than last year, as well as research on microgrids and photovoltaics. The first Energy Night grew from the vision of Dave Danielson (PhD), who wanted to provide members of the diverse

MIT energy community an opportunity to interact and see the breadth of energy research, policy, and entrepreneurship across MIT. For the fourth Energy Night, co-directors Melissa Webster (MBA '09) and Matthew Denman (PhD Candidate) began their planning on a Saturday afternoon in May and continued over the summer, including presenter recruitment and screening and logistics coordination with the museum's interim programs manager, the invaluable Jon Markowitz Bijur. Efforts moved into high gear at the beginning of the fall semester when Forgan McIntosh (MBA '10), Kathreen Thome (SB '09), Mahesh Konduru (MBA '10), and Chris Walti (MBA '10), joined the team. Everything culminated on October 10, when another 26 students pitched in, with support from club Co-Presidents Amy Fazen (MBA '09) and Lara Pierpoint (PhD Candidate), Vice President Jeff McAulay (TPP '09), Secretary Pearl Donohoo (TPP '09), Website Chair Ed Carlevale, and Past Presidents Daniel Enderton (PhD '08) and Dave Danielson.

"One of the questions I got spurred a train of thought," one presenter wrote in the post-event survey, "that led to a potentially patentable invention. It's hard to beat that." Please mark your calendar for the fifth annual Energy Night on Friday, October 16, 2009, at the MIT Museum, once again bringing together the best MIT developments in energy research, policy, and entrepreneurship.



**Above: Kevin Brokish, PhD Student in Course 6 (left), talking to a participant of the 4<sup>th</sup> Annual Energy Night about his research**



## *MIT's First Ever Solar Symposium* (by Kevin Huang)

Just like many great MIT energy ideas, it all started at the Muddy Charles Pub. The question was: how can we build a cohesive, Institute-wide community around solar energy research at MIT? While a great deal of work remains before that vision is fully realized, MIT took a promising step forward on January 30.

MIT research into solar energy has exploded in recent years, in large part due to the prevalence of generous funding from industry and philanthropic sponsors like Eni and the Chesonis Family Foundation. As is often the case at academic institutions, however, solar energy researchers at MIT are spread across many different departments and remain relatively isolated from their solar energy peers in adjacent fields of study. The MIT Solar Energy Symposium sought to change that.

To lay the foundation of an engaged solar research community at MIT, the symposium brought together faculty, students, and affiliated researchers that span the academic spectrum. This included scientists and engineers that are developing the next generation of photovoltaics, novel solar concentrators, and innovative storage and conversion solutions as well as researchers from economics, MIT Sloan, and technology policy.

Professor Vladimir Bulovic launched the event with an inspirational justification for the expansion of solar in our global energy system and the challenges that confront the research community in realizing a solar-powered world. Following this introduction, Professor Tonio Buonassisi outlined the vast array of possible technological solutions to these challenges, solutions on which many at MIT are working. Complementing this discussion on solar technology, former MIT student Michael Rogol analyzed the state of the global solar industry. The second half of the symposium placed MIT within context of the broader solar research effort. Professor Robert Armstrong, deputy director of the MIT Energy Initiative, outlined the work of the Sustainable Energy Revolution Program and, in particular, the various formalized areas of MIT solar research including the Eni-MIT Solar Frontiers Center, the Solar Revolution Program, and the MIT-Fraunhofer Center for Sustainable Energy Systems. Finally, the event concluded with a brief but academically diverse panel of student research presentations from Steve Hudelson, Peter Bermel, Phil Reusswig, and Lauren Culver.

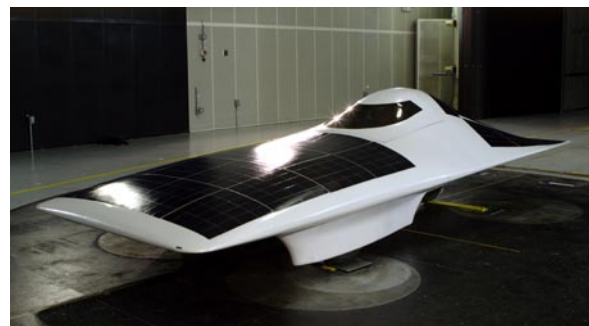
While many new cross-campus introductions and connections were made and many attendees likely learned something new, the most valuable product of the symposium could very well be the tremendous momentum the event generated – a student-driven energy and interest in building an active and engaged solar energy community on the foundation that was laid down by the symposium.

*The MIT Solar Energy Symposium was organized by students Kevin Huang, Qichao Hu, and Becky Ladewski as well as Daniel Enderton and Marissa Blake of the MIT Energy Initiative. It was co-sponsored by the MIT Energy Initiative and the Chesonis Family Foundation.*

## MIT Solar Electric Vehicle Team

(By George Hansel)

On February 27, the student-run MIT Solar Electric Vehicle Team unveiled their new car "Eleanor", named for the famous Ford Mustang fastback featured in the original *Gone In 60 Seconds*. Unlike her namesake, the Solar Electric Vehicle Team's Eleanor is designed with not only speed, but also efficiency, in mind. The all-electric, solar-powered vehicle weighs only 475 pounds without a driver and can cruise indefinitely at highway speeds while consuming less power than a toaster oven. The well-publicized event featured a presentation about Eleanor's systems and design by team members, as well as a faculty speaker. SEVT members discussed vehicle construction as well as future plans for the vehicle. "The basic construction of the car is a steel tube space-frame chassis surrounded by an extremely light aerodynamic shell supporting the solar cells," said aerodynamic lead designer David Sanchez '09. "Using carbon and aramid composites offers the best combination of simplicity and lightness." Other team members emphasized that a mix of well-established and cutting-edge technology is essential to getting the highest possible energy efficiency possible while ensuring reliability. "The car is going to race for nearly 1900 miles during the World Solar Challenge, nearly all of which is deserted Australian outback," said electrical lead Alexander Hayman '08. The World Solar Challenge is the multi-day, cross-country road race that Eleanor was designed for and will compete in during October of this year. "Reliability is just as important as efficiency," he continued, reiterating a point well-known to both the designers of solar vehicles and the developers of emerging technologies in green and renewable energy. For more information, visit [mitsolar.com](http://mitsolar.com) or email [gosolar@mit.edu](mailto:gosolar@mit.edu).



**Above Left and Right: MIT SVT Students work on Eleanor; Below Left and Right: Featured images of the car**

*The MIT Solar Electric Vehicle Team gratefully thanks Infinesse Corporation, the Ford Motor Company, MIT's Edgerton Center, and its other sponsors for their continued support.*

## *Energy 101 Update* (by Ashleigh Hildebrand)

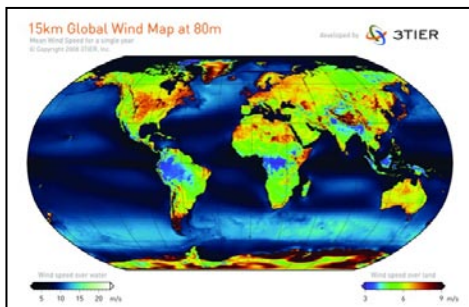
Although they are rather new to the Energy Club standing series, the Energy 101 sessions have been a rousing success! These presentations are designed to be an introduction to a broad energy subject, often taught by graduate students working in the field for their research. We had three great Energy 101 presentations in the fall of 2008. Visiting scientist Rich Sears gave us a primer on "Petroleum 101." Peter Bermel and Steve Hudelson shared their knowledge for a "Solar Energy 101." And now we know how we get our electricity, thanks to Kevin Brokish's "Electricity Grid 101." Attendance has been great – each event keeps growing in size! If turn-out and the extent of questions and discussion are any indication, these sessions are proving to be quite valuable for Energy Club members!

This spring will be no less information-packed! The end of March brings a "Wind Energy 101" as part of "Wind Week." Also on deck are presentations on the basics of climate change legislation, energy storage, and energy efficiency. We are also continuing to document our 101 sessions and make the knowledge available on-demand! Copies of the presentations are available on the MIT Energy Club website under "Standing Series." We are also harnessing convenient synergies by turning 101 presentations into single page at-a-glance "Factsheets." For more information, or if you are interesting in sharing your own knowledge through a 101 session, please contact Ashleigh Hildebrand, the Energy 101 Chair, at [ash456@mit.edu](mailto:ash456@mit.edu).

## *Entrepreneurship and MIT CEP Update*

(by Marcio von Muhlen, Entrepreneurship Co-chair and co-director for CEP)

In the summer of 2008, Diana Huidobro of the MIT Clean Energy Prize approached the Energy Club with the goal of co-sponsoring an energy focused entrepreneurship series on campus. The series would be a way to highlight energy entrepreneurship to the Energy Club community as well as raise awareness for the Prize, which serves as the Energy Track for the fabled MIT100k business plan competition. We



named the endeavor the "Cleantechology Series" and successfully launched it with visits by founder-CEOs Saul Griffith of Makani Power (in collaboration with Katherine Dykes and the wind sub-community) and Ken Westrick of 3TIER Group during Fall 2008. We also have founder-CEOs of Voltree Power and Envapower scheduled to appear in Spring 2009. These events follow in the rich tradition of the Energy Club bringing top-level speakers from exciting new energy ventures.

The Energy Club is a perfect partner to the entrepreneurship community at MIT and beyond because the business of energy is extremely dependent on both technology and policy developments in shaping its evolution. The ability to bring together business, engineering and policy community members to the same room is thus particularly important in enabling new ventures in the energy space to flourish. We hope that by holding this kind of event at MIT we will help bring together the teams that will found the next generation of energy companies, ones that I fully expect will revolutionize the way we purchase and use energy. For more info on the Clean Energy Prize, check out [www.mitcep.org](http://www.mitcep.org)



**Above: Saul Griffith, CEO of Makani Power**

## *Growing a Global Student Energy Community*

(by Kevin J. Huang)

How do we secure sponsorship? Who are the major players in the global energy industry? How do you run a successful conference? What are other students doing?

These are important questions that nascent energy clubs around the world predictably ask themselves. Students interested in energy are not in short supply at universities around the world. Answers to these common questions that stem from the growing pains of emergent student-run energy initiatives, however, can be harder to find. To fill this void, the Collegiate Energy Association (CEA) was founded a little over a year ago at MIT. The CEA seeks to engage student-run energy organizations with their peers around the world so they may learn from one another and form collaborative partnerships in energy at the student level. In its relatively brief existence, the CEA has grown into a truly global student community, encompassing 36 member energy clubs from 8 nations across Asia, North America, and Europe.

While the CEA started out as a website (<http://www.collegeenergy.org>) to virtually connect its member organizations to each other, it has developed into an international organization that fosters the kind of global collaboration that will certainly be a vital component of any solution to our contemporary energy challenges. For instance, at the 2008 MIT Energy Conference, student leaders of organizations from Japan, the United States, and the United Kingdom convened in the days prior to the conference for the CEA's first Annual Meeting. Beyond the inherently valuable personal connections that were forged between the visiting leaders, various working group discussions cultivated a range of new ideas and new collaborative initiatives to address many of the shared challenges that student-run energy organizations face – challenges such as ready access to the international energy industry, information exchange, and connections to other future energy leaders.



In addressing these issues, the CEA has since forged mutually beneficial partnerships with the World Energy Council and the New England Clean Energy Council. Additionally, several collaborative opportunities are in development to enhance the kinds of personal association between students that make such a global network so valuable. These opportunities include an Annual Leadership Retreat, a regional collaboration between Boston-area energy clubs, and a national partnership between the Berkeley Energy and Resources Collaborative and the MIT Energy Club. And just as a year ago, the CEA will hold its next Annual Meeting at the 2009 MIT Energy Conference to further seed innovative collaborative ideas for the upcoming year.

Because energy is and will continue to be a truly global phenomenon, the Collegiate Energy Association remains committed to building a cohesive community of student energy leaders on an international scale to match that of the shared challenges we all face. For more information contact Kevin Huang at [kjhuang@mit.edu](mailto:kjhuang@mit.edu).

## *Alumni Features* (by Meredith Fischer)

Alumna Profile: Danielle France



Danielle France earned her PhD from the Biological Engineering Department in 2007. Her work focused on the biological spring mechanism in a protozoan called *Vorticella convallaria*. While at MIT she worked on the BE student board, played intramural soccer, and was on the Hobby Shop advisory board.

Danielle is currently the bioprocess engineer at Luca Technologies, LLC. Luca's technology stimulates the microbial conversion of coal and other hydrocarbon resources (oil, shale) to methane. Conversion takes place within depleted coal-bed methane wells, in order to harvest the hydrocarbon resource which would otherwise be left in site underground. Danielle is also a mentor in the MIT Energy Club Alumni Mentorship Program.

We asked Danielle to talk to us about her career in energy and how her experiences at MIT have shaped her professional life.

**The Joule: Tell us a bit about your position at Luca.** DF: I am a scientist within the applied research group, which is tasked with developing new and more efficient improvements to our core technology, and building a better understanding of the microbial processes involved in hydrocarbon conversion. This work is at a basic scientific level but will fuel the next-generation technologies for the company. Specifically, a large part of my work to date has focused on building the laboratory tools which effectively represent our field-scale "geobioreactors".

**The Joule: How did you get interested in energy?** DF: As soon as I really started thinking about the scale of human problems it was clear that energy was one of them. I had always been interested in applying engineering to biology, and by the time I finished my degree there were enough demonstrated ways to engineer biology to produce energy solutions that I opened up myself up to looking at working in the energy field.

**The Joule: What big questions and challenges do you think are important for energy professionals in this field?** DF: I think the biggest issue facing the energy sector is conservation. It's more of a social challenge than a scientific challenge: how do you get people to realize higher energy use is not required for a modern comfortable lifestyle?

**The Joule: How did your time at MIT influence your career path?** DF: Being at MIT solidified my belief that science can always yield new and interesting solutions to world problems. There's a lot more that has to happen past basic science to make an impact, but the basic scientific research is essential. Because of that, I am still an active scientist now and if I do move into a different career focus, I'll keep a heavy reliance on scientifically-formed solutions.

**The Joule: What do you miss most about MIT?** DF: I miss the people I met at MIT and how open and labile their minds were for new ideas. I also miss being in a community where science is a valued and easy-flowing language. I miss the Muddy - it was always fun.



Alum Profile: Kerry Bowie  
*Associate Commissioner for Operations, Massachusetts Department of Environmental Protection (MassDEP)*

**The Joule: Please describe a bit about your work.** KB: I currently serve as an Associate Commissioner at MassDEP; however, I recently transferred from the Executive Office of Energy & Environmental Affairs. In my former role, I focused on permitting issues; was the clean energy and environment liaison for the Governor's performance metrics initiative; helped create the Commonwealth Energy Resource Team; and coordinated the Secretariat's emergency support functions. In my current role, I assist the Deputy Commissioner with operations projects related to permitting, assistance, compliance, enforcement, and response. I work with our bureaus and regions to coordinate and expand the outreach and technical assistance of the Agency and currently am focused on permitting issues associated with the Commonwealth's Accelerated Bridge Program and the recently passed Economic Stimulus Package.

**The Joule: How did your time at MIT influence your career path?** KB: I had two chapters at MIT: My undergraduate experience was a humbling, formative period which taught me how to think. I majored in environmental engineering and concentrated in environmental policy which included classes from the Department of Urban Studies and Planning that focused on a number of the topics that I deal with now. My graduate experience at Sloan tended much more to hone my skills, focus my experiences, and chart my path. I was able to observe the entrepreneurial side of the private sector from the perspectives of venture capital/private equity firms and start-ups. My exchanges with my macroeconomics professors and discussions with executives at some of the start-ups in the area helped to cement my understanding of the pivotal role that government plays in ensuring our sustainable energy future.

**The Joule: What do you miss most about it or what's a favorite memory(s) from your time here?** KB: I would have to say that it is the relationships forged out of the rigor inherent in MIT's programs and associated rituals. I am still in contact with a number of my close friends from my undergraduate days. My fondest memories of my time at Sloan are of the treks. I had amazing times on the Asia Trek, MonTrek and Africa Trek and actually organized a Deep South Trek before I left where I introduced my [international] classmates to catfish and grits and took them to sites such as the Martin Luther King, Jr. Memorial and Coca-Cola Museum in Atlanta. While the theory and practice of business, engineering, and science are all amazing at MIT, it is really all about the people!

**The Joule: What big questions/challenges do you think are important for professionals in this sector to address?** KB: One of the biggest questions we are faced with is "How do we price carbon?" I think the questions of whether or not climate change really exists and what is the best solution have been tabled by the overwhelming majority. It generally is accepted that climate change is real and that we need to be attacking it with everything that we can – shotgun vs. silver bullet approach. For example, the Northeast's Regional Greenhouse Gas Initiative (RGGI) is the first mandatory, market-based cap in the country and will hold its third auction on March 18<sup>th</sup>. The second big question I believe we are facing actually may be the more central issue as the carbon pricing question is part and parcel... "How do we change behavior?" Henry David Thoreau reminds us that, "Things do not change; we change." While there has been a veritable blitzkrieg of media and regulatory attention focused on sustainability over the past few years, most measures have been focused on point sources such as electrical utility plants. While the point and line sources (i.e., auto emissions) are being covered the last frontier in a sense is what I like to call cloud sources (i.e., commercial/residential energy efficiency, water conservation, and recycling measures) as they are individually tiny but collectively enormous.

# The Last Word

Look for issues of *the Joule* on the MIT Energy Club website at <http://www.mitenergyclub.org/> and check out these upcoming events this spring and fall:

## Lectures:

### Overview of the Energy Storage Industry

06:00-07:00PM Wednesday March 11

Leader: Richard Baxter, Senior VP at Ardour Capital

Location: E51-335

### The State of Energy Storage Innovations, Development and Investments in (trans) Portable Applications

06:15-08:00PM Tuesday March 17

Leader:

Location: 32-123, Kirsch Auditorium, Stata Center

### Wind Power and the Path to a Quarter of the World's Electricity

06:00-07:00PM Wednesday April 01

Leader: Dr. James Lyons, Novus Energy Partners CTO, former Chief Engineer of Electrical Systems at GE Research

Location: E51-145

### MA DOER Commissioner Phil Giudice discusses the Future of Energy in MA (DATE CHANGED to 4/29)

06:00-07:00PM Wednesday April 29

Leader: Philip Giudice, Commissioner, Massachusetts Department of Energy Resources

Location: E51-149

## Energy 101s:

- Wind Energy – March 31<sup>st</sup>
- Energy Efficiency – April 9<sup>th</sup>
- Energy Storage – April 23<sup>rd</sup>

## Wind Week 2009: <http://windweek.mit.edu>

- Lecture and 101s – March 31<sup>st</sup> and April 1<sup>st</sup>
- **Networking Reception & Student Poster Session – April 2<sup>nd</sup>**
- **Technical Workshop** on State of the Art and Research Challenges in Offshore Wind Energy Technology with Various World Class Experts – **Friday, April 3<sup>rd</sup>**
- Tour of Hull Wind Facility and Discussion of their Planned Offshore Wind Installation – Saturday, April 4<sup>th</sup>

*(This is a brand new initiative from the Energy Club's newly formed wind energy sub-community and features a full week-long series of events all around the theme of wind energy and culminating with a full day technical workshop; registration required for workshop so sign-up early!)*