
Case-Altair Energy

Dr. Jack M. Wilson

Distinguished Professor of Higher Education, Emerging Technologies, and Innovation



About

- **About Altaeros** Altaeros Energies was founded in 2010 to generate low cost renewable energy by harnessing the strong winds found at higher altitudes. Altaeros Energies won the 2011 ConocoPhillips Energy Prize, and has received funding from the U.S. Department of Agriculture, the California Energy Commission, and the Maine Technology Institute.
- Founded in 2010 out of MIT, Altaeros Energies is funded by
 - the US Department of Agriculture and
 - National Science Foundation Small Business Innovation Research programs,
 - the Alaska Energy Authority,
 - the California Energy Commission,
 - the Maine Technology Institute, and
 - the Massachusetts Clean Energy Center
- Altaeros Energy <http://www.altaerosenergies.com/>
<http://www.altaerosenergies.com/about.html>

Team



Adam Rein – Chairman/Founder

Adam has an extensive background in the business of green energy and cleantech having held positions at the World Economic Forum and Bain & Company. In 2010 he co-founded Altaeros Energies, recognizing the opportunity presented by high level winds for clean power generation and other applications. Altaeros Energies became a founding member company of Greentown labs, the largest early stage cleantech incubator in the United States, where Adam currently serves on the board of directors. In 2013, Adam joined MissionPoint Capital Partners which focuses on providing growth investment for companies accelerating the transition to a low carbon world. Adam holds a BA from Yale University, an MPA in Business and Government from the John. F. Kennedy School of Government at Harvard University and an MBA from the Massachusetts Institute of Technology Sloan School of Management.



Ben Glass – CEO/CTO & Founder

As a cleantech entrepreneur, Ben is driven by a passion for boosting efficiency and sustainability through elegant technical solutions. He developed the idea for Altaeros Energies while conducting research on compact, efficient turbomachinery at the Massachusetts Institute of Technology's Gas Turbine Lab. After developing the initial prototypes, Ben co-founded Altaeros in 2010, and is currently leading the company to full commercialization of the technology. Ben holds a BS and MS in Aeronautical and Astronautical Engineering from MIT.



Deepak Shahane – VP Business Development

With over 30 years of experience in high technology and clean energy Deepak brings experience in both engineering and business to Altaeros Energies. After successfully selling his first company, NetPlaneSystems, Deepak held executive positions at Conexant, Mindspeed Technologies and Motorola before he founded MetaMAX Communications in 2008 where he served as CEO. After successfully building the company into one of the premier wireless data providers in India, he left the company to focus on helping entrepreneurial companies develop technology and business opportunities on a global basis. Deepak joined Altaeros in 2015 to establish the company in key initial markets, recognizing the impact the company's technology will have. He holds a B.S. from Osmania University in India and an M.S. from the University of New Hampshire.



Dr. Benjamin Bollinger – VP Engineering

Ben joined Altaeros in September of 2015 to lead the company's engineering efforts in commercializing its technology. His previous role was as Chief Engineer at Sustain X, a company he co-founded in 2007, which focused on grid-scale energy storage solutions to support a cleaner and more efficient electric grid. Ben holds a PhD in Engineering Sciences from the Thayer School of Engineering at Dartmouth where he held a variety of research positions prior to founding SustainX.



Sheri Palazzo – Director of R&D Operations

Sheri joined Altaeros in January 2016 excited to jump into the start-up world. Sheri brings over twenty years of successful product development and engineering leadership experience having previously worked at GE, Bose and Hewlett-Packard. She now leads the research and development of Altaeros' technology, pushing the engineering team step by step towards commercialization. Sheri holds a Masters in Mechanical Engineering from Northeastern University and Bachelors in Mechanical Engineering from Tufts University.

- <http://www.altaiosenergies.com/company.html>

The Buoyant Airborne Turbine (BAT)

- The Altaeros BAT integrates proven aerospace and wind turbine technology. The BAT lifting platform is adapted from tethered aerostats, which have reliably lifted heavy communications and monitoring equipment high into the air for decades. The Altaeros BAT integrates four main components:
 - **Shell** - A proprietary helium-filled shell made from high performance, industrial fabrics that lifts the turbine up and stabilizes it in the air.
 - **Turbine** - A lightweight conventional three-blade, horizontal axis wind turbine fixed within the shell.
 - **Tethers** – The lightweight, high strength tethers hold the turbine in place in all weather conditions and transmit power to the ground.
 - **Ground Station** - The portable ground station is rapidly deployed from a shipping container and includes an autonomous control system and power conditioning equipment.

Funding

- Altaeros Energies has received funding towards wind turbine technology development from a number of sources, including the U.S. Department of Agriculture, the National Science Foundation, the California Energy Commission, the Maine Technology Institute, the Massachusetts Clean Energy Center, Cleantech Innovations New England, and the Alaska Energy Authority.
- In addition, Altaeros Energies received the 2011 ConocoPhillips Energy Prize.
- This material is based upon work supported by
 - the National Institute of Food and Agriculture,
 - U.S. Department of Agriculture, under Agreement No. 2012-33610-20169 of the Small Business Innovation Research Grants Program; and
 - by the National Science Foundation under Grant No. 1248528.

BAT

- Tethered blimp style wind energy generator
 - <http://tech.co/highest-wind-turbine-altaeros-energies-2014-03>
 - http://www.altaerosenergies.com/pressrelease_2012_03.html
- Material on CNN.com
 - <http://www.cnn.com/interactive/2014/06/tech/cnn10-inventions/>



MIT Grads to Test World's First Commercial Airborne Wind Turbine

- By Kent Harrington; June 10th, 2014
- <http://chenected.aiche.org/energy/mit-grads-to-test-worlds-first-commercial-airborne-wind-turbine/>
- “After landing a cool \$1.3 million from the state of Alaska to test their new airborne wind turbine, Ben Glass and Adam Rein, the young co-founders of Altaeros Energies, became the latest poster boys representing MIT’s reputation for pumping out useful innovation. Four years ago, when the two graduated from MIT, it was obvious how much they’d had been shaped by the university’s entrepreneurial DNA. They could have walked into GE and swapped their diplomas for jobs, but they’d already built their own rival technology.”
- “They also had a fully tweaked **elevator pitch** and a **smart business plan** (again, courtesy of MIT), that opened a lot of angel investors’ doors, where they bagged vital seed money.””

Plundering blimp technology

- *The two partners made the most of their cash-burn by quickly scaling up a prototype. In 2012, at a frigid, snowbound Air Force base in Maine (anticipating future deployments), their Buoyant Air Turbine or BAT, named after the helium-filled shell that floats high above the ground, harnessed the powerful winds at 300 feet and produced far more energy than similar turbines on the ground. Then last August, it was successfully tested again at 500 feet, in stronger 45-mph winds.*
- *And thanks to a savvy company promo that went viral on YouTube, hundreds of thousands of fans are now rooting for their turbine's success.*
- *Although the silver-sheathed turbine may look exotic, Glass and Rein know that conservative utilities can take years before green-lighting infrastructure projects, so rather than going for “a moon shot,” Mr. Rein told the New York Times, “what we really tried was the safe shot.” With that in mind, they ransacked the blimp industry for time-tested technology and then transformed it into an advanced, software and sensor-driven aerostat platform.*

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- *Deployed in just 24 hours*
 - *Saving time and money: call it pop-up infrastructure. Since the BAT is inflated on site, eliminating costly cranes, cement foundations and steel towers, it can be deployed in under 24 hours. A deflated BAT is also easily packed into two mid-sized shipping containers and transported anywhere in the world, where it's re-inflated and launched into the air.*
 - *Once aloft, three tethers connect the BAT to a rotating ground station, from which it operates almost autonomously. As power travels down a tether to the ground station, on-board anemometers can detect wind speeds and adjust the craft's optimal altitude and direction. The BAT can also self-dock during emergencies like rough weather or a broken tether.*

Heading off-grid

- *From the beginning, Altaeros targeted a small niche far off the grid: villages, islands, mines, or disaster zones that rely on expensive diesel power. And prime real estate would be anywhere a traditional turbine can't be delivered or constructed.*
- *Altaeros' ability to reduce operating costs, particularly for Alaska, said Alan Baldivieso, program manager for emerging energy at the Alaska Energy Authority, "makes this type of deployment very attractive." The authority awarded Altaeros the grant from its Emerging Energy Technology Fund because fuel is so expensive in parts of Alaska.*
- *As Glass and Rein prepare their 30 kilowatt BAT for its 18 month commercial demonstration, where it will fly 1,000 feet above the ground, they say it will provide power to 12 homes for \$0.18 per kilowatt-hour, about half the normal price of off-grid electricity in Alaska.*
- *Altaeros wants to show that their turbine is less costly than the Northern Power Systems 100, a popular, 100Kw turbine built for cold, harsh climates, which has replaced many diesel generators in Alaska. While supplying power to 25 to 30 homes, the NPS 100 "Arctic Model" is capable of operating in conditions as low as -40C. (NPS company demo video) This could be a formidable challenge for Altaeros, since their turbine is always described as "conventional."*

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- *According to the Alaska Village Electric Cooperative (AVEC), a nonprofit electric utility serving 54 communities in Western and Interior Alaska, many small towns have used three of the 100-kilowatt turbines to generate up to 20 percent of their power needs. Since Altaeros has said their BAT design will be scaled up and hopes to have a 100-kilowatt model available in a couple of years, utilities in Alaska want to test its potential.*
 - *But the BAT promises extra services that could make it more useful than the NPS 100. Glass told Technology Review, it can lift additional “payloads,” like weather monitoring and surveillance equipment. He thinks that the most useful addition is Wi-Fi: “If you can put a Wi-Fi unit up outside the village, you’re much higher than you’d get with a traditional tower. That would allow you to cover six to eight times the area you would with a tower.”*

Designed during free time at MIT

- *Glass has been working on BAT since he was an undergrad, finally working out the basics while finishing his master's degree in aeronautics. He designed the BAT in his free time, starting from the premise that typical towers couldn't reach powerful winds blowing high above the ground.*
- *Then he brought his concept to Energy Ventures, a class at the MIT's Sloan School of Management where engineering and business students collaborate on startups for clean tech ideas. That's where he met Adam Rein, a teacher's assistant and an MBA student. Rein helped him develop the company's initial business model.*
- *Today, the company's headquarters in Greentown Labs, a clean-tech incubator cofounded by Rein, is crazy with last-minute activity. To prepare for the Alaska trial, a small group of employees are doing extra computer modeling as they enhance algorithms. Soon they'll be packing the BAT and shipping it off to withstand the harsh Alaskan winter during its most important test.*

MIT's real world experience

- *As wrap-up activity buzzes around him, Glass sees that his undergraduate years on MIT's Solar Electrical Vehicle Team, where he built and raced solar cars, equipped him the skills to bring the BAT from concept to reality. "Just being able to see a project from the design stage through building, testing, and operating was valuable," he told Technology Review. It's obviously helped him to lead the technical team at Altaeros to refine a new energy tool that might have an impact on the real world.*
 - <http://chenected.aiche.org/energy/mit-grads-to-test-worlds-first-commercial-airborne-wind-turbine/>

Mitsubishi invests in Altaeros

- <https://www.bloomberg.com/news/articles/2015-08-27/mitsubishi-heavy-invests-in-altaeros-airborne-wind-technology>
- Japan's Mitsubishi Heavy Industries Ltd. and Oman-based Suhail Bahwan Group have invested in Altaeros Energies Inc., a U.S. company developing airborne wind turbines, the companies said in a statement Thursday.
- The move follows the December announcement by Japanese telecommunications company SoftBank Group Corp. that it planned to invest \$7 million in Altaeros.

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- Generating power, 600m up in the air; Anmar Frangoul ; Special to CNBC.com; Wednesday, 22 Jul 2015
 - *"There's a whole bunch of different applications for it," Glass said. "One of the most exciting ones is if you look at rural areas – especially in developing markets – [where] the incumbent sources of electricity are very expensive, very dirty diesel generators."*

– <http://www.cnbc.com/2015/07/22/generating-power-600m-up-in-the-air.html>