

Biography of Jay Whitacre **Chief Technology Officer, Aquion Energy**

Dr. Jay Whitacre was raised in Westerville, Ohio, and from a young age was technically inclined: he was an avid computer programming by age 9 (in 1981), scored a near perfect 39/40 at the Ohio State Science Fair at age 12, and won various awards in high school for achievements in Science and Engineering. He attended Oberlin College, where he graduated in 1994 with Honors in Physics and a Minor in Philosophy. While at Oberlin, he completed a year-long independent research project studying thin film solid-state PV solar cells – an experience that cemented his lifelong interest in clean energy technologies. He earned his Masters (1997) and Ph.D. (1999) in Materials Science and Engineering from the University of Michigan where he continued his work on thin-film solid state materials and devices, spending a significant amount time performing research at the Stanford Synchrotron Radiation Laboratory, where he used high resolution x-ray scattering techniques to characterize thin film interface and surface properties.

Whitacre parlayed this work into a Postdoctoral Scholar position at Caltech to study and develop thin film solid-state electrochemically functional materials and devices (in collaboration with researchers at the Jet Propulsion Laboratory). A year later, he was hired as a full time member of the technical staff at JPL and spent the next 6 years exploring a wide array of functional materials, devices, and systems for power/energy applications. Early successes included the discovery of a low-temperature processing route for producing highly functional crystallographically oriented electrode structures. The paper describing this work won Whitacre the Electrochemical Society's Norman Hackerman Young Author award (judged to be the best paper published in the Journal of the Electrochemical Society by an author under 30). An extension of the results described in this paper led to several patents and the creation of the smallest “on-chip” solid-state Li-ion batteries and battery arrays ever produced.

As Whitacre became more accomplished in the field of electrochemically functional materials, he expanded his research to cover fuel cell catalysis, nanostructured electrode powders for Li-ion batteries, thermoelectric materials, large format batteries for aerospace applications, and high capacity fluorinated carbon electrode materials. At age 32, he was promoted to the “Senior” Level at JPL and was trained as a power systems engineer by the in-house concurrent engineering design team known as Team X. This experience greatly expanded his appreciation for the technology selection and implementation process and also galvanized his desire to focus on energy-related research topics that can have a significant impact at the systems level. While at JPL, Whitacre was the primary author of 3 US patents, over 10 provisional patents, Author or Co-Author on 25 Peer-Review Publications, and was listed as an inventor on 12 new technology/invention disclosures (that were published in “NASA Tech Briefs”). He won 3 NASA Space Act awards (2002 – 2004) for innovation and invention. In 2005, Whitacre was chosen to be the Cognizant Engineer for the Mars Science Laboratory Decent Stage energy storage sub-system, a task that included oversight, design, and the early stages of implementation of a thermal battery-based system that flawlessly powered the critical 20-minute Entry Decent and Landing phase of Curiosity's mission in August 2012.

In 2007, Dr. Whitacre accepted a joint appointment at Carnegie Mellon University in the departments of Materials Science & Engineering and Engineering & Public Policy. Since then,

he has established himself as an international leader in the field of large-scale energy storage devices and systems (for vehicles as well as stationary applications) by examining key problems from both fundamental materials as well as systems/economic/policy perspectives. He has developed a broad research group where lab work is conducted in concert with policy techno-economic analyses to justify work and assess the impact of various results.

Whitacre's technology policy-related projects include a study of the performance of Li-ion batteries as used in urban driving environments, with an emphasis on understanding the economics of performance degradation in the context of battery pack sizing and pricing decisions. His Materials Science research has been focused on understanding and exploiting functional ceramics and metallic alloys for energy storage and conversion. Generally speaking, his is focused not on a collection or classification of material types (as is academically traditional in the MSE field), and instead is more inclined towards a family of physical phenomena and engineering principles related by functionality, application, and policy.

Whitacre's research into ultra low cost neutral pH aqueous electrolyte energy storage functional materials and devices, which started in 2007, has led to 7 granted United States Patents, multiple granted international patents, with more than 20 more applications under various stages of examination. The novelty and potential impact of this work allowed Whitacre to raise significant funding from the venture capital community, starting with an investment from Kleiner Perkins Caulfield and Byers in 2008, that led to the founding of a company initially named "44Tech". The company spun out of CMU in January 2010 as Aquion Energy, and has been growing rapidly ever since. From June 2008 to April 2011 Aquion did not have a full-time CEO; as such, Whitacre (as Founder and CTO), was the highest-ranking company officer and was largely responsible for successfully shepherding the technology first demonstrated in his labs through the early phases of development to the point where scaled manufacturing of a product was considered viable. During these years, Whitacre took multiple semesters of leave without pay from Carnegie Mellon while still maintaining his research group there.

He is an unusually interdisciplinary researcher with demonstrated strengths in different but related disciplines, and as such is at the forefront of the "sustainable energy technology" field. Communicating with academic, policy, and industrial communities has involved invitations to speak at venues ranging from technical conferences (including keynote addresses and invited presentations at Gordon Research Conferences), to delivering a TEDx talk, to speaking at the Aspen Institute Summer Ideas Festival (2013), the Toyota Sustainability Conference (2011), and Harvard Business School (an HBS case study on Aquion Energy was written in 2011 and is taught frequently). Whitacre has won numerous awards, including a CMU early achievement award (2009), the endowed Elia Development Chair (2010), and also recently won the 2014 Carnegie Science Award for Advanced Materials, and the 2014 Resnick Institute "Resonate" award for Achievement in Sustainability Sciences. In May of 2014, Fortune Magazine listed Whitacre as one of the top 25 Eco Innovators in the world (#19), along with Elon Musk, James Cameron, and the founders/CEO's of various large global energy technology companies (<http://fortune.com/2014/05/01/the-worlds-top-25-eco-innovators/>). Aquion Energy has also won many awards and has been listed in the MIT Technology Review's annual "50 Most Innovative Companies" in both 2013 and 2014. Beyond these high-profile honors, multiple other awards have been bestowed on both Whitacre and Aquion. Along with receiving funding from Bill Gates (\$10 Million in 2013), Whitacre was also

selected to sit on an small energy advisory committee, which culminated in a 6-person round table day-long sessions with Mr. Gates in 2014.