Video: 'Terawatt challenge' seeks game changers in photovoltaics

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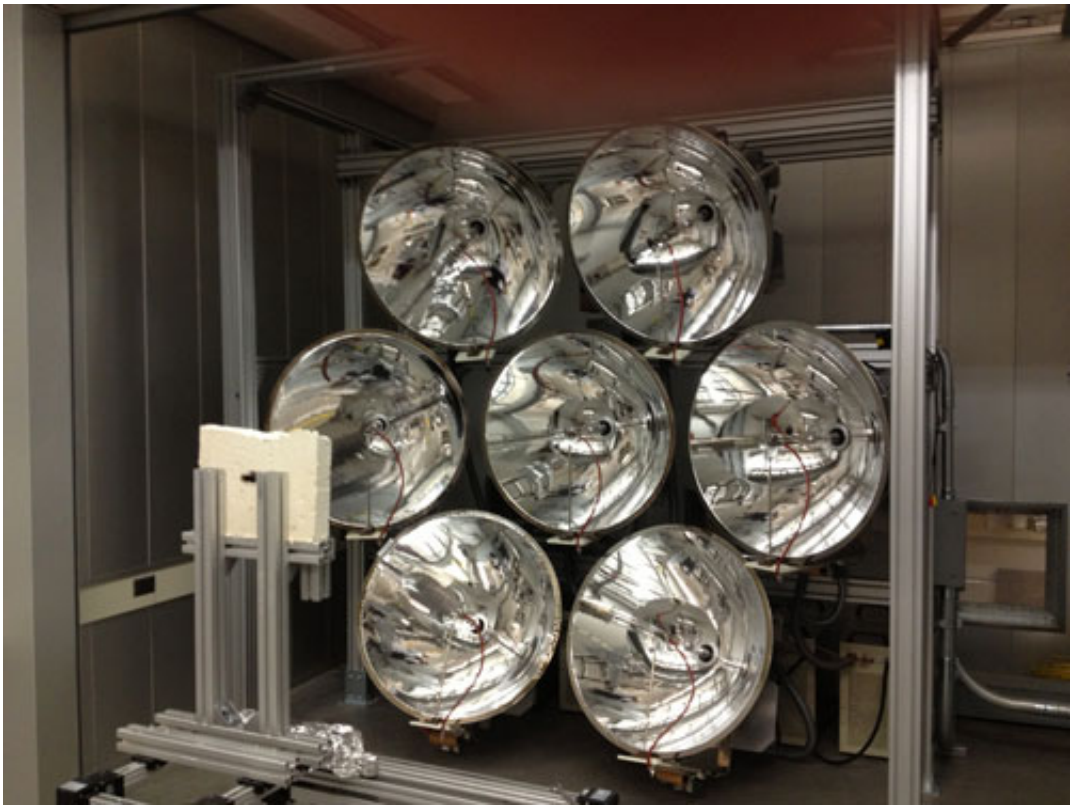
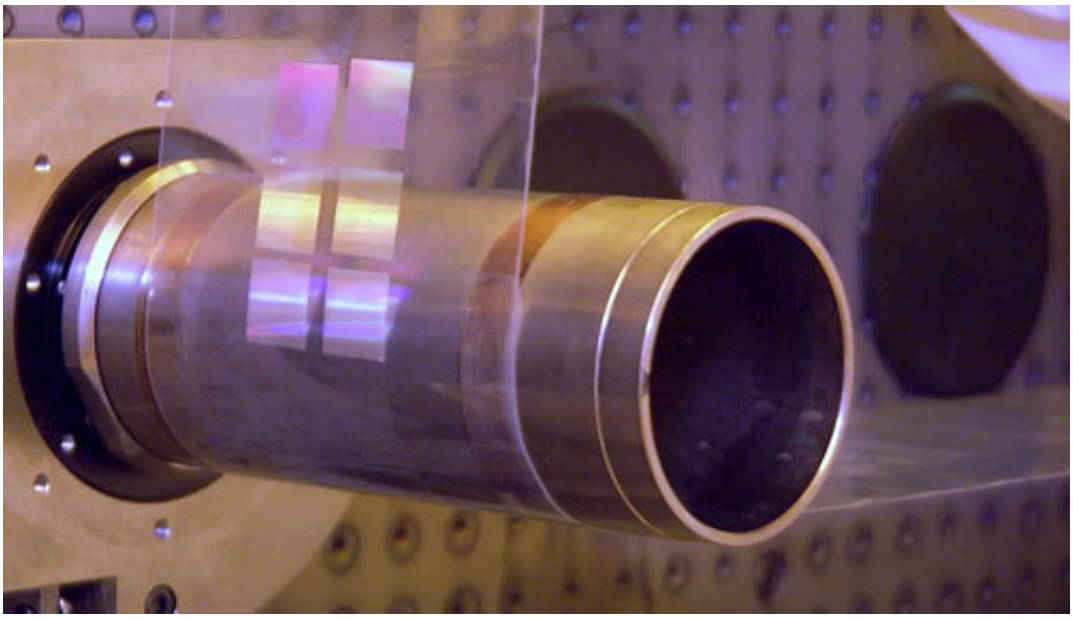


With support from NSF's Office of Emerging Frontiers in Research and Innovation, California Institute of Technology (Caltech) chemical engineer Sossina Haile and University of Minnesota mechanical engineer Jane Davidson are working to expand the nation's renewable energy storage capacity. Their mission is to put the heat of the sun to work creating renewable fuels from sources that don't need to be drilled out of the ground. The researchers are collecting sunlight to drive chemical reactions that break apart water and carbon dioxide molecules in order to make alternative fuels, such as hydrogen fuel. Solar-powered fuels, or "sun gas," would power the vehicles we drive today. "One of the real advantages of solar fuels is that it still powers the same cars that

we drive today," Davidson says. "You can use it for long-distance trucks. You can make fuels for airplanes. You pull up to the gas station and you can get exactly the same product, but made from sunlight, water and CO2." Credit: Science Nation, National Science Foundation

Modern society is very much defined by its access to electricity. What if researchers could advance sustainable energy technologies to the point where everyone around the world had access to clean, cheap energy sources? Richard Smalley, 1996 Nobel Prize winning chemist, called it the greatest challenge facing the world in the 21st century and coined the phrase 'terawatt challenge.'

Researchers at the Quantum Energy and Sustainable Solar Technologies (QESST) Center are hoping to meet much of the terawatt challenge with solar technology alone by vastly improving the performance of photovoltaic cells. QESST is an engineering research center supported by the National Science Foundation (NSF) and the Department of Energy. Nearly a dozen universities participate in the center's research. The center's headquarters are at Arizona State University.



There's no shortage of ideas about how to use nanotechnology, but one of the major hurdles is how to manufacture some of the new products on a large scale. With NSF support, University of Massachusetts (UMass) Amherst chemical engineer Jim Watkins and his team are working to make nanotechnology more practical for industrial-scale manufacturing. One of the projects they're working on at the NSF Center for Hierarchical Manufacturing (CHM) is a roll-to-roll process for nanotechnology that is similar to what is used in traditional manufacturing. They're also designing a process to manufacture printable coatings that improve the way solar panels absorb and direct light. They're even investigating the use of self-assembling nanoscale products that could have applications for many industries. The center creates fabrication tools that are enabling versatile and high-rate continuous processes for the manufacture of nanostructures that are systematically integrated into higher order structures using bottom-up and top-down techniques. Credit: Science Nation, National Science Foundation

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