The University of California Advanced Solar Technologies Institute (UC Solar)

Research—Innovation—Education

UC DAVIS UNIVERSITY OF CALIFORNIA
Cal
UC MERCED
UCSB
UC San Diego
UC RIVERSIDE
UC SANTA CRUZ
UC IRVINE
UCLA

UC Solar Mission Statement

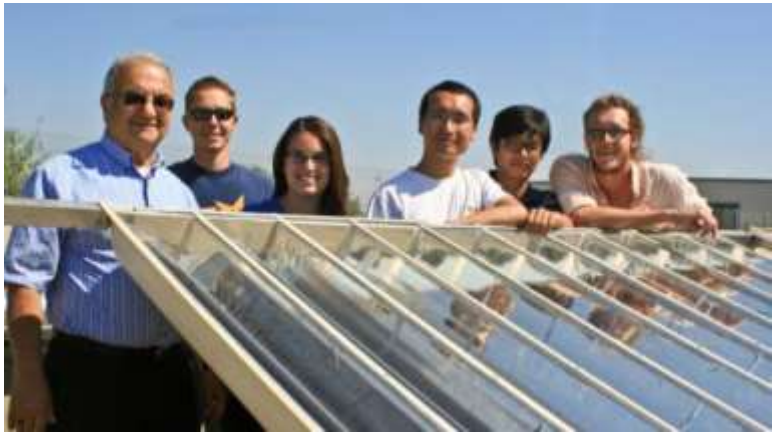
UC Solar creates technologies that make solar energy systems more efficient, more affordable, and easier to integrate. In addition, UC solar educates and develops tomorrow's solar energy leaders and entrepreneurs.

UC Solar Overview

- UC Solar is a multidisciplinary research institute that was established in 2010 by the UC Office of the President
- It is made up of faculty and students from the University of California Merced, Berkeley, Santa Barbara, Davis, San Diego, Riverside, Irvine, Santa Cruz and Los Angeles
- The institute's faculty members include mechanical engineers, materials scientists, environmental engineers, physicists, chemists, computer scientists and economists
- UC Solar is led by UC Merced Professor Roland Winston
- Research projects are funded by government, corporate and foundation grants and private philanthropy

UC Solar Overview

- UC Solar faculty are leaders in their fields with long track records of research and development success
- The emphasis is on "applied" research—projects that can be brought to market quickly and efficiently
- UC Solar is a vital component of a solar R&D continuum that is essential to California's economic future
  - *Education (UC Solar)*
  - *Research (UC Solar)*
  - *Innovation (UC Solar)*
  - Product development
  - Commercialization
  - Widespread adoption



UCMERCED

Roland Winston
Director, UC Solar
Distinguished Professor
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Gerardo Diaz
Co-Director, UC Solar
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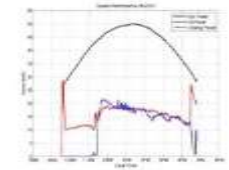
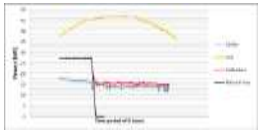
- Designing, developing, testing and demonstrating concentrating photovoltaic and solar thermal systems






Constance Chang-Hasnain
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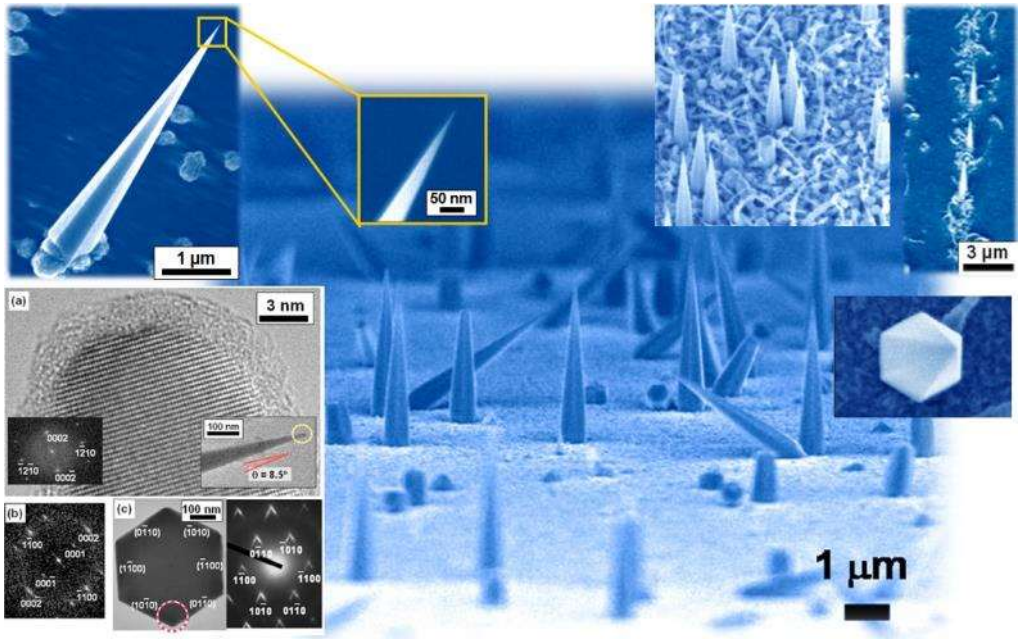
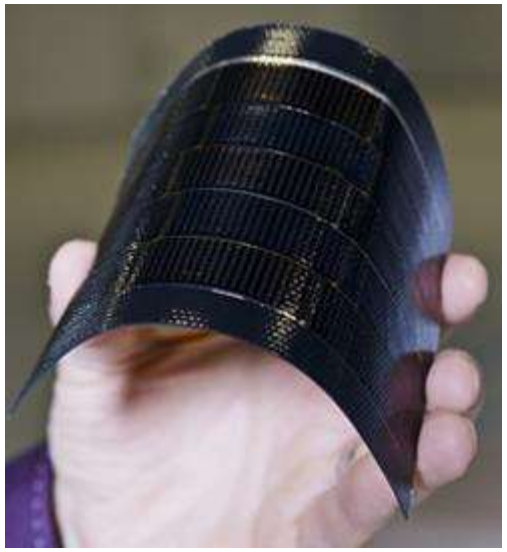
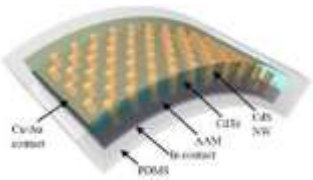
- Focusing on achieving very high-efficiency solar cells using nanoneedles, nanowires and quantum dots
- Developing high performance thin film solar cells








Umesh Mishra
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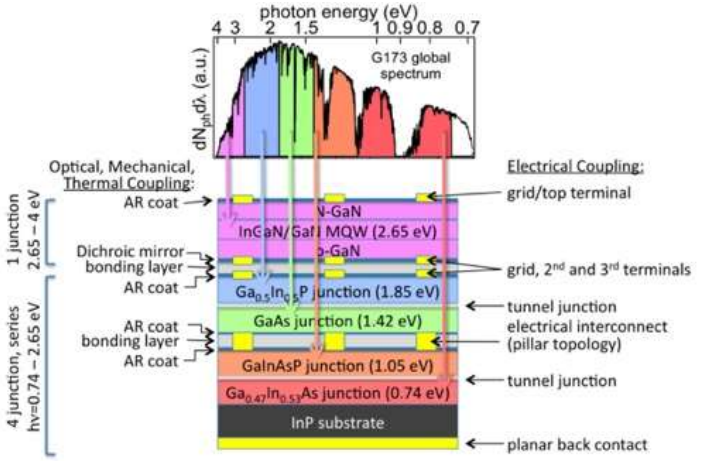
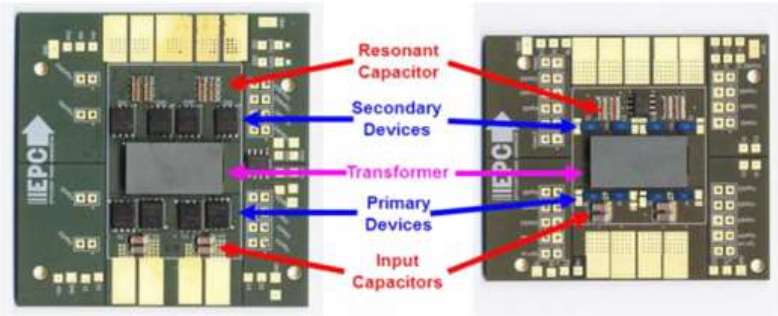
- Developing materials to harness power in the ultraviolet portion of the solar spectrum
- Designing enhanced GaN power conversion technologies





UCDAVIS
UNIVERSITY OF CALIFORNIA

Pieter Stroeve
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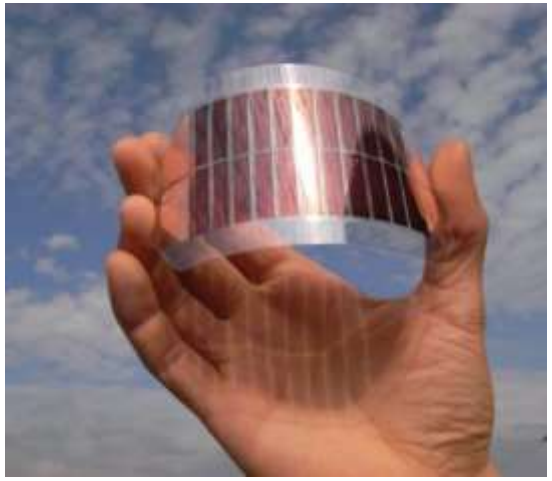
- Using organic materials to create new photovoltaic cells and to develop sunlight-to-electricity processes
- Developing solar energy solutions for agriculture



UC San Diego

Deli Wang
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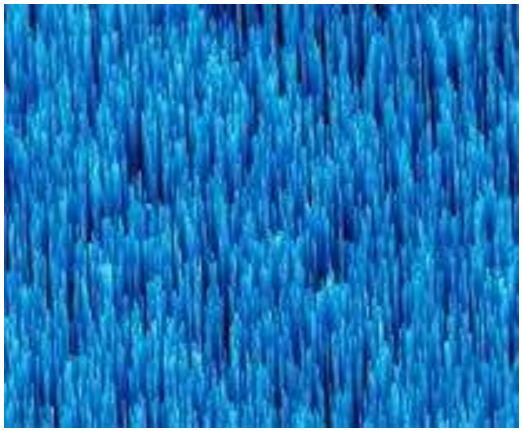
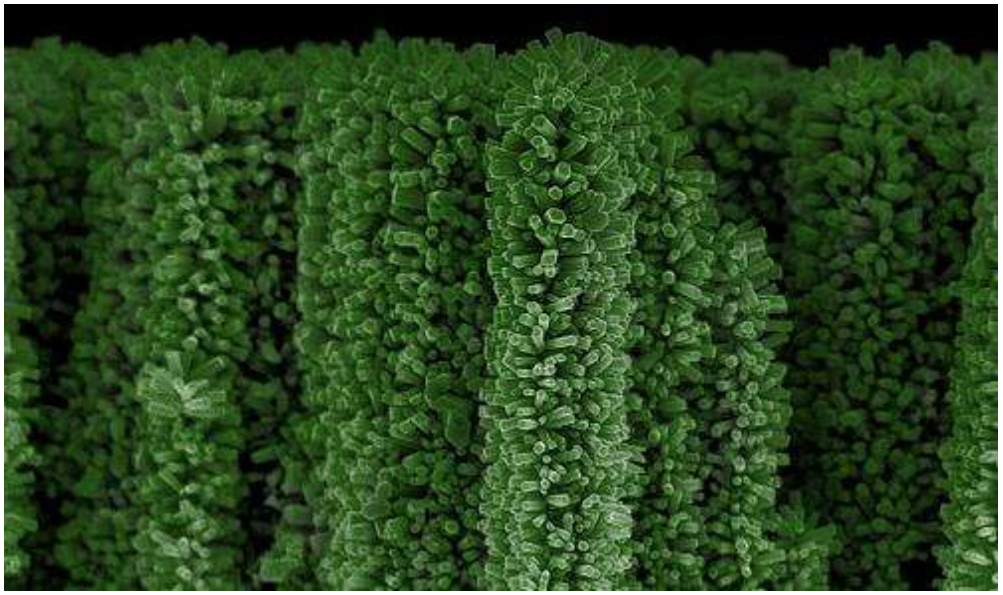
- Using new nanomaterials to develop wide spectrum solar cells and solar fuel conversion technologies





UC RIVERSIDE UNIVERSITY OF CALIFORNIA

Alfredo Martinez-Morales
Co-Director, UC Solar
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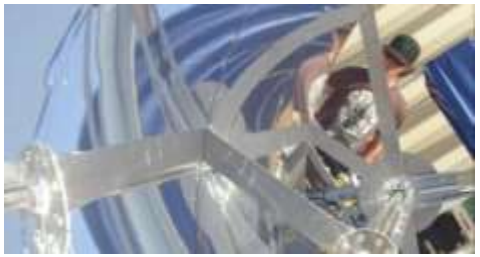
- Developing high-performance solar cells and enhanced storage technologies
- Designing and demonstrating grid integration technologies



UCIRVINE

Reginald Penner
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Professor
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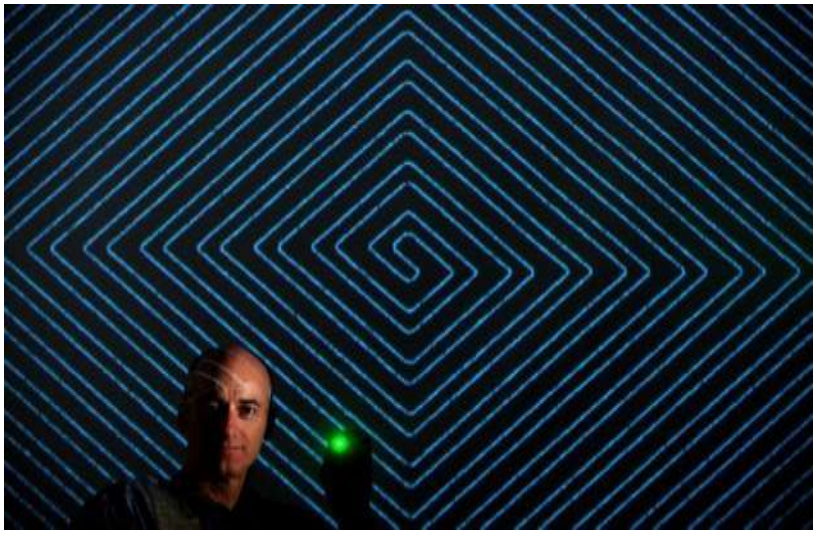
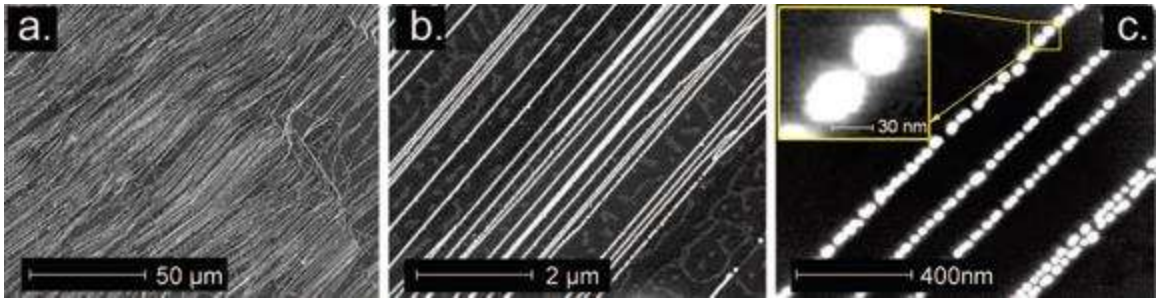
- Developing low-cost solar cells, thermoelectric devices, water splitting for chemical fuel production, and enabling technologies





UC SANTA CRUZ

Michael Isaacson
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- Developing new materials for solar energy conversion and designing intelligent infrastructure solutions for energy system control and management


Yang Yang
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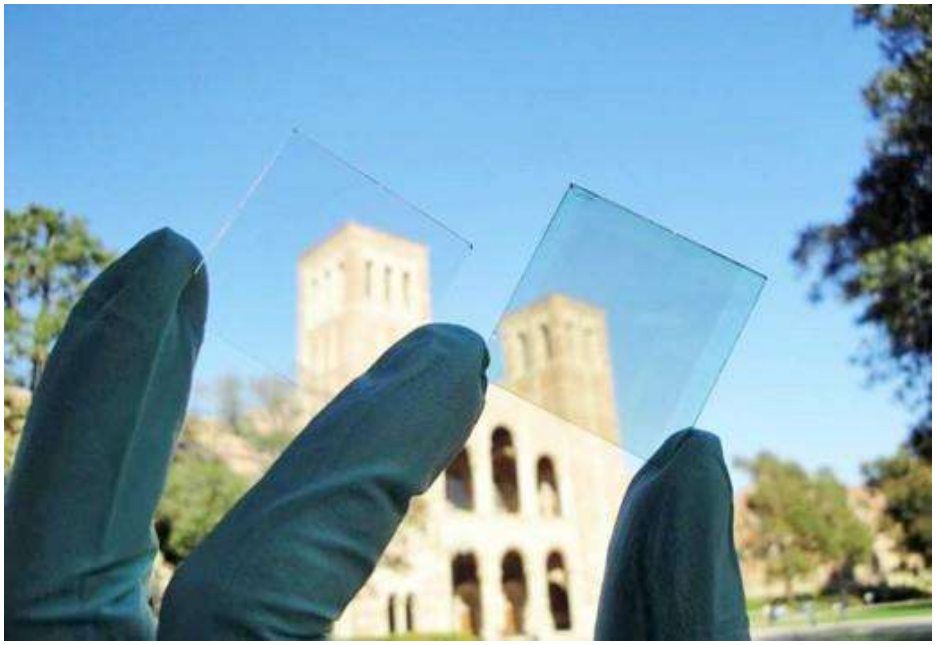
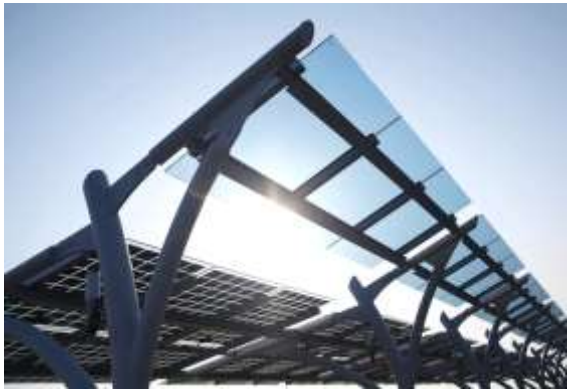
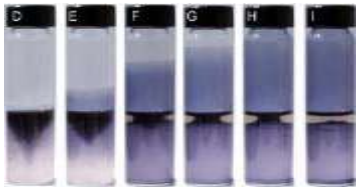
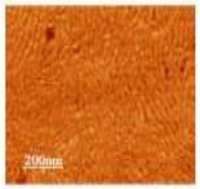
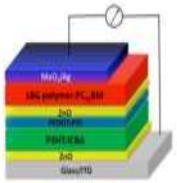
- Developing solution process solar cells using polymers and other inorganic substances





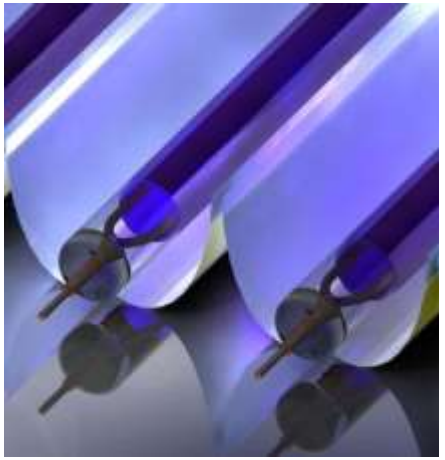






Highlight Project—XCPC

- In 2011, UC Merced introduced the External Compound Parabolic Concentrator (XCPC) for industrial process heat
- XCPC features include:
  - Fixed, non-tracking design
  - High thermal efficiency to 200C
  - Installation flexibility (lightweight)
  - Performs well on diffuse (hazy) days
  - Can utilize water or heat transfer fluid



- Displaces fossil fuel and reduces GHG emissions
- Targets commercial applications such as double-effect absorption cooling, boiler preheating, dehydration, sterilization, desalination and steam extraction

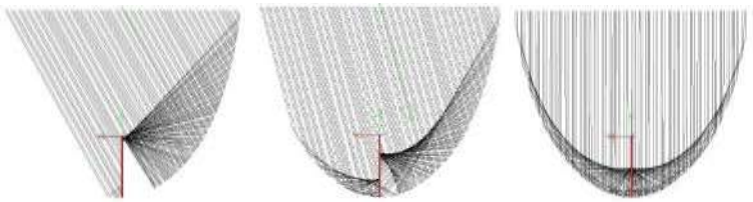
Highlight Project—XCPC

- For the past three summers, the XCPC has been powering the UC Merced Solar Cooling Demonstration Project
  - 160 north/south XCPCs
  - 50 sqm aperture area producing 19 kWh at >175ºC
  - 6.5-ton Broad double-effect absorption chiller
  - Direct solar-powered cooling for six hours per day (plus two hours extended cooling)

- XCPC demonstration systems have now been installed in the U.S. (GTI, Purdue, NASA Ames), India, Mongolia and Dubai

Highlight Project—ICPC

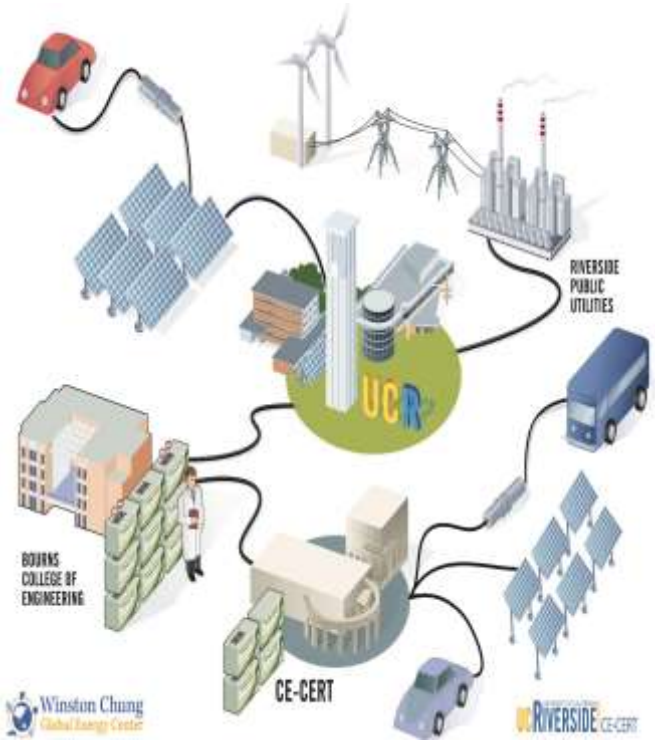
- Researchers at UC Merced have designed and patented the next-generation non-tracking solar thermal collector—the Internal Compound Parabolic Concentrator (ICPC)
- The ICPC combines the thermal receiver and the non-imaging concentrator into a single vacuum tube, leading to:
  - Lower cost
  - Lighter weight
  - Increased thermal efficiency



- Research and development are ongoing, and UC Solar is seeking project sponsors and technology licensees

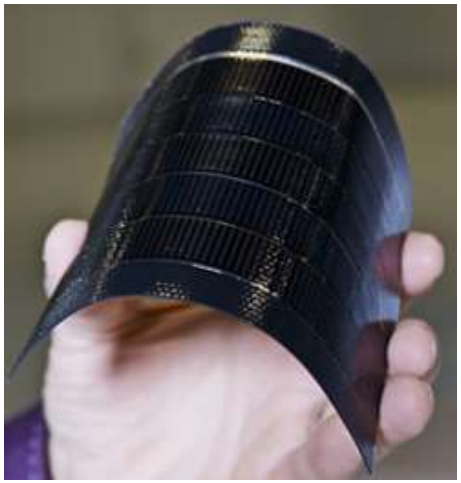
Highlight Project—Integrated Grid

- UC Riverside is launching an initiative that integrates utility scale renewable energy, energy storage, EV charging and smart grid controls
- Project objectives include:
  - Demonstrating the functionality of smart grid protocols
  - Providing EV charging demand without increased grid loads
  - Providing a real world smart grid test-bed platform
  - Evaluating the efficiency of energy storage
  - Evaluating power quality



Highlight Project—GaAs Solar Cells

- UC Berkeley's Eli Yablonovitch has developed a method for manufacturing ultrathin GaAs solar cells
- These flexible cells recently set the NREL efficiency record for solar cells—verified at 23.5%
- GaAs performs well
  - At high temperature
  - In low light
- Cells are about one micron thick
  - Greatly reducing GaAs material
  - Lowering system LCOE



The UC Solar Operating Model

- Assemble a multi-campus, multidisciplinary team of faculty with a broad range of solar technology expertise
- Partner with industry to identify technical barriers and conduct research that reduces and/or removes those barriers
- Envision and create a new generation of solar technologies, and develop and license these technologies
- Educate future workers and entrepreneurs
- Provide unbiased feedback to sponsors, state agencies, venture capitalists, and other solar energy stakeholders
- Be self-sustaining through research grants, philanthropic gifts and corporate sponsors

Institute Funding Opportunities

- Industry Consortium membership fees
- Large multidisciplinary research grants (UC Merced and multi-campus)
- Institute/center level grants (e.g., DOE Innovation Hubs)
- Institute naming gift
- Foundation support (e.g., The Energy Foundation)
- Corporate research grants

Current UC Solar Sponsors

UC Solar Industry Partners

- The UC Solar Industry Consortium enables collaboration with industry and helps ensure that innovations can be brought to market quickly and efficiently
- UC Solar Consortium Members (or “Sponsors”) pay a modest annual fee to:
  - Partner with some of the UC’s finest scientific minds and the solar industry’s most progressive companies
  - Participate in research projects and receive advance knowledge of scientific breakthroughs and new inventions
  - Work closely with students and postdoctoral researchers
  - Influence the solar research and education agenda at the world’s leading research university

UC Solar Objectives

- Establish the UC as a global leader in solar energy research and development
- Educate tomorrow's solar energy leaders and entrepreneurs
- Align UC Solar and its Sponsor and Affiliate organizations with the core domestic challenge of the 21st century—energy independence
- Be the hub of the "Solar Valley"

Contact Us

- For more information regarding UC Solar, please visit the UC Solar website at: www.UCSolar.org
- Or, contact:

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