Energy Research
For more than a decade, UNLV researchers have engaged in world-class efforts to study various aspects of renewable energy. This research program has received funding by federal and state agencies, as well as many industrial partners. Our researchers have addressed questions related to many topics, including solar and wind energies, nuclear energy, fuel cells and “smart grid” technology.

We would like to introduce you to some of our researchers. Please contact us if we can help with future collaboration.

Dr. Rama Venkat
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Dr. Mohamed Trabia
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Rendering on slide 1: Mojave Bloom, UNLV’s entry into the 2020 U.S. DoE Solar Decathlon, won third place overall, with first place wins in the operations and presentation contests.
Energy Research Areas of Expertise

- Electric power systems and power quality and static power converters
- Nanostructured light-absorbing coatings for advanced Concentrating Solar Power
- Design of grid-tied and standalone photovoltaic (PV) systems
- Solar-powered atmospheric water harvesting
- Game theoretic approaches for energy networks
- Demand-side management
- Digital twins
- Hybrid electric vehicles and battery charging systems
- Third generation dye-sensitized solar cells
- Flow studies for solid particle solar receivers
- Photocatalysts for solar energy conversion
- Soft polymeric materials for efficient heat and mass transfer
- Corrosion modeling
- High temperature heat exchanger and decomposer design
- Molten salt properties and storage vessel design
- Reactor physics
Energy Research

Why UNLV?

• UNLV is a leader among the state’s public entities dedicated to advancing renewable energy in the region and beyond.

• UNLV is located centrally in the southwest, close to many renewable energy resources including solar, wind, and geothermal energies.

• UNLV has been the host site of the *National Clean Energy Summit*, as well as other important international meetings.

• UNLV is now considered a convening center for renewable energy leaders throughout the nation and world.
Energy Research

Why UNLV?

- UNLV’s outstanding achievements in renewable energy research, its success in forging public/private partnerships, and its excellent academic programs place the university at the forefront of the field.
- UNLV has acquired more than $99 million in research funding in the past decade on wide-ranging subjects in the clean energy area, including:
  - Solar and geothermal power;
  - Biofuels;
  - Photonics;
  - Nuclear energy and the reprocessing of nuclear waste; and
  - Hydrogen production, storage, and use.
Faculty Involved in Energy Research

Dr. Yahia Baghzouz
Professor, Department of Electrical and Computer Engineering
Co-Director, Center for Energy Research

Dr. Alexander Barzilov
Professor, Department of Mechanical Engineering

Dr. Wolfgang Bein
Professor, Department of Computer Science
Co-Director, Center for Information Technology and Algorithms

Dr. Yi-Tung Chen
Chair & Professor, Department of Mechanical Engineering
Co-Director, Center for Energy Research

Dr. Heejin Cho
Professor, Department of Mechanical Engineering

Dr. Jeremy Cho
Assistant Professor, Department of Mechanical Engineering

Dr. Jaeyun Moon
Associate Professor, Department of Mechanical Engineering

Dr. Samir Moujaes, P.E.
Professor, Department of Mechanical Engineering

Dr. Vince Wang
Assistant Professor, Department of Mechanical Engineering

Dr. Hui Zhao
Professor, Department of Mechanical Engineering
Energy Research Highlights
Dr. Yahia Baghzouz
Professor, Department of Electrical and Computer Engineering
Co-Director, Center for Energy Research
Phone: (702) 895-0887
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- Expertise
  - Electric power systems, power quality, and static power converters
  - Design of grid-tied and standalone photovoltaic (PV) systems
  - Impact of partial shading on PV array performance
  - Impact of distributed generation in electrical distribution systems
  - Hybrid electric vehicles and battery charging systems
  - Demand-side management
  - Smart Grid concepts

Determining voltage quality through computer simulations.

Testing bifacial PV panel to search for an accurate electrical circuit model.
Dr. Yahia Baghzouz
Professor, Department of Electrical and Computer Engineering
Co-Director, Center for Energy Research

Relevant Publications


• C. Hicks and Y. Baghzouz, “Experimental Steady-State and Transient Analysis of a Behind-The-Meter Battery Storage for Residential Customers with PV Systems”, IEEE International Conference on Clean Electric Power, Otranto, Italy, July 2-5, 2019. art. no. 8890193, pp. 438-443.


Dr. Alexander Barzilov
Professor, Department of Mechanical Engineering
Phone: (702) 895-4325
Email: alexander.barzilov@unlv.edu

• Expertise
  • Clean energy generation using nuclear power plants
  • Nuclear energy
  • Multiphysics modeling of nuclear systems
  • Liquid metal cooled fast reactors
  • Molten salt reactors
  • Small modular reactors
  • Nuclear power plant monitoring
  • Nuclear fuel cycle and waste management
  • Nuclear safeguards
  • Digital Twins
Dr. Alexander Barzilov  
Professor, Department of Mechanical Engineering

Relevant Publications

Dr. Wolfgang Bein
Professor, Department of Computer Science
Co-Director, Center for Information Technology and Algorithms (CITA)

Phone: (702) 895-1477
Email: wolfgang.bein@unlv.edu

- Expertise
  - Speed scaling scheduling for CPUs
  - Online energy management: manage variables, distributed and unpredictable supply from renewables
  - Game theoretic approaches for energy networks

Above: Algorithm designs for the Smart Grid
Below: Dependable renewable energy distribution
Dr. Wolfgang Bein
Professor, Department of Computer Science
Co-Director, Center for Information Technology and Algorithms (CITA)

Relevant Publications

• Bein W. “Energy Saving in Data Centers”. Electronics (2018); 7(1):5.
Dr. Yi-Tung Chen
Chair & Professor, Department of Mechanical Engineering
Co-Director, Center for Energy Research
Phone: (702) 895-1202
Email: yitung.chen@unlv.edu

- Expertise
  - Computational fluid dynamics
  - Numerical heat and mass transfer related to thermal system design
  - Renewable energy
  - High temperature heat exchanger and decomposer design
  - Corrosion modeling
  - Fuel cells (PEMFC and solid oxide fuel cell [SOFC])
Dr. Yi-Tung Chen  
Chair & Professor, Department of Mechanical Engineering  
Co-Director, Center for Energy Research  

Relevant Publications  
- Yang Han, Chaoxiang Zhao, Hao Bai, Yanjun Li, Jiayue Yang, Yitung Chen, Guo Hong, David Lacroix, and Mykola Isaiev, “Modulating thermal transport in porous carbon honeycomb by cutting and deformation techniques,” Physical Chemistry Chemical Physics, Vol. 24, (2022), pp. 3207-3215  
- Ting Ma, Yitung Chen, Aleksandr N. Pavlenko, and Qiuwang Wang, “Heat and mass transfer advances for energy conservation and pollution control in a renewable and sustainable energy transition,” Renewable and Sustainable Energy Reviews, 145, (2021), 111087, pp.1-3  
- Wenxiaoj Chu, Xionghui Li, Yitung Chen, Qiuwang Wang, and Ting Ma, “Experimental study on small scale printed circuit heat exchanger with zigzag channels,” Heat Transfer Engineering, 42(9), (2021), pp. 723-735
Dr. Heejin Cho  
Professor, Department of Mechanical Engineering  
Phone: (702) 895-1331  
Email: heejin.cho@unlv.edu

- Expertise
  - Energy system modeling and optimization
  - Advanced sensor and control system for energy systems
  - Net zero energy/carbon building design and optimization
  - Distributed and renewable energy systems
  - Combined heat and power (CHP) system
  - Heating, ventilation, and air-conditioning (HVAC) systems
  - Integrated & smart building system
  - Nuclear ventilation and passive cooling
Dr. Heejin Cho  
Professor, Department of Mechanical Engineering

Relevant Publications

Dr. Jeremy Cho
Assistant Professor, Department of Mechanical Engineering
Phone: (702) 895-4701
Email: jeremy.cho@unlv.edu

- Expertise
  - Liquid-vapor phase-change heat transfer for enhanced thermal management
  - Soft polymeric materials for efficient heat and mass transfer
  - Solar-powered atmospheric water harvesting
Dr. Jeremy Cho
Assistant Professor, Department of Mechanical Engineering

Relevant Publications

Dr. Jaeyun Moon
Associate Professor, Department of Mechanical Engineering
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Email: jaeyun.moon@unlv.edu
Website: http://jmoon.faculty.unlv.edu/

• Expertise
  • Thermoelectric nanomaterials and device fabrication
  • Nanostructured light-absorbing coatings for advanced Concentrating Solar Power (CSP)
  • Photocatalysts for solar energy conversion
  • Electrical and thermal properties of inorganic and hybrid (inorganic-organic) materials

Thermoelectric generators (TEGs) can directly convert heat energy to electricity.

Ivanpah Solar Electric Generating System and a schematic diagram of solar receivers.
Dr. Jaeyun Moon  
Associate Professor, Department of Mechanical Engineering

Relevant Publications


Patents

Dr. Samir Moujaes, P.E.
Professor, Department of Mechanical Engineering

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Email: samir.moujaes@unlv.edu

- Expertise
  - Phase studies for alternative fuels derived from coal
  - Flow studies for solid particle solar receivers
  - Computer simulation of thermosiphon-driven solar heaters
  - Two-phase and three-phase flow thermal hydraulics studies
  - Energy conservation and HVAC systems

Above left: A solid-particle receiver (SPR) gravity feed to heat particles for a high-temperature production facility, using concentrated solar energy.
Above right: Testing apparatus used at UNLV to characterize the heat exchanger suggested for high-temperature hydrogen production, using nuclear energy as the heat source.
Dr. Samir Moujaes, P.E.
Professor, Department of Mechanical Engineering

Relevant Publications

Dr. Vince (Meng-Jen) Wang
Assistant Professor, Department of Mechanical Engineering with Emphasis on Nuclear
Phone: 702-895-1331
Email: vince.wang@unlv.edu

• Expertise
  • Particle Transport Simulation and Method Development
  • Nuclear Reactor Core Design and Analysis
  • Radiation Shielding Analysis
  • Nuclear Reactor Operation

Neutron Radiography System

Reactor Pressure Vessel
Neutron Fluence Calculation

Spent Nuclear Fuel Cask Dose Rate Monitoring
Dr. Vince Wang
Assistant Professor, Department of Mechanical Engineering

Relevant Publications

Dr. Hui Zhao  
Professor, Department of Mechanical Engineering  
Phone: (702) 895-1463  
Email: hui.zhao@unlv.edu

• Expertise
  • Third-generation dye-sensitized solar cell  
  • Ionic-liquid-based energy storage technology  
  • Lab-on-a-chip technologies toward biomedical diagnostics and analysis

Applications of ionic-liquid electrochemical capacitors.

Third-generation nanocrystal-enhanced dye-sensitized solar cell.
Dr. Hui Zhao
Professor, Department of Mechanical Engineering

Relevant Publications


