Renewable 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, 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.
Renewable Energy
Research Areas of Expertise

- Electric power systems and power quality
- Solar power generation
- Design of grid-tied and standalone photovoltaic (PV) systems
- Power plant dry cooling
- Solar thermal applications: domestic hot water, process heat, cooling
- Thermosiphon-driven solar heaters
- Solar hybrid lighting
- Wind energy assessment
- Aerodynamics of turbine blades
- Combustion and propulsion modeling
- Baseline research into molten salt types and energy storage technologies

- Vehicle design with fuel cells and alternative fuels
- Hybrid electric vehicles and battery charging systems
- High temperature heat exchanger design
- Fuel cells design
- High-temperature properties of metallic alloys, ceramics, and composites
- Surface modification for enhanced heat and mass transfer (condensation, boiling, absorption, etc.)
- Metal hydride for use in energy devices and production
- Molten salt technology for use in Naval power production facilities design
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 for the past four years, as well as other important international meetings. UNLV is now considered a convening center for renewable energy leaders throughout the nation and world.
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 Renewable Energy Research

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

Dr. Shubhra Bansal  
Assistant Professor, Department of Mechanical Engineering

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

Dr. Robert Boehm, P.E.  
Distinguished Professor, Department of Mechanical Engineering  
Director, Center for Energy Research

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

Dr. William Culbreth  
Associate Professor, Department of Mechanical Engineering

Dr. Kwang J. Kim  
NV Energy Professor of Energy and Matter, Department of Mechanical Engineering

Dr. Samaan Ladkany  
Professor, Department of Civil & Environmental Engineering & Construction

Dr. Jaeyun Moon  
Assistant Professor, Department of Mechanical Engineering

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

Dr. Darrell Pepper  
Professor, Department of Mechanical Engineering  
Director, Nevada Center for Advanced Computational Methods

Dr. Hui Zhao  
Associate Professor, Department of Mechanical Engineering
# Renewable Energy Research

## Additional Resources

<table>
<thead>
<tr>
<th>Resource</th>
</tr>
</thead>
<tbody>
<tr>
<td><a href="#">Center for Energy Research</a></td>
</tr>
<tr>
<td><a href="#">Center for Materials and Structures</a></td>
</tr>
<tr>
<td><a href="#">Nevada Center for Advanced Computation Methods</a></td>
</tr>
<tr>
<td><a href="#">Solar Energy Initiative</a></td>
</tr>
<tr>
<td><a href="#">Team Las Vegas Solar Decathlon 2013</a></td>
</tr>
</tbody>
</table>
Renewable Energy Research Highlights
Renewable Energy Research

Dr. Yahia Baghzouz
Professor, Department of Electrical and Computer Engineering
Co-Director, Center for Energy Research
Phone: (702) 895-0887
Email: Yahia.Baghzouz@unlv.edu

• 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.

Searching for the impact of PV power fluctuations.

Testing bifacial PV panel to search for an accurate electrical circuit model.
Relevant Publications


• W. Peng, S. Haddad, Y. Baghzouz, Improving power quality in distribution feeders with high PV penetration through inverter controls, CIRED, May 29-30, 2012.


Renewable Energy Research

Dr. Shubhra Bansal
Assistant Professor, Department of Mechanical Engineering

Phone: (702) 895-2720
Email: shubhra.bansal@unlv.edu

- Expertise
  - Performance and reliability of thin film photovoltaic devices
  - PV module and device reliability
  - Physics-based life prediction models for design and materials control
  - Energy conversion and storage
Dr. Shubhra Bansal
Assistant Professor, Department of Mechanical Engineering

Relevant Publications

Renewable Energy Research

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

Algorithm designs for the Smart Grid.

Dependable renewable energy distribution.
Renewable Energy Research

Dr. Wolfgang Bein

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

Relevant Publications

Renewable Energy Research

Dr. Robert Boehm, P.E.

Distinguished Professor, Department of Mechanical Engineering Director, Center for Energy Research
Phone: (702) 895-4160
Email: Bob.Boehm@unlv.edu
Website for the Center for Energy Research: www.unlv.edu/cer

• Expertise
  • Solar power generation (PV, CPV, CSP)
  • Power plant dry cooling
  • Solar thermal applications: domestic hot water, process heat, cooling
  • Energy conservation and solar applications in buildings
  • Solar hybrid lighting
  • Renewable hydrogen generation
  • Vehicle design with fuel cells and alternative fuels
  • Geothermal power production

Center: At UNLV, photovoltaic systems are being developed to provide solar energy, including this Amonix Integrated High Concentration Photovoltaic (IHCPV) system.
Bottom: The Villa Trieste community of homes in Las Vegas have many energy-reducing features, including solar energy panels and an intelligent communications system between users and the utility.
Renewable Energy Research

Dr. Robert Boehm, P.E.
Distinguished Professor, Department of Mechanical Engineering
Director, Center for Energy Research

Relevant Publications

Renewable Energy Research

Dr. Yi-Tung Chen
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 SOFC)
Renewable Energy Research

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

Relevant Publications

- Wenhao Pu, Chen Yue, Dong Han, Weifeng He, Xuan Liu, Qi Zhang, Yitung Chen, “Experimental study on organic Rankine cycle for low grade thermal energy recovery,” Applied Thermal Engineering, 94 (2016), pp. 221-227.
Renewable Energy Research

Dr. William Culbreth
Associate Professor, Department of Mechanical Engineering
Phone: (702) 895-3426
Email: william.culbreth@unlv.edu

- Expertise
  - Research on molten salts as a heat energy storage medium
  - Molten salt properties and storage vessel design

Dr. Samaan Ladkany
Professor, Department of Civil & Environmental Engineering & Construction
Phone: (702) 895-3438
Email: samaan.ladkany@unlv.edu

Proton exchange membrane
Electrocatalysts
Protons \([H^+]\)
H\(_2\)O H\(_2\)O
O\(_2\) H\(_2\)
Anode Cathode
h\(\nu\)
Renewable Energy Research

Dr. Kwang J. Kim
NV Energy Professor of Energy and Matter
Department of Mechanical Engineering

Phone: (702) 774-1419
Email: Kwang.Kim@unlv.edu
Web: www.kwangjinkim.org
YouTube: http://www.youtube.com/user/kwangkimlab

• Expertise
  • Surface modification for enhanced heat and mass transfer (condensation, boiling, absorption, etc.)
  • Metal hydride for use in energy devices and production

Boiling Surfaces: source: Int. J. H & M Transfer, 63, 2013


Renewable Energy Research

Dr. Kwang J. Kim
NV Energy Professor of Energy and Matter,
Department of Mechanical Engineering

Relevant Publications


For more publications: http://scholar.google.com/citations?user=VX3wtWEAAAAJ&hl=en
Dr. Jaeyun Moon
Assistant Professor, Department of Mechanical Engineering
Phone: (702) 895-5611
Email: jaeyun.moon@unlv.edu

• Expertise
  • The light-absorbing coatings for improved solar receivers of high temperature Concentrating Solar Power (CSP)
  • Nanostructured materials for thermoelectric applications
  • Hybrid materials for energy applications
  • Thermal barrier coatings
  • Electrical and thermal properties of inorganic and hybrid (inorganic-organic) materials
Renewable Energy Research

Dr. Jaeyun Moon
Assistant Professor, Department of Mechanical Engineering

Relevant Publications

Dr. Samir Moujaes, P.E.
Professor, Department of Mechanical Engineering
Phone: (702) 895-3265
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

Left: A solid-particle receiver (SPR) gravity feed to heat particles for a high-temperature production facility, using concentrated solar energy.
Right: Testing apparatus used at UNLV to characterize the heat exchanger suggested for high-temperature hydrogen production, using nuclear energy as the heat source.

A schematic of UNLV’s Air Duct Leakage Laboratory (ADLL)
Renewable Energy Research

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

Relevant Publications

Renewable Energy Research

Dr. Darrell Pepper
Professor, Department of Mechanical Engineering
Director, Nevada Center for Advanced Computational Methods
Phone: (702) 895-1056
Email: Darrell.Pepper@unlv.edu

- Expertise
  - Computational Fluid Dynamics, heat transfer and species transport
  - Advanced computational techniques
  - Wind energy assessment
  - Groundwater modeling and transport through porous media
  - Aerodynamics of turbine blades
  - Thin-film solar panels
  - Combustion and propulsion modeling

Meteorological tower placed in the Nellis Dunes area

Nevada topography and prevailing wind pattern

Areas in Nevada with wind energy potential (Class 4-7)

April 2017
Renewable Energy Research

Dr. Darrell Pepper
Professor, Department of Mechanical Engineering
Director, Nevada Center for Advanced Computational Methods

Relevant Publications

Dr. Hui Zhao
Associate 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.
Renewable Energy Research

Dr. Hui Zhao
Associate Professor, Department of Mechanical Engineering

Relevant Publications

- H Zhao, S Zhai., 2015, Energy Conversion over Super-hydrophobic Surfaces. APS meeting abstracts.
- Zhao, H., 2011, The role of hydrodynamic behavior of DNA molecules in dielectrophoretic polarization under the action of an electric field, Physical Review E, 84, 021910.
- Zhao, H., 2011, Double layer polarization of a non-conducting particle in an alternating current field with applications to dielectrophoresis, Electrophoresis 32, 2232-2244.