

Energy Research



Energy Research



Dr. Rama Venkat
Dean, College of Engineering
Phone: (702) 895-1094
Email: Rama.Venkat@unlv.edu



Dr. Mohamed Trabia
Associate Dean, College of Engineering
Phone: (702) 895-0957
Email: Mohamed.Trabia@unlv.edu

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.

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
- Digital twins
- Combined heat and power (CHP) system
- Assessing efficacy of decarbonization plans
- 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 reactors
- Land use change impacts of fossil fuel, bioenergy, and renewable energy
- Smart Grid concepts
- Speed scaling scheduling for CPUs
- Nuclear reactor operation
- Third-generation dye-sensitized solar cell

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. Marie-Odile Fortier

Assistant Professor, Sustainability in Arid Lands, Department of Civil and Environmental Engineering and Construction

Dr. Jaeyun Moon

Associate 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

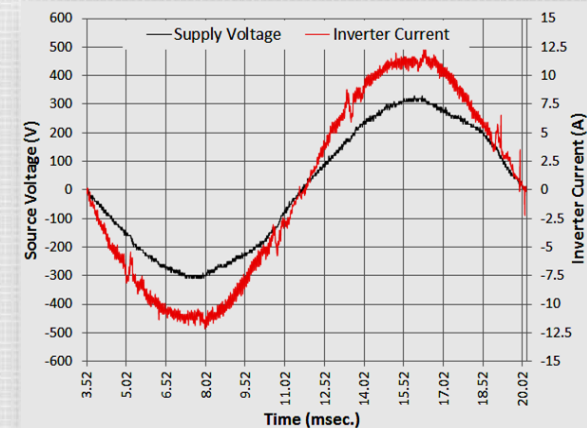
Professor, Department of Electrical and Computer Engineering
Co-Director, Center for Energy Research

Phone: (702) 895-0887

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

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



Determining voltage quality through computer simulations.



Dr. Yahia Baghzouz

Professor, Department of Electrical and Computer Engineering
Co-Director, Center for Energy Research



Relevant Publications

- Johnson, J., Shaon, M.A.R., Baghzouz, Y.; "Improved RC Model of Air Conditioning Load – A Case Study" (2023) IEEE PES Innovative Smart Grid Technologies Conference Europe.
- Shaon, M.A.R., Baghzouz, Y.; "Day-Ahead Residential Customer Load Forecasting Using Prophet (2023) Proceedings", 2023 IEEE International Conference on Environment and Electrical Engineering and 2023 IEEE Industrial and Commercial Power Systems Europe, *EEEIC / I and CPS Europe 2023*.
- Shaon, M.A.R., Baghzouz, Y.; "On the accuracy of open-source and commercial solar forecasting tools" (2022) Proceedings of the 2022 International Conference and Utility Exhibition on Energy, Environment and Climate Change, ICUE 2022.
- Hossain, R., Gautam, M., Mansourlakouraj, M., Livani, H., Benidris, M., Baghzouz, Y.; "Soft Actor Critic Based Volt-VAR Co-optimization in Active Distribution Grids" (2022) IEEE Power and Energy Society General Meeting, 2022-July.
- Shaon, M.A.R., Baghzouz, Y.; "Customer Bill Management Using Thermal and Virtual Electricity Storage" (2022) Proceedings of International Conference on Harmonics and Quality of Power, ICHQP, 2022-May.
- Blackstone, B., Baghzouz, Y.; "Value Added Sequential Services for BTM Storage when Paired with PV Systems" (2020) Proceedings of International Conference on Harmonics and Quality of Power, ICHQP, 2020-July, art. no. 9177904,
- Hicks, C., Baghzouz, Y.; "Experimental Steady-State and Transient Analysis of a Behind-The-Meter Battery Storage for Residential Customers with PV Systems" (2019) ICCEP 2019 - 7th International Conference on Clean Electrical Power: Renewable Energy Resources Impact, art. no. 8890193, pp. 438-443.
- Blackstone, B., Hicks, C., Gonzalez, O., Baghzouz, Y. (2018) "Development of an Outdoor Diesel Generator - PV Microgrid for Education and Research" (Conference Paper) IEEE Power and Energy Society General Meeting (2018), 8586424.
- Pinzon, A.M.O., Silveira, P.M.D., Baghzouz, Y. (2018) "Simulation of microgrid hierarchical control" (Conference Paper) Proceedings of International Conference on Harmonics and Quality of Power, ICHQP, pp. 1-6.
- Hicks, C., Baghzouz, Y., Haddad, S., "Power quality of residential PV system under low solar irradiance and off-grid operation" (Conference Paper) Proceedings of International Conference on Harmonics and Quality of Power, ICHQP, pp. 1-5 (2018).

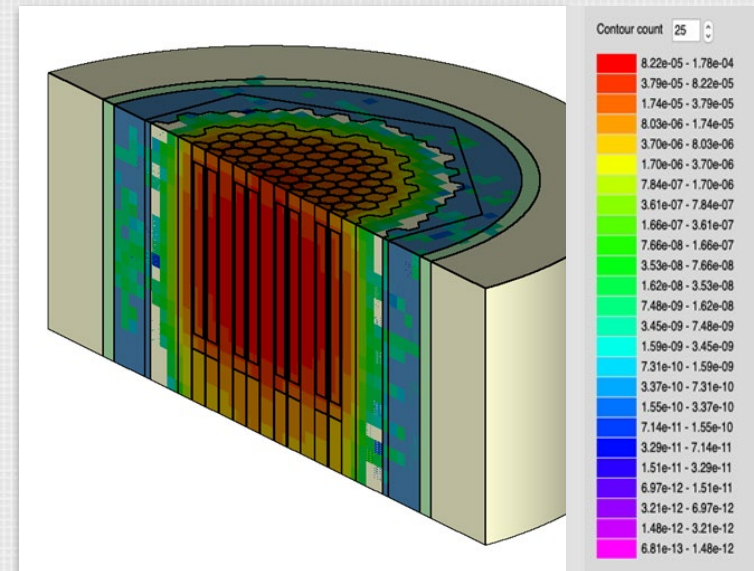
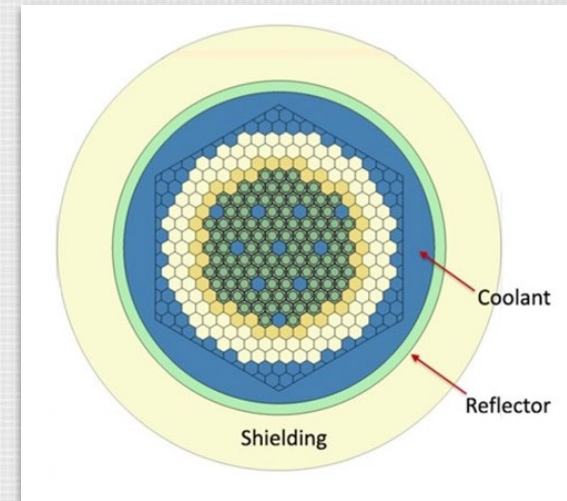
Dr. Alexander Barzilov

Professor, Department of Mechanical Engineering

Phone: (702) 895-4325

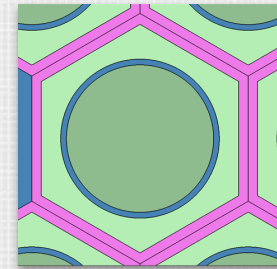
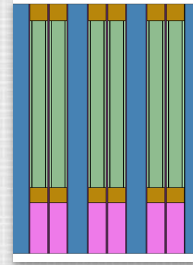
Email: alexander.barzilov@unlv.edu

- 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

- [A. Barzilov](#), J. Stewart, "Modeling of Irradiated Dimensional Change Strain in MSR Graphite Moderator," *Nuclear Engineering and Design* 407, 112277 (2023).
- D. Chiang, [A. Barzilov](#), "Analysis of Fuel Cycles for Pool-Type, Sodium-Cooled Fast Small Modular Reactor," 2023 Int. Congress on Advances in Nuclear Power Plants (ICAPP'23), Gyeongju, Korea, April 23-27, 2023.
- M. Arguelles Perez, W. Yim, [A. Barzilov](#), "CZT Sensor Based Radiation Source Localization Using Multiple Autonomous UAVs," Waste Management Symposia (WM2023), Phoenix, AZ, February 26 - March 2, 2023.
- [A. Barzilov](#), M. Kazemeini, "Unmanned Aerial System Integrated Sensor for Remote Gamma and Neutron Monitoring," *Sensors* 20, 5529 (2020).
- D. Chiang, [A. Barzilov](#), "Analysis of Fuel Cycle of PRISM Fast Neutron Spectrum Reactor," American Nuclear Society Winter Meeting, November 16 -19, 2020.
- [A. Barzilov](#), J. Stewart, "GeN-FOAM Model of Graphite Moderator of a Molten Salt Reactor," Int. Topical Meeting on Advances in Thermal Hydraulics (ATH'20), Palaiseau, France, October 20-23, 2020.
- W. Yim, Z. Cook, M. Kazemeini, [A. Barzilov](#), "Low-Altitude Contour Mapping of Radiation Fields Using UAS Swarm," *Intelligent Service Robotics* 12, 219-230 (2019).
- M. Kazemeini, J. Vargas, [A. Barzilov](#), W. Yim, "UAS Based Remote Sensing for Nuclear Power Plants," Int. Congress on Advances in Nuclear Power Plants (ICAPP'19), Juan-les-Pins, France, May 12-15, 2019.
- M. Kazemeini, [A. Barzilov](#), W. Yim, J. Lee, "Gamma Ray and Neutron Sensors for Remote Monitoring Using Aerial Robotic Platforms," *Sensors & Transducers* 229(1), 47-54 (2019).
- Z. Cook, J. Lee, J. Hartman, [A. Barzilov](#), W. Yim, "Contour Mapping Based Radiation Source Localization by UAS Swarm," *Transactions of American Nuclear Society* 115, 1425 (2016).

Dr. Wolfgang Bein

Professor, Department of Computer Science

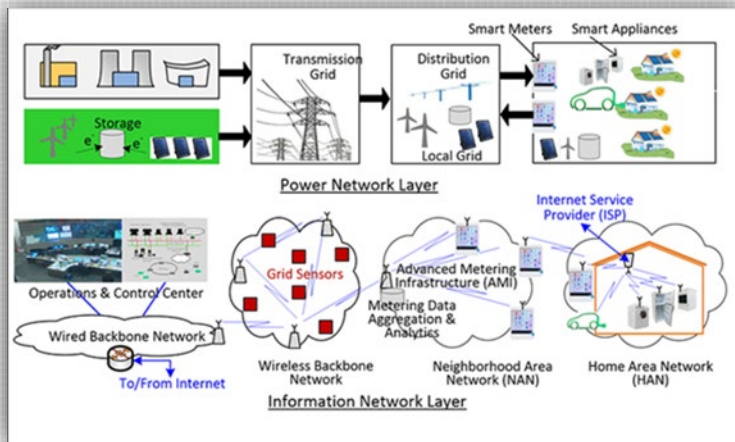
Co-Director, Center for Information Technology and Algorithms (CITA)

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

Below: Dependable renewable energy distribution



Above: Algorithm designs for the Smart Grid



Dr. Wolfgang Bein

Professor, Department of Computer Science

Co-Director, Center for Information Technology and Algorithms (CITA)



Relevant Publications

- Nyknahad, D., Bein, W., Gewali, L., Aslani, R., "Multi-Objective Grid Scheduling for Battery Exchange Stations in Battery Consolidation Systems," (2021) IEEE 11th Annual Computing and Communication Workshop and Conference, CCWC 20219375933, pp. 1099-1105.
- Andro-Vasko, J., Bein, W., Cisneros, B., Domantay, J., "Online Competitive Schemes for Linear Power-Down Systems" (2020), *Advances in Intelligent Systems and Computing*, 1134, pp. 579-584.
- Nyknahad, D., Aslani, R., Bein, W., Gewali, L., "Zoning Effect on the Capacity and Placement Planning for Battery Exchange Stations in Battery Consolidation System", (2020) 10th Annual Computing and Communication Workshop and Conference, CCWC, 9031261, pp. 619-625.
- James Andro-Vasko, Wolfgang Bein, Hiro Ito. "Energy Efficiency and Renewable Energy Management with Multi-state Power-down Systems", *Information* (2019).
- Bein W. "Energy Saving in Data Centers". *Electronics* (2018); 7(1):5.
- Andro-Vasko J., Avasarala S.R., Bein W. (2018). "Continuous State Power-Down Systems for Renewable Energy Management." In: Latifi S. (eds) *Information Technology - New Generations. Advances in Intelligent Systems and Computing*, volume 738, Springer Verlag, pp 701-707.
- Andro-Vasko, J., Bein, W., Ito, H., Pathak, G. (2017). "A Heuristic for State Power Down Systems with Few States". *Advances in Intelligent Systems and Computing*, Springer Verlag. 558.
- Wolfgang Bein, Bharat Madan, Doina Bein, and Dara Nyknahad (2016). "Algorithmic Approaches for a Dependable Smart Grid". *Advances in Intelligent Systems and Computing*, Springer Verlag. 448.
- Andro-Vasko J, Bein W, Ito H, Nyknahad D. "Evaluation of Online Power-Down Algorithms" (2015), Proceedings of the 12th International Conference on Information Technology, IEEE, 473-478.

Dr. Yi-Tung Chen

Chair & Professor, Department of Mechanical Engineering

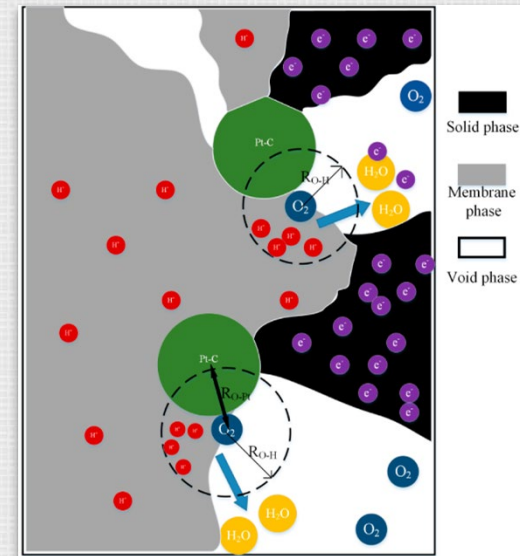
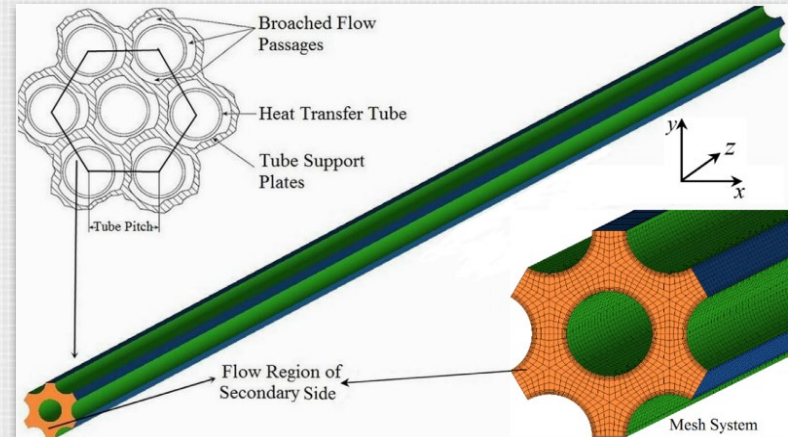
Co-Director, Center for Energy Research

Phone: (702) 895-1202

Email: yitung.chen@unlv.edu

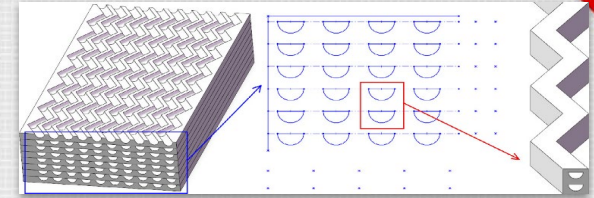
- Expertise

- 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
- Hongyang Wei and Yitung Chen, "Application of different Krylov subspace methods in subcooled flow boiling simulation," *Annals of Nuclear Energy*, 168, (2022), 108904, pp. 1-9
- Zhirui Zhao, Jianxin Shi, Baozhi Sun, Yitung Chen, Wanze Wu, and Huidan Fu, "The Influence of four-wire structure on the flow and heat transfer process in supercritical water-cooled reactor fuel assembly," *Applied Thermal Engineering*, 203, (2022), 117941, pp. 1-14
- Zirui Xu, Wangnan Chen, Jie Lian, Xiongwei Yang, Qiuwang Wang, Yitung Chen, and Ting Ma, "Study on mechanical stress of semicircular and rectangular channels in printed circuit heat exchangers," *Energy*, 238, (2022), 121655, pp. 1-10
- Kaipo Kekaula and Yitung Chen, "Effect of ambient temperature variation on pressure drop during condensation in long inclined tubes," *Journal of Thermal Science and Engineering Applications*, 14(2), (2022), 021005, pp. 1-12
- Qingfei Bian, Ke Tian, Kong Ling, Yitung Chen, Min Zeng, and Qiuwang Wang, "Transport phenomena and evolution mechanism of the melt pool during a laser-based metal melting process," *Journal of Thermal Science and Engineering Applications*, (2021), DOI: 10.1115/1.4053226, pp. 1-36
- Hongyang Wei, Kevin Briggs, Victor Quintanilla, and Yitung Chen, "Evaluation of different Krylov subspace methods for the simulation of water faucet problem," *Nuclear Science and Techniques*, Vol. 32, Issue 5, (2021), Article number 44, pp. 1-16
- Hongyang Wei, Victor Quintanilla, Yitung Chen, Peiyao Qi, Xing Li, Shouxu Qiao, and Sichao Tan, "The numerical simulation and analysis of turbulent flow behavior in 5x5 fuel rod bundle with split-type mixing vane," *Annals of Nuclear Energy*, 159, (2021), 108324, pp. 1-13
- 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
- Wenxiao 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

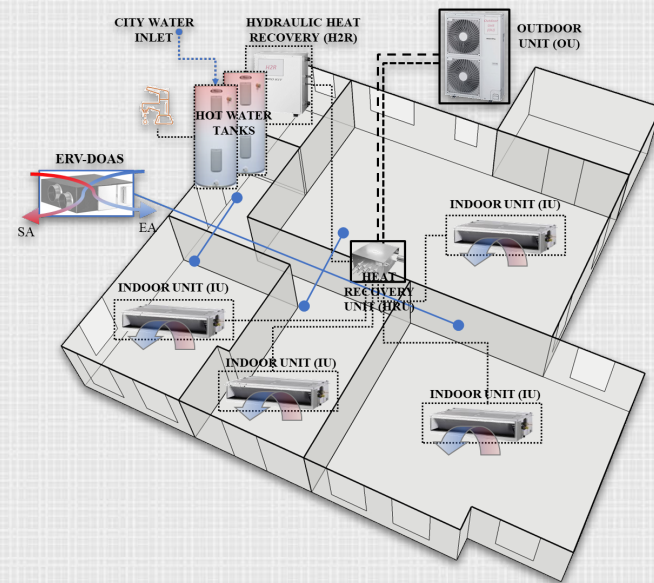
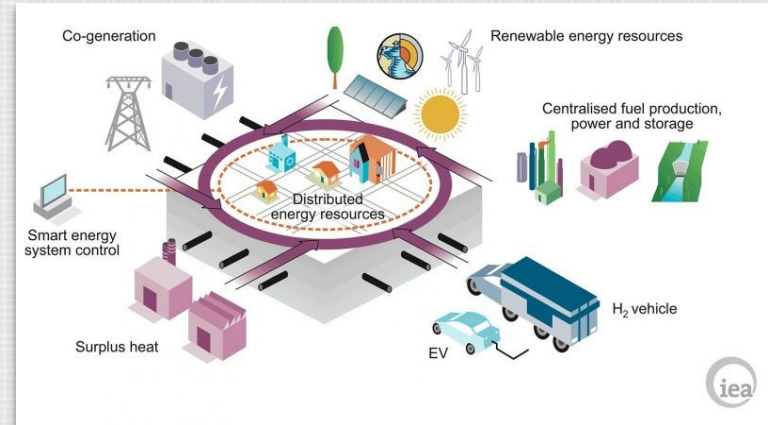
Dr. Heejin Cho

Professor, Department of Mechanical Engineering

Phone: (702) 895-1331

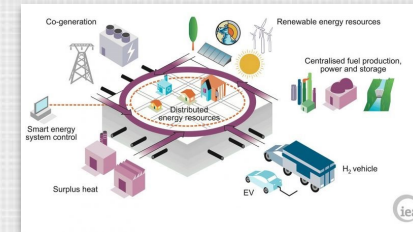
Email: heejin.cho@unlv.edu

- 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

- Hwang, J., Maharjan, K., and Cho, H., 2023, "A review of hydrogen utilization in power generation and transportation sectors: Achievements and future challenges," *International Journal of Hydrogen Energy*, in Press.
- Kim, D., Lee, J., Do, S., Mago, P.J., Lee, K., and Cho, H., 2022, "Energy Modeling and Model Predictive Control for HVAC in Buildings: A Review of Current Research Trends," *Energies*, 15 (19), 7231.
- Patterson, M., Singh, P., and Cho, H., 2022, "The Current State of the Industrial Energy Assessment and its Impacts on the Manufacturing Industry," *Energy Reports*, 8, November 2022, pp. 7297-7311.
- Philippe, S., Spayde, D., and Cho, H., 2022, "Design and Feasibility Study of Biomass-Driven Combined Heat and Power Systems for Rural Communities," *J. Energy Resource Technology*, 144(7): 070909.
- Zhang, J., Cho, H., and Mago, P.J., 2022, "Design and Optimization of Integrated Distributed Energy Systems for Off-Grid Buildings," *J. Energy Resource Technology*, 144(7): 070902.
- Neves, R., Cho, H., and Zhang, J., 2021, "Pairing Geothermal Technology and Solar Photovoltaics for Net-Zero Energy Homes," *Renewable & Sustainable Energy Reviews*, 140, 110749.
- Kim, D., Cho, H., Mago, P.J., Yoon, J. and Lee, H., 2021, "Impact on Renewable Design Requirements of Net-Zero Carbon Buildings under Potential Future Climate Scenarios," *Climate*, Keynote Paper in the Special Issue on Interactions of the Variation in Environmental Conditions Due to Climate Change and the Possibility of Obtaining a Low-Carbon Building Stock, 9(1), 17.
- Neves, R., Cho, H., and Zhang, J., 2021, "State of the Nation: Customizing Energy and Finances for Geothermal Technology in the United States Residential Sector," *Renewable & Sustainable Energy Reviews*, 137, 110463.
- Kim, D., Cho, H., Koh, J. and Im, P., 2020, "Net-Zero Energy Building Design and Life-Cycle Cost Analysis with Air-Source Variable Refrigerant Flow and Distributed Photovoltaic Systems," *Renewable & Sustainable Energy Reviews*, 118, 109508.
- Cox, S.J., Kim, D., Cho, H., and Mago, P.J., 2019, "Real Time Optimal Control of District Cooling System with Thermal Energy Storage Using Neural Networks," *Applied Energy*, 238, pp. 446-480.

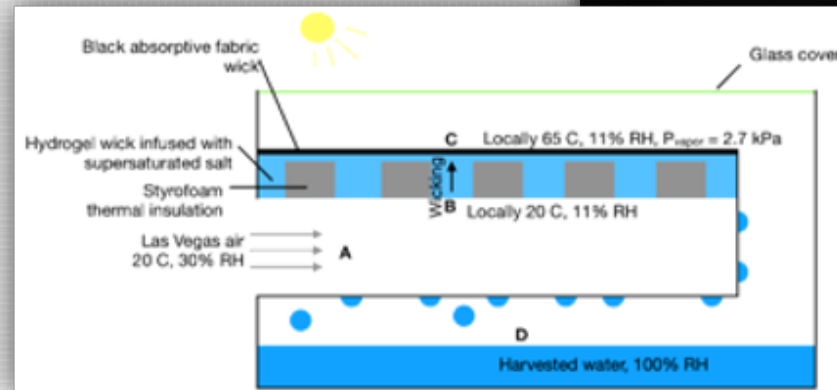
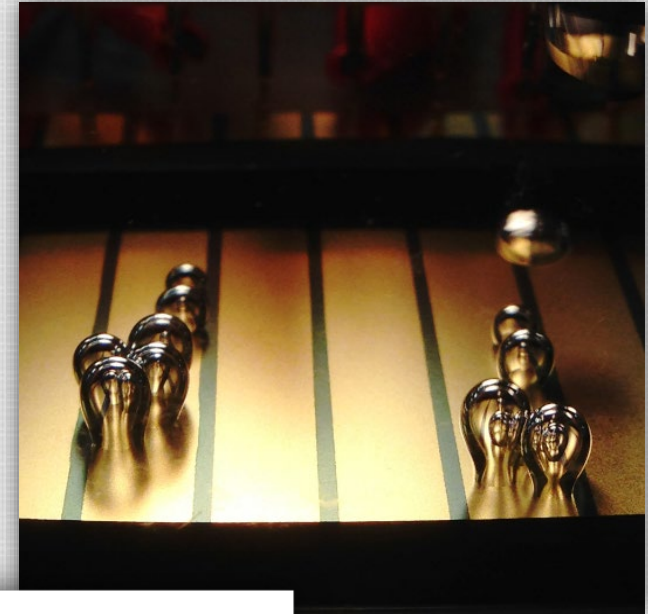
Dr. Jeremy Cho

Assistant Professor, Department of Mechanical Engineering

Phone: (702) 895-4701

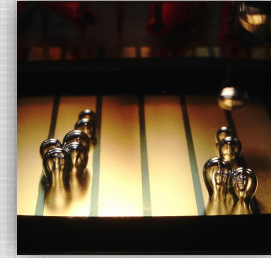
Email: jeremy.cho@unlv.edu

- 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

- Y. Gao, N.K.K. Chai, N. Garakani, S. S. Datta, H.J. Cho (2022), "A Simple Relation between Stiffness and Swelling of a Hydrogel," *Bulletin of the American Physical Society*
- Y. Gao, N.K.K. Chai, N. Garakani, S.S. Datta, H.J. Cho (2021), "Scaling laws to predict humidity-induced swelling and stiffness in hydrogels," *Soft Matter*, 17(43), 9893-9900
- J-F Louf, N. B. Lu, M. G. O'Connell, H. J. Cho, S. S. Datta (2021), "Under pressure: Hydrogel swelling in a granular medium," *Science Advances*, 7(7).
- H. J. Cho, E. N. Wang (2019), "Bubble nucleation, growth, and departure: A new dynamic understanding," *International Journal of Heat and Mass Transfer*, 145, 118803.
- H. J. Cho, N. B. Lu, M. P. Howard, R. A. Adams, S. S. Datta (2019), "Crack formation and self-closing in shrinkable, granular packings," *Soft Matter*, 15(23), 4689-4702.
- H. J. Cho, S. S. Datta (2019), "Scaling Law for Cracking in Shrinkable Granular Packings," *Physical Review Letters*, 123(15), 158004.
- H. K. Mutha, H. J. Cho, M. Hashempour, B. L. Wardle, C. V. Thompson, E. N. Wang (2018), "Salt rejection in flow-between capacitive deionization devices," *Desalination*, 437, 154-163.
- H. J. Cho, D. J. Preston, Y. Zhu, E. N. Wang (2016), "Nanoengineered materials for liquid-vapour phase-change heat transfer," *Nature Reviews Materials*, 2, 16092.
- H. Kim, H. J. Cho, S. Narayanan, S. Yang, H. Furukawa, S. Schiffrés, X. Li, Y. Zhang, J. Jiang, O. M. Yaghi, E. N. Wang (2016), "Characterization of adsorption enthalpy of novel water-stable zeolites and metal-organic frameworks," *Scientific Reports*, 6, 1-7.
- H. J. Cho, J. P. Mizerak, E. N. Wang (2015), "Turning bubbles on and off during boiling using charged surfactants," *Nature Communications*, 6(1), 1-7.

Dr. Marie-Odile Fortier

Assistant Professor, Sustainability in Arid Lands, Department of Civil and Environmental Engineering & Construction

Phone: (702) 774-3417

Website: marieodilefortier.com

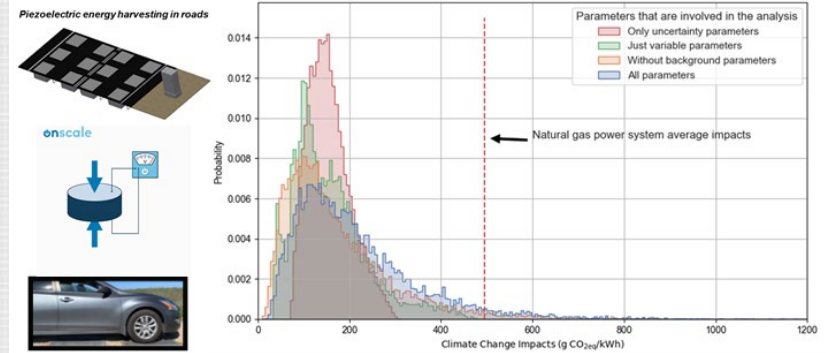
Email: marie-odile.fortier@unlv.edu

Expertise

- Geospatial life cycle assessment, carbon footprints of energy systems
- Land use change impacts of fossil fuel, bioenergy, and renewable energy
- Assessing efficacy of decarbonization plans
- Energy data analytics



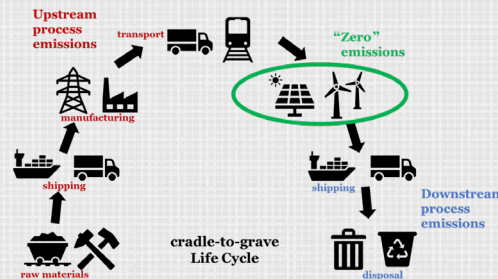
Modeling the performance and life cycle greenhouse gas emissions of emerging renewable energy technologies



Land use and albedo change impacts of energy systems



US oil and gas well pads



Dr. Marie-Odile Fortier

Assistant Professor, Department of Civil and Environmental Engineering and Construction

Relevant Publications

- Pfadt-Trilling AR, Widyolar BK, Jiang L, Brinkley JT, Bhusal Y, Winston R, and Fortier M-OP. (2023) "Life cycle greenhouse gas emissions of low-temperature process heat generation by external compound parabolic concentrator (XCPC) solar thermal array." *Renewable Energy* 205, 992-998.
- Therasme O, Volk TA, Fortier M-OP, Kim Y, Wood CD, Ha H, Ali A, Brown TR, and Malmshemer RW. (2022) "Carbon footprint of biofuels production from forest biomass using hot water extraction and biochemical conversion in the Northeast United States." *Energy* 241, 122853.
- Pfadt-Trilling AR, Volk TA, and Fortier M-OP. (2021) "Climate change impacts of electricity generated at a waste-to-energy facility." *Environmental Science and Technology* 55(3), 1436-1445.
- Pfadt-Trilling AR and Fortier M-OP. (2021) "Greenwashed energy transitions: Are US cities accounting for the life cycle greenhouse gas emissions of energy resources in climate action plans?" *Energy and Climate Change* 2, 100020.
- Yang S, Volk TA, and Fortier M-OP. (2020) "Willow biomass crops are a carbon sequestration system or low-carbon biomass feedstock depending on prior land use and transportation distances to end users." *Energies* 13(16), 4251.
- Fortier M-OP, Teron L, Reames TG, Munardy DT, and Sullivan B. (2019) "Introduction to evaluating energy justice across the life cycle: A social life cycle assessment approach." *Applied Energy* 236, 211-219.
- Fortier M-OP, Roberts GW, S-Williams SM, Sturm BSM. (2017) "Determination of the life cycle climate change impacts of land use and albedo change in algal biofuel production." *Algal Research* 28, 270-281.

Dr. Jaeyun Moon

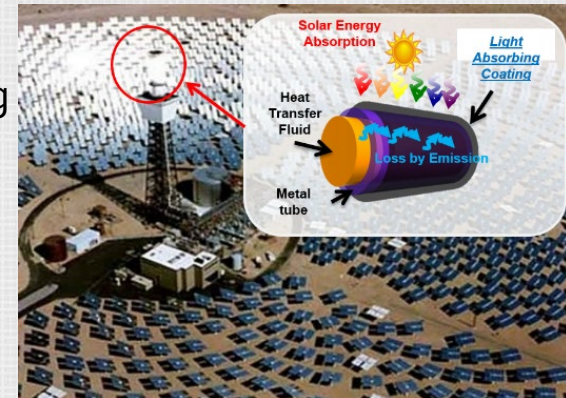
Associate Professor, Department of Mechanical Engineering

Phone: (702) 895-5611

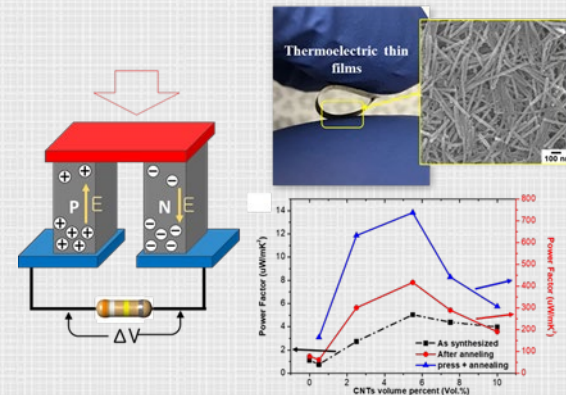
Email: jaeyun.moon@unlv.edu

Website: <http://jmoon.faculty.unlv.edu/>

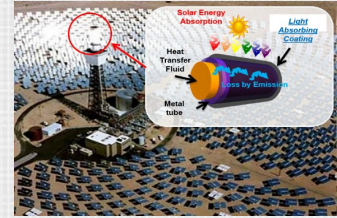
- Expertise
 - Thermoelectric nanomaterials and device fabrication
 - Nanostructured light-absorbing coatings for advanced Concentrating Solar Power (CSP)
 - Photocatalysts for solar energy conversion
 - Electrical and thermal properties of inorganic and hybrid (inorganic-organic) materials



Ivanpah Solar Electric Generating System and a schematic diagram of solar receivers.



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



Dr. Jaeyun Moon

Associate Professor, Department of Mechanical Engineering

Relevant Publications

- R. Jazaei, M. Karakouzian, B. O'Toole, J. Moon, S. Gharehdaghi, "Energy dissipation capacity of cementitious nanocomposite reinforced by hybrid carbon nanotubes." *Construction and Building Materials* 323 (2022): 126396.
- T.L. Nguyen, V.D. Phung, K. Ayalew, D.Chun, I.T. Kim, K.J. Kim, J. Moon, "Tailored synthesis of molybdenum-selenide/selenium/sodium-molybdate hybrid composites as a promising anode for lithium-ion and sodium-ion batteries." *Chemical Engineering Journal* 415 (2021): 128813.
- J. Byun, H. An, J. Hong, D.W. Chun, J. Moon, "Thermoelectric performance of n-type polycrystalline SnSe with surface depletion by pressureless sintering." *Applied Surface Science* 544 (2021): 148834.
- F. Anez, S. Pochampally, C. Obra, J. Moon, E.J. Marti, "Comparison of Biochar Attained from Various Feedstocks for the Adsorption of Arsenic in Water." (2021) Undergraduate Research Symposium Posters. 75.
- J. Byun, H. An, J. Hong, D. W. Chun, and J. Moon. "Thermoelectric performance of n-type polycrystalline SnSe with surface depletion by pressureless sintering." *Applied Surface Science* 544 (2021): 148834.
- T. L. Nguyen, V. D. Phung, K. Ayalew, D. Chun, I. T. Kim, K. J. Kim, and J. Moon. "Tailored synthesis of molybdenum-selenide/selenium/sodium-molybdate hybrid composites as a promising anode for lithium-ion and sodium-ion batteries." *Chemical Engineering Journal* 415 (2021): 128813.
- H. An, M. Pusko, D. Chun, J. Moon, "In-situ synthesis of flexible hybrid composite films for improved thermoelectric performance", *Chemical Engineering Journal* 357, 547-558 (2019).
- D. E. Karas, J. Byun, C. Jose, S. Tam, J. Moon, "Copper-oxide spinel absorber coatings for high-temperature concentrated solar power systems", *Solar Energy Materials and Solar Cells* 182 321-330 (2018).
- H. An, D. Karas, B. Kim, S. Trabia, J. Moon, "Flexible n-type thermoelectric composite films with enhanced performance through interface engineering and post-treatment", *Nanotechnology* 29 (27) 275403 (2018).

Patents

- J. Moon, M. Pusko, K. Ayalew, S.V. Pochampally, H. Ahn; Nevada System of Higher Education Board of Regents, assignee. "Compliant three-dimensional thermoelectrics." U.S. Patent 17,112,586. 2021 June 6

Dr. Vince (Meng-Jen) Wang

Assistant Professor, Department of Mechanical Engineering with Emphasis on Nuclear

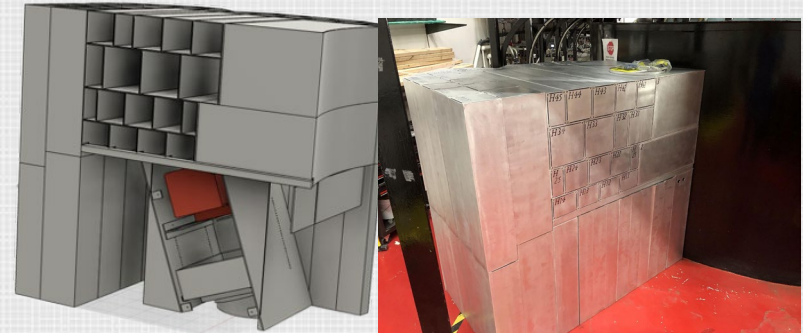
Phone: 702-895-1331

Email: vince.wang@unlv.edu

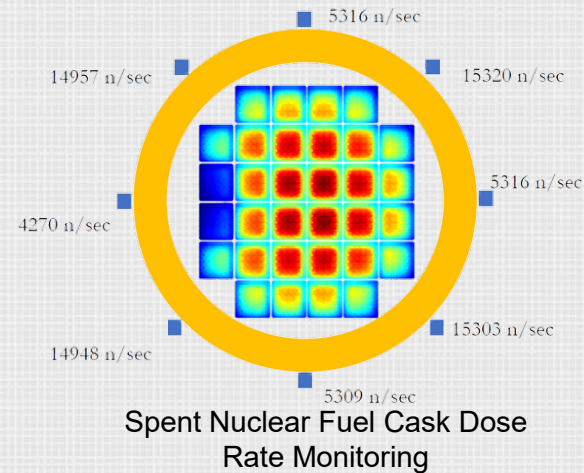
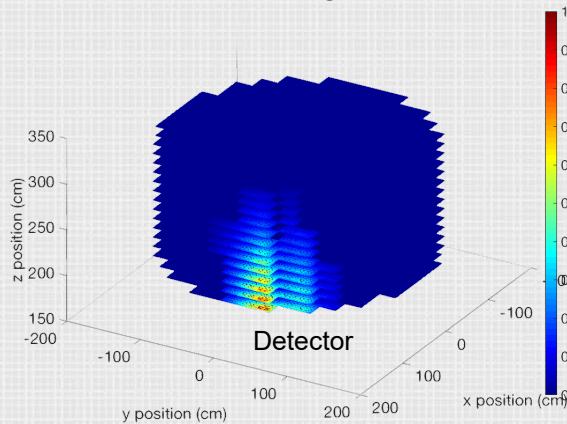
- Expertise

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

Neutron Radiography System

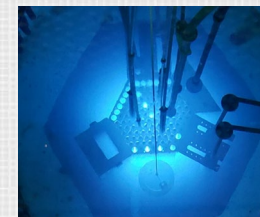


Reactor Pressure Vessel
Neutron Fluence Calculation



Dr. Vince Wang

Assistant Professor, Department of Mechanical Engineering



Relevant Publications

- C. Olson, J. Snow, M.-J. Wang, G. Sjoden, E. Cazalas, "An Experimental Validation of Spectrally Matched Neutron Detection Systems using ^3He and BF_3 ", *Nuclear Technology* (2023)
- T. W. Hall, M.-J. Wang, G. Sjoden, C. Hines, and M. Watrous, "Computationally Optimized Irradiation Chamber Design for the Production of ^{135}Xe in Washington State University TRIGA Reactor", *Nuclear Science and Engineering* (2023)
- T. W. Hall, M.-J. Wang, G. Sjoden, and M. Watrous, "Computational and Experimental Optimization of ^{135}Xe Production in Calibration Sources", *Journal of Environmental Radioactivity*, Vol. 244-245, 106814 (2022)
- M. Hartos, M.-J. Wang, and G. Sjoden, "Design of an Ultra-Compact Imaging Chamber and Radiation Beamstop for a Neutron Radiography System Employing Particle Transport", Vol. 386, 111570, *Nuclear Engineering and Design*. (2022)
- M. Hartos, M.-J. Wang, G. E. Sjoden, "Computational Design and Optimization of a Neutron Imaging Beamline Using Monte Carlo and Deterministic SN Radiation Transport for the Utah TRIGA Reactor", Vol. 382, 111374, *Nuclear Engineering and Design*. (2021)
- M.-J. Wang, G.E. Sjoden, A. Foley, S. Mohanty, " $3\text{D } S_N$ and Monte Carlo Calculations of the Utah TRIGA Reactor Core using PENTRAN and MCNP6", Vol. 155, *Annals of Nuclear Energy*. (2021)
- M.-J. Wang, G.E. Sjoden, "Experimental and Computational Dose Rate Evaluation using SN and Monte Carlo Method for a Packaged $^{241}\text{AmBe}$ Neutron Source", *Nuclear Science and Engineering*. (2021)
- M.-J. Wang, R.-J. Sheu, J.-J. Peir, J.-H. Liang, "Criticality calculations of the HTR-10 pebble-bed reactor with SCALE6/CSAS6 and MCNP5," Technical Note, *Annals of Nuclear Energy*, Volume 64, Pages 1-7 (2014).
- M.-J. Wang, M. Simpson, and G. E. Sjoden, "Direct Multi-group Cross-sections via NJOY+OJOYU for PWR and FLiBe-MSR Reactor Systems," American Nuclear Society Annual Meeting 2023, Indianapolis, IN (2023)
- M.-J. Wang, T. Hall, G. E. Sjoden, et. al, "Experimental Benchmark of BSOLVE using the WSU TRIGA Reactor," The International Conference on Mathematics and Computational Methods Applied to Nuclear Science and Engineering (M&C 2023), Niagara Falls, Ontario, Canada (2023).
- M.-J. Wang, A. Haghghat, "Experimental Benchmark for the DRF Methodology using the VENUS-3 Problem", 2019 ANS Winter Meeting and Nuclear Technology Expo, Washington DC, U.S.A. (2019)

Dr. Hui Zhao

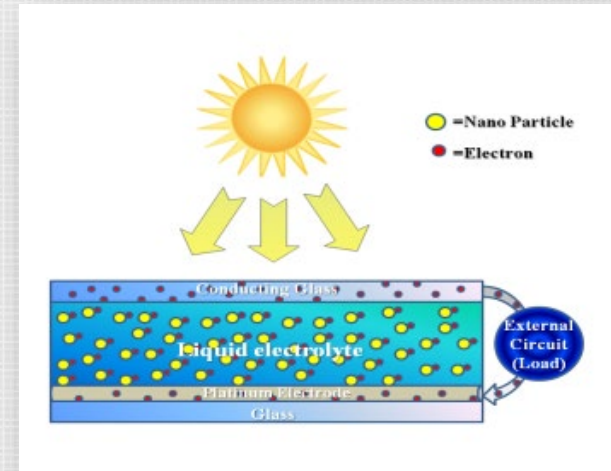
Professor, Department of Mechanical Engineering

Phone: (702) 895-1463

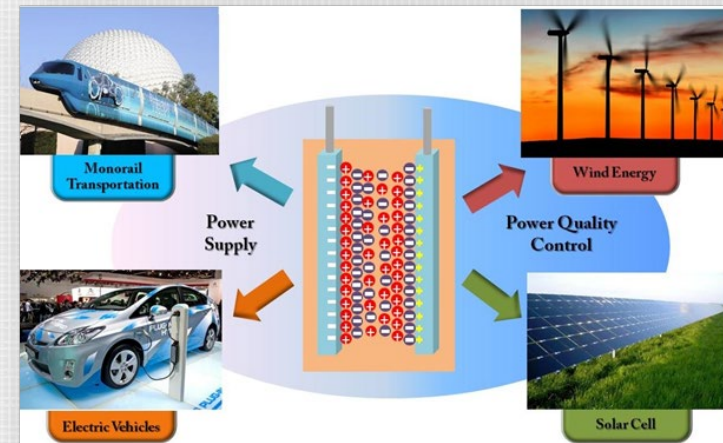
Email: hui.zhao@unlv.edu

- 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.



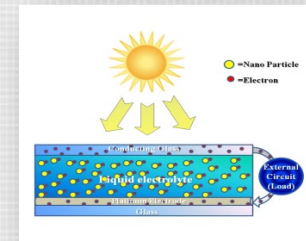
Third-generation nanocrystal-enhanced dye-sensitized solar cell.



Dr. Hui Zhao

Professor, Department of Mechanical Engineering

Relevant Publications



- He, F., Zhu, M., Fan, J., Ma, E., Zhai, S., Zhao, H.; "Automated Drone-Delivery Solar-Driven Onsite Wastewater Smart Monitoring and Treatment System" (2023) *Advanced Science*, 10 (24), art. no. 2302935.
- Krystek, D., Zhao, Y., Zhao, H.; "Discrepancy-Based Genetic Algorithm Optimization of Quasi-Random Nanostructures for Broadband Light Reflection Mitigation" (2023) IEEE Research and Applications of Photonics in Defense Conference, RAPID 2023 – Proceedings.
- Y. Zhao, M. Zhu, S. Zhai, H. Zhao. (2021), "A bioinspired hybrid light-trapping structure and its fabrication for thin-film solar cells," IEEE Photonics Conference (IPC), 1-2
- H Zhao, S Zhai. (2015), "Energy Conversion over Super-hydrophobic Surfaces". *APS meeting abstracts*.
- Zhao, H. (2012), "The influence of nonelectrostatic ion-ion interactions on double layer capacitance", *Physical Review E*, 86, 051502.
- Uppapalli, S. and Zhao, H. (2012), "The polarization of a diffuse soft particle subjected to an alternating current field," *Langmuir*, 28, 11164-11172.
- Zhao, H. (2011), "Diffuse-charge dynamics of ionic liquids in electrochemical systems", *Physical Review E*, 84, 051504.
- 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.
- Zhao, H. (2011), "Streaming potential generated by a pressure-driven flow over super-hydrophobic stripes", *Physics of Fluids*, 23, 022003. (selected for the Feb. 14, 2011 issue of *Virtual Journal of Nanoscale Science & Technology*) (top 20 most downloaded articles in Feb. 2011).