Ian T. Greenquist, PhD

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Executive Summary

My dream is to help solve global climate change by improving the performance, economics, and environmental impact of the nuclear energy industry. I am an expert in the development and use of fuel performance models for UO_2, metallic fuels, and advanced fuel concepts; sensitivity and uncertainty analysis; and code coupling. I am hardworking, passionate, driven, and reliable. I believe in always being honest, in doing what is right, in trying new things, and in performing my duty. These attributes help me deliver quality results and give me a history of good relationships with employers and coworkers.

Skill Summary

- **Expertise:** fuel performance, nuclear materials, sensitivity and uncertainty analysis, multiphysics simulations
- **Programming Languages:** C++, Python, MATLAB
- **Modeling Techniques:** Finite Element, Phase Field, Monte Carlo
- **Modeling Software:** BISON, MARMOT, MOOSE, OpenMC, ANSYS, Aspen Plus, Simulink, ChemCAD
- **Languages:** English, Spanish

Education

- **Pennsylvania State University** — State College, PA
  Doctor of Philosophy: Nuclear Engineering — 8/2019
  GPA: 3.87
- **Brigham Young University** — Provo, UT
  Bachelor of Science: Chemical Engineering — 4/2015
  GPA: 3.42
- **Brigham Young University—Idaho** — Rexburg, ID
  Associate of Applied Science: Engineering Technology — 4/2012
  GPA: 3.41

Experience

Oak Ridge National Laboratory — Oak Ridge, TN

R&D Associate Staff Member: Nuclear Fuels Analyst — 1/2021–Present

- Evaluated risk of cladding burst and fuel release for very-high-burnup UO_2 fuel rods
- Analyzed the fuel performance of weapons-grade plutonium in metallic fast reactor fuel
- Fuel performance simulations predicting the behavior of uranium-molybdenum fuel in LWR reactors
- Completed the first comprehensive uncertainty quantification of BISON metallic fuel predictions
- Developed a novel nuclear fuel and completed preliminary reactor physics and heat transfer analyses

Postdoctoral Research Associate: Nuclear Fuels Analyst — 7/2019–12/2020

- Fuel performance modeling of experimental reactors as part of Versatile Test Reactor project
- Developed 2 benchmark problems for testing and comparison of metallic fuel performance codes
- Implemented fuel performance models for U-Mo fuel and modeled the fuel in experimental conditions
- Wrote peer-reviewed papers, technical reports, presented research at conferences

Pennsylvania State University State College, PA
Research Assistant 8/2015–5/2019

- Developed a mechanistic mesoscale sintering model based on the phase field method
- First-of-kind comparison of mesoscale sintering model to experimental data
- First-of-kind quantification of kinetic effects of dopants using only simulations
- First-of-kind mesoscale model of irradiation-enhanced densification within UO_2 nuclear fuel
- Created new techniques to generate initial conditions and measure density in simulations
- Contributed C++ code to MOOSE and MARMOT phase field application

Idaho National Laboratory Idaho Falls, ID
Nuclear Engineering Intern 5/2015–7/2015

- Developed benchmark phase-field simulation based on CALPHAD data
- Developed online phase field tutorial for new users of MOOSE framework
- Helped develop code to simulate grain-size effects on highly enriched nuclear fuels

Chemical Engineering Intern 5/2014–8/2014

- Competed 2 projects to improve profitability, cleanliness, and flexibility of coal-fired power plants
- Assessed the potential of running pretreated biomass pellets in existing coal-fired power plants
- Analyzed physical and chemical properties of 8 types of biomass pellets and coal
- Constructed an Aspen Plus model of a Coal-fired power plant with attached Steam Electrolysis plant

Brigham Young University Provo, UT
Undergraduate Research Assistant 6/2013–4/2014

- Evaluated potential strategies for hybrid nuclear energy systems with oil and gas production systems
- Developed MATLAB application for model-predictive control and optimization applications
- Attended an invited session at a national laboratory on Nuclear Hybrid Energy Systems
- Wrote grant proposals, presentations, and reports

Upper-Division Math Tutor 8/2012–4/2015

- Tutored students in college math classes in principles, applications, and problem-solving strategies
- Specialized in advanced subjects: Multivariable Calculus, Linear Algebra, and Ordinary Differential Equations
- Planned and taught exam-review sessions
- Assisted with other math courses: College Algebra, Trigonometry, Calculus 1 and 2, Business Calculus

Select Publications

- **UO_2-liquid metal suspension fuel concept for enhanced passive safety of LWRs: A heat pipe case study** 2022
  I. Greenquist
  Nuclear Engineering and Design
- **Sensitivity and Uncertainty of the IFR-1 BISON Benchmark** 2022
  I. Greenquist, J. J. Powers
  Progress in Nuclear Energy
- **Metallic Fuel Performance Benchmarks for Versatile Test Reactor Applications (*Invited*)** 2022
  J. Hirschhorn, J. J. Powers, I. Greenquist, R. T. Sweet, J. Hu, D. L. Porter, D. C. Crawford
  Nuclear Science and Engineering
- **25 Pin BISON Fuel Performance Benchmark Case Based on the X430 Series of Experiments** 2021
  I. Greenquist, J. J. Powers
  Journal of Nuclear Materials

- Development of a U-19Pu-10Zr Fuel Performance Benchmark Problem Based on the IFR-1 Experiment 2021
  I. Greenquist, K. M. Cunningham, J. Hu, J. J. Powers, D. C. Crawford
  Journal of Nuclear Materials
- Analysis of the Impact of Fuel Microstructure on Irradiation-Enhanced Densification Using Grand Potential Simulations 2021
  I. Greenquist, M. Tonks, Y. Zhang
  Annals of Nuclear Energy
- Research Needs for Uranium-Zirconium-Based Metallic Fuels 2020
  A. Aitkaliyeva, M. Tonks, J. Hirschhorn, J. J. Powers, I. Greenquist, B. Beeler
  INL Technical Memo
- Grand Potential Sintering Simulations of Doped UO_2 Accident-Tolerant Fuel Concepts 2020
  I. Greenquist, M. Tonks, M. Cooper, A. Andersson, Y. Zhang
  Journal of Nuclear Materials
- Development of a Microstructural Grand Potential-Based Sintering Model 2020
  I. Greenquist, M. Tonks, L. K. Aagesen, Y. Zhang
  Computational Materials Science
- Review of Sintering and Densification in Nuclear Fuels: Physical Mechanisms, Experimental Results, and Computational Models 2018
  I. Greenquist, M. Tonks, Y. Zhang
  Journal of Nuclear Materials