

# Nolan E. Goth

NUCLEAR ENGINEER

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## Experience

### Oak Ridge National Lab

*Oak Ridge, Tennessee*

R&D ASSOCIATE NUCLEAR ENGINEER

*2021 - Present*

- Designed and constructed a molten chloride salt bearing test rig for salt-wetted bearing development
- Designed and tested HALEU targets to address molybdenum-99 domestic supply chain issues
- Generated cryogenic system models and machine learning control optimization for the Spallation Neutron Source

R&D ASSISTANT NUCLEAR ENGINEER

*2019 - 2021*

- Analyzed thermal-hydraulics of high-temperature pebble bed reactor cores
- Designed and analyzed fluoride and chloride molten salt heat exchangers and test sections

### Texas A&M University

*College Station, Texas*

GRADUATE RESEARCHER, FAST REACTOR FUEL ASSEMBLY FLOW CHARACTERIZATION

*2015 - 2018*

- Group leader of a six-person team with \$1.2M budget
- Designed, procured, constructed, and operated an experimental flow facility
- Performed PIV, SPIV, and PTV laser-based measurement techniques to quantify fuel assembly flow behavior
- Collaborated with NASA on the design of a compact reactor module for Martian surface fission power

### The Babcock & Wilcox Company, mPower SMR

*Lynchburg, Virginia*

OPERATIONS ENGINEER & PROJECT MANAGER

*2013 - 2014*

- Performed system design reviews of mPower SMR systems
- Developed budget trends, tracked critical paths, and formulated weekly plans

### Missouri S&T

*Rolla, Missouri*

SENIOR REACTOR OPERATOR & OPERATIONS INSTRUCTOR

*2010 - 2012*

- Conducted reactor power maneuvers and supervised fuel movements, material irradiations, and handling activities
- Taught introductory reactor operations classes

### Smith-Goth Engineers, Inc.

*Springfield, Missouri*

AUTOCAD TECHNICIAN

*2006 - 2008*

- Designed and drafted HVAC, lighting, and fire protection systems

## Education

### Texas A&M University

*College Station, Texas*

PHD IN NUCLEAR ENGINEERING

*2018*

MS IN NUCLEAR ENGINEERING

### Missouri S&T

*Rolla, Missouri*

BS IN NUCLEAR ENGINEERING

*2012*

BA IN ECONOMICS

## Select Publications

### JOURNAL

- [1] Thien Nguyen, **Goth, Nolan**, Philip Jones, Saya Lee, Rodolfo Vaghetto, and Yassin Hassan. "PIV measurements of turbulent flows in a 61-pin wire-wrapped hexagonal fuel bundle". In: *International Journal of Heat and Fluid Flow* 65 (2017), pp. 47–59.
- [2] Thien Nguyen, **Goth, Nolan**, Philip Jones, Rodolfo Vaghetto, and Yassin Hassan. "Stereoscopic PIV measurements of flow in a complex geometry of a tightly packed rod bundle with wire spacers". In: *International Journal of Heat and Fluid Flow* (2017).

- [3] Rodolfo Vaghetto, **Goth, Nolan**, Philip Jones, Mason Childs, Saye Lee, Duy Thien Nguyen, and Yassin A Hassan. “Pressure Measurements in a Wire-Wrapped 61-Pin Hexagonal Fuel Bundle”. In: *Journal of Fluids Engineering* 140.3 (2018), p. 031104.
- [4] **Goth, Nolan**, Philip Jones, Thien Nguyen, Rodolfo Vaghetto, and Yassin Hassan. “PTV/PIV Measurements of Turbulent Flows in Interior Subchannels of a 61-Pin Wire-Wrapped Hexagonal Fuel Bundle”. In: *International Journal of Heat and Fluid Flow* (2018).
- [5] **Goth, Nolan**, P Jones, DT Nguyen, R Vaghetto, YA Hassan, A Obabko, E Merzari, and PF Fischer. “Comparison of experimental and simulation results on interior subchannels of a 61-pin wire-wrapped hexagonal fuel bundle”. In: *Nuclear Engineering and Design* 338 (2018), pp. 130–136.
- [6] Mason Childs, Rodolfo Vaghetto, Philip Jones, **Goth, Nolan**, and Yassin Hassan. “Experimental Determination and Analysis of the Transverse Pressure Difference in a Wire-Wrapped Rod Bundle”. In: *International Journal of Heat and Mass Transfer* (2020).

## CONFERENCE

- [1] **Goth, Nolan**, Mason Childs, Philip Jones, Saya Lee, D.T. Nguyen, Rodolfo Vaghetto, and Y.A. Hassan. “Particle Image Velocimetry Measurements in a Wire-Wrapped 61-pin Hexagonal Fuel Bundle”. In: *American Nuclear Society Winter Meeting*. 2016.
- [2] **Goth, Nolan**, Philip Jones, Saya Lee, D.T. Nguyen, Rodolfo Vaghetto, and Y.A. Hassan. “Velocity and Pressure Measurements in a Wire-Wrapped 61-Pin Hexagonal Fuel Bundle”. In: *Engineering Turbulence Modeling and Measurements* 11. 2016.
- [3] **Goth, Nolan**, Philip Jones, Mason Childs, Saya Lee, D.T. Nguyen, Rodolfo Vaghetto, and Y.A. Hassan. “Pressure Measurements in a Wire-Wrapped 61-Pin Hexagonal Fuel Bundle”. In: *American Nuclear Society Winter Meeting*. 2016.
- [4] Rodolfo Vaghetto, **Goth, Nolan**, Mason Childs, Philip Jones, Saya Lee, D.T. Nguyen, and Y.A. Hassan. “Flow Field and Pressure Measurements in a 61-Pin Wire-Wrapped Hexagonal Fuel Bundle”. In: *American Nuclear Society Winter Meeting*. 2016.
- [5] **Goth, Nolan**, Philip Jones, Saya Lee, D.T. Nguyen, Rodolfo Vaghetto, and Y.A. Hassan. “Time-Resolved PIV/PTV Measurements on Interior Subchannels of a Wire-Wrapped 61-pin Hexagonal Fuel Bundle”. In: *American Nuclear Society Annual Meeting*. 2017.
- [6] **Goth, Nolan**, Philip Jones, D.T. Nguyen, Rodolfo Vaghetto, Y.A. Hassan, Aleksandr Obabko, Elia Merzari, and Paul Fisher. “Comparison of Experimental and Simulation Results on Interior Subchannel of a 61-Pin Wire-Wrapped Hexagonal Fuel Bundle”. In: *17th International Topical Meeting on Nuclear Reactor Thermal Hydraulics*. 2017.
- [7] **Goth, Nolan**, Philip Jones, D.T. Nguyen, Rodolfo Vaghetto, and Y.A. Hassan. “Turbulent Transverse Plane PIV Measurements on a Wire-Wrapped 61-Pin Hexagonal Fuel Bundle”. In: *26th International Conference on Nuclear Engineering*. 2018.
- [8] **Goth, Nolan**, Lance White, William Headley, D.T. Nguyen, Rodolfo Vaghetto, and Y.A. Hassan. “High Resolution Transverse Plane PIV Measurements of a 61-pin LMFBR Fuel Bundle”. In: *American Nuclear Society Winter Meeting*. 2018.
- [9] Lance White, **Goth, Nolan**, Thien Nguyen, Rodolfo Vaghetto, and Yassin Hassan. “High-Fidelity Velocity Measurements in a Totally Blocked Interior Subchannel of a Wire-wrapped 61-Pin Hexagonal Fuel Bundle”. In: *Thermal Hydraulic Simulations and Experiments for the Safety Assessment of Metal cooled reactors (SESAME)*. 2019.
- [10] **Goth, Nolan**, Marilyn Delgado, Trevor Howard, and Kevin Robb. “Molten Salt Air-Cooled Heat Exchanger Fluid Dynamics”. In: *American Nuclear Society Winter Meeting*. 2020.
- [11] **Goth, Nolan**, Trevor Howard, Jorge Navarro, Elliott J Fountain, Nesrin Ozgan Cetiner, and Chris Bryan. “Design and Heat Generation Rate Analysis of LEU-UAlx Dispersion Target Plates for Irradiation in the High Flux Isotope Reactor”. In: *American Nuclear Society Annual Meeting*. 2021.
- [12] **Goth, Nolan**, Trevor Howard, Jorge Navarro, Elliott J Fountain, Nesrin Ozgan Cetiner, and Chris Bryan. “Thermal-Hydraulic Analysis and Experimental Flow Testing of LEU-UAlx Dispersion Target Plates for Irradiation in the High Flux Isotope Reactor”. In: *American Nuclear Society Annual Meeting*. 2021.
- [13] **Goth, Nolan**, Trevor Howard, Jorge Navarro, Elliott J Fountain, Nesrin Ozgan Cetiner, and Chris Bryan. “Component-and System-Level Thermal-Hydraulic Modeling of LEU-UAlx Dispersion Target Plates for Irradiation in the High Flux Isotope Reactor”. In: *19th International Topical Meeting on Nuclear Reactor Thermal Hydraulics*. 2022.
- [14] **Goth, Nolan**, Duy Thien Nguyen, and W. David Pointer. “Investigation of Point Contact Strategies for CFD Simulations of Pebble Bed Reactor Cores”. In: *American Nuclear Society Annual Meeting*. 2022.
- [15] **Goth, Nolan**, Duy Thien Nguyen, Kevin Robb, and Ethan Kappes. “Numerical Investigation of Cartridge Heater Performance Applied to the FASTR Main Heater for Molten Chloride Salts”. In: *American Nuclear Society Annual Meeting*. 2022.
- [16] **Goth, Nolan**, Jorge Navarro, Elliott Fountain, Alex Huning, and Chris Bryan. “Preliminary Design Status of HALEU Annular Targets for Irradiation in the High Flux Isotope Reactor”. In: *American Nuclear Society Annual Meeting*. 2022.

- [17] Bryan Maldonado, Frank Liu, **Goth, Nolan**, Pradeep Ramuhalli, Matthew Howell, Ryuji Maekawa, and Sarah Cousineau. “Data-Driven Modeling of a High Capacity Cryogenic System for Control Optimization”. In: *22nd World Congress of the International Federation of Automatic Control (IFAC)*. 2023.
- [18] **Goth, Nolan**, Frank Liu, Bryan Maldonado, Pradeep Ramuhalli, Matthew Howell, Ryuji Maekawa, and Sarah Cousineau. “Dynamic systems modeling of the Spallation Neutron Source Cryogenic Moderator System to optimize transient control and prepare for power upgrades”. In: *2023 Cryogenic Engineering Conference and International Cryogenic Materials Conference*. 2023.
- [19] Duy Thien Nguyen, **Goth, Nolan**, Pablo Moresco, Vincent Jodain, and Vivek Rao. “Preliminary experimental and numerical studies of light-core vortex rings”. In: *American Nuclear Society Winter Meeting*. 2023.

## TECHNICAL REPORTS

- [1] Duy Thien Nguyen, **Goth, Nolan**, Pablo Moresco, Vincent Jodain, and Vivek Rao. *Design and Testing of the Vortex Ring Facility*. Tech. rep. Oak Ridge National Lab.(ORNL), Oak Ridge, TN (United States), 2023.

## THESIS & DISSERTATION

- [1] **Goth, Nolan**. “Design and PIV Measurements on a Wire-Wrapped 61-Rod Hexagonal Fuel Assembly Experimental Facility”. MA thesis. Texas A&M University, 2017.
- [2] **Goth, Nolan**. “Analysis of Experimental PIV/PTV Measurements on a Matched-Index-of-Refraction 61-Pin Wire-Wrapped Hexagonal Fuel Bundle”. PhD thesis. 2018.

## Skills

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<b>Thermal Hydraulics (Sim)</b>	StarCCM+, OpenFOAM, Ansys, BISON, EcosimPro, COBRA-TF
<b>Thermal Hydraulics (Exp)</b>	Test Loops, Optics, Instrumentation, Sensors, LDV, PIV, SPIV, PTV
<b>Neutronics (Sim)</b>	Serpent, MPACT, MCNP, SCALE/ORIGEN, Homemade Diffusion/Transport/MOC Codes
<b>Neutronics (Exp)</b>	Shielding, Dosimetry, Directional Detectors
<b>Reactor Operations</b>	Senior Reactor Operator, Fuel Movement, Power Maneuver, Operator Training
<b>Programming</b>	Python, MATLAB, $\LaTeX$ , C++, SQL
<b>Modeling</b>	Solidworks, AutoCAD, Tecplot, Paraview, Gmsh

## Certifications and Awards

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- 2021 **ORNL Inventor**, UT-Battelle
- 2018 **Innovations in Nuclear Technology R&D Award - 2<sup>nd</sup> Place**, U.S. Department of Energy
- 2017 **Workshop and First Place Poster**, Consortium for Advanced Simulation of LWRs (CASL) Summer Institute
- 2017 **Crane Operator**, National Commission for the Certification of Crane Operators
- 2012 **Magna Cum Laude**, Missouri S&T
- 2011-12 **Senior Reactor Operator License**, Nuclear Regulatory Commission
- 2008-12 **Bright Flight Scholarship**, Missouri Dept of Higher Education
- 2008-12 **NRC Scholarship**, Nuclear Regulatory Commission