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# Nicholas G. Russell, P.E.

(Nick)

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Oak Ridge, TN 37831-6003

## PROFESSIONAL EXPERIENCE

Irradiation Design Engineer, Technical Staff Member — April 2023 - Present
Oak Ridge National Laboratory

- Work with the Irradiation Engineering (IE) group to design and fabricate novel irradiation experiments for use in the High Flux Isotope Reactor (HFIR). Supporting material, radioisotope, and nuclear fuel research.
- Support the ORNL radioisotope program to develop crucial isotopes such as $^{238}$Pu, $^{75}$Se, and $^{63}$Ni.
- Custodian of Nuclear Energy and Fuel Cycle Division's water test loop, a critical system that mimics the flow characteristics of HFIR's different facilities.
- Actively implementing a newly designed target rod that makes up the flux trap bundle within HFIR's core. The work will increase the coolant flow through the core allowing for the use of more target locations, as well as, simplifying the manufacturing and therefore lowering time and cost to fabricate.
- Designing a new larger capacity irradiation capsule capable of irradiating BWR cladding tube specimens in HFIR. Design will increase capsule internal volume by over 20%.
- Optimized the flow geometry for qualification of the Generation III $^{238}$Pu targets in HFIR by flow testing the experiment assembly. See publication 1 below.
- Fabricated a miniature fuel experiment for HFIR's vertical experiment facility to test taggant performance in $UO_2$ fuel to support nuclear forensics. See conference proceedings 17 below.

Irradiation Design Engineer, Associate Technical Staff Member — December 2019 - April 2023
Oak Ridge National Laboratory

- Developed measurement systems for testing molten salt thermophysical properties in support of industry and the molten salt reactor program at ORNL. See publications 2-4 and variable gap patent below.
- Designed a molten tin irradiation capsule to determine the effects of neutron irradiation on the corrosion rate of FeCrAl for use in fusion reactors. Implemented new capability for liquid metal corrosion testing in the HFIR flux trap. See publication 5 below.
- Designed a HFIR experiment to test a proprietary high temperature shielding material's performance within the flux trap of HFIR.
- Supported HFIR restart by flow testing surrogate HFIR fuel plates to test weld performance.
- Developed HFIR safety calculations and new designs, as well as, task leader on numerous irradiation projects.

Post Master's Research Associate — January 2019 - December 2019
Oak Ridge National Laboratory

- Worked with the NEIT group, now IE group, to design and build irradiation experiments.

Graduate Research Assistant — May 2017 - December 2018
Tennessee Tech University

- Employed by Lincoln Laboratory at MIT to develop stress - strain data for the solder used in their printed circuit board designs. This data along with an FEA model were used to determine cryogenic thermal cycling effects and failure on the electronic packages.

Undergraduate Research Assistant — September 2016 - May 2017
Tennessee Tech University

## EDUCATION

Master of Science in Mechanical Engineering — May 2019
Tennessee Tech University — 3.75 GPA

- Thesis: *Determination of Stress - Strain Response for Eutectic 63Sn-37Pb Solder at Cryogenic Temperatures using Instrumented Indentation and Finite Element Analysis*

Bachelor of Science in Mechanical Engineering, Cum Laude — May 2017
Tennessee Tech University — 3.65 GPA

## SKILLS

*Technical*: Experiment design, finite element analysis, thermal hydraulics, machine design, and mechanics of materials

*Computational*: ANSYS, Abaqus, PTC Mathcad and Creo, SolidWorks, Inventor, MATLAB, Octave, Python, LaTeX, and Microsoft Office

## CREDENTIALS AND AFFILIATIONS

- Professional Engineer, State of Tennessee Registration #127736 — January 2024 - Present
- American Society of Mechanical Engineers, Member — April 2023 - Present
- Granted DOE 'Q' Clearance — June 2022 - Present
- Scouts BSA, Assistant Scoutmaster and Advancement Chair — February 2019 - Present
- Tau Beta Pi Engineering Honor Society, Member — November 19, 2016
- Pi Tau Sigma Mechanical Engineering Honor Society, Treasurer and Service Chair — April 28, 2016
- Eagle Scout — September 24, 2013

## PATENTS

- Gallagher et al. "Variable Gap Thermal Conductivity Apparatus and Method" U.S. Patent No. 11,719,656, filed September 24, 2021, and issued August 8, 2023.

## PUBLICATIONS

*Journal Articles*

1. **Russell, N. G.**, Howard, R. H., Smith, K. R., "Development of the Generation III (ATR Generation I) Plutonium-238 Production Target Design" 2023. Appl. Radiat. Isot. https://doi.org/10.1016/j.apradiso.2023.110912.
2. Gallagher, R. C., Agca, C., **Russell, N. G.**, McMurray, J. W., Ezell, N. D., "Assessment of Molten Eutectic LiF-NaF-KF Density through Experimental Determination and Semiempirical Modeling" 2022. J. Chem. Eng. Data. https://doi.org/10.1021/acs.jced.2c00081.
3. Gallagher, R. C., Birri, A. H., **Russell, N. G.**, Phan, A., Gheribi, A. E. "Investigation of the thermal conductivity of molten LiF-NaF-KF with experiments, theory, and equilibrium molecular dynamics" 2022. J. Mol. Liq. https://doi.org/10.1016/j.molliq.2022.119151.
4. Gallagher, R. C., Birri, A. H., **Russell, N. G.**, Ezell, N. D., "Design and performance of a variable gap system for thermal conductivity measurements of high temperature, corrosive, and reactive fluids" 2022. Int. J. Heat Mass Transf. https://doi.org/10.1016/j.ijheatmasstransfer.2022.122763.
5. Kondo, M., Pint, B. A., Jun, J., **Russell, N. G.**, McDuffee, J. L., et al., "Conceptual Design of HFIR Irradiation Experiment for Material Property Compatibility Study on Liquid Sn Divertor" 2021. Plasma Fusion Res. Vol. 16, 2405040, May 2021. https://doi.org/10.1585/pfr.16.2405040.

*Technical Reports*

6. Birri, A. H., Sweeney, D. C., **Russell, N. G.**, Stiefel, K. E., Crowell, M. W., Fuller, M. D., Triplett, B. E., Petrie, C. M., "Testing of an Optical Fiber--Based Gamma Thermometer in the High Flux Isotope Reactor Gamma Irradiation Facility" ORNL/TM-2023/3029, 2023. https://doi.org/10.2172/1996658.
7. Hauck, G., Bryan, C., Chandler, D., Crawford, D., Fudurich, V., Grooms, M., Pointer, D., **Russell, N. G.**, "Volume 10: Flow Test Facilities; HFIR Futures – Enhanced Capabilities Series" ORNL/TM-2022/2691/V10, 2023. https://doi.org/10.2172/1922301.
8. Birri, A. H., Gallagher, R. C., **Russell, N. G.**, Termini. N. C., Rose, P., Ezell, N. D., "FY22 Progress Report on Viscosity and Thermal Conductivity Measurements of Molten Salts" ORNL/TM-2022/2573, 2022. https://doi.org/10.2172/1887678.
9. On, C., **Russell, N. G.**, Bhattacharya. A., "HFIR Neutron Irradiations on Fusion Structural Steels in LDRD Project 10816" 2022.
10. On, C., **Russell, N. G.**, Arregui-Mena, J. D., "Summary Results for BECQ GAIN Project" ORNL/SPR-2022/2527, 2022.
11. Queern, S. L., Green, H. M., Conner, J. D., Foster, C. J., **Russell, N. G.**, "2020 $^{63}$Ni Campaign: Target Fabrication" ORNL/TM-2021/2027, 2021.
12. Petrie, C. M., Geringer, J. W., James, A., Smith, K. R., Burns, J. R., Le Coq, A. G., **Russell, N. G.**, Deck, C. P., Koyanagi, T., Katoh, Y., "HFIR SiC Bowing Test Ready to Insert" ORNL/SPR-2021/1838, 2021. https://doi.org/10.2172/1778084.
13. Le Coq, A. G., Petrie, C. M., Harp, J. M., Mulligan, P. L., Champlin, P. A., **Russell, N. G.**, Linton, K. D., Nelson, A. T., "FY 2020 AFC HFIR Irradiation and PIE Status Report" ORNL/SPR-2020/1731, 2020.
14. Ezell, N. D., Gallagher, R. C., **Russell, N. G.**, Martin, A., McAlister, A., McMurray, J. W., "Thermophysical Property Measurements of Salt Mixtures" ORNL/TM-2020/1633, 2020. https://doi.org/10.2172/1763479.
15. Geringer, J. W., Robertson, J. P., Chen, X., Champlin, P. A., **Russell, N. G.**, Katoh, Y., "Annual DOE-QST Collaborative Research Report" ORNL/SPR-2019/1278, 2019.
16. Ezell, N. D., Kisner, R., **Russell, N. G.**, Reed, F. K., Champlin, P. A., Keiser, J., Martin, A., Holcomb, D., "Development of a Corrosion Monitoring System for Advanced Molten Salt Reactors" ORNL/TM-2019/1273, 2019. https://doi.org/10.2172/1566970.

*Conference Proceedings*

17. Linton, K. D., Gorton, J. P. **Russell, N. G.**, Howard, R. H., Le Coq, A. G., Petrie, C. P., "Harnessing HFIR Neutron Irradiations: Innovative Experiments and Standardized Capabilities" co-author on presentation at TMS 2024, Orlando, FL, USA, March 3-7, 2024.
18. **Russell, N. G.**, Chapel, A. S., Howard, R. H., Bryan, C. D., Hirtz, G. J., Crowell, M. W., "Design and Testing of a Next Generation HFIR Target Rod Rabbit Holder Facility" Presented at ANS MiNES 2023, New Orleans, LA, USA, December 10-14, 2023.
19. Le Coq, A. G., Gorton, J. P., **Russell, N. G.**, Schrell, A. M., Linton, K. D., "Advanced Reactor Irradiation Testing at Oak Ridge National Laboratory under the Nuclear Science User Facilities Program" co-author on presentation at ANS MiNES 2023, New Orleans, LA, USA, December 10-14, 2023.

20. **Russell, N. G.**, Pint, B. A., Kondo, M., "Liquid Tin Compatibility Experiment in HFIR" Presented at ANS MiNES 2023, New Orleans, LA, USA, December 10-14, 2023.
21. Wilson, B., Shields, A., **Russell, N. G.**, Nelson, A. T., Ulrich, T., Scott, S., Wellons, M., "Irradiation of Isotopically Tagged $UO_2$ Fuel for Intentional Forensics Purposes" Proc. 2022 ANS Winter Meeting and Technology Expo, Phoenix, AZ, USA, November 13-17, 2022.
22. Gallagher, R. C., **Russell, N. G.**, Rose, P., Agca, C., Martin, A., Chapel, A. S., Ezell, N. D., "Experimental Property Measurements on Molten Salts" Proc. 2021 ACS Annual Meeting, Atlanta, GA, USA, August 22-26, 2021.
23. Gallagher, R. C., **Russell, N. G.**, Martin, A., Ezell, N. D., "Thermophysical Property Measurements of Molten Salts: Perspectives on Fuel and Irradiated Salts" Proc. 2020 ANS Winter Meeting and Nuclear Technology Expo, Chicago, IL, USA, November 16-19, 2020.