

# Prashant K. Jain

Oak Ridge National Laboratory  
Oak Ridge, TN 37831-6167

- Phone: 865-278-6400 (cell) • E-Mail: [jainpk@ornl.gov](mailto:jainpk@ornl.gov)
- ORCID: 0000-0001-7055-2386 • Citizenship: USA
- <https://www.ornl.gov/staff-profile/prashant-k-jain>

## Profile

Dr. Prashant Jain is a Group Leader and R&D staff member for Thermal Hydraulics research in the Reactor and Nuclear Systems Division at Oak Ridge National Laboratory (ORNL). Prashant received his MS (2006) and PhD (2010) in nuclear engineering from the University of Illinois, Urbana-Champaign, and his BTech (2004) in mechanical engineering from the Indian Institute of Technology, Bombay. He has over 15 years of experience in nuclear thermal design and safety analyses, computational fluid dynamics, single- and two-phase turbulent flows and heat transfer, advanced multi-physics modeling, analytical benchmarks, lattice Boltzmann method, and parallel scientific software development. At ORNL, he leads the development of advanced three-dimensional multi-physics design and safety basis models for the present highly enriched uranium core and the proposed low-enriched uranium core designs of the High Flux Isotope Reactor (HFIR). He also serves as an R&D analyst for the Spallation Neutron Source (SNS) Proton Power Upgrade project and its Second Target Station (STS) design project. He is also the principal developer of the ORNL's lattice Boltzmann method CFD code, PRATHAM, and the thermo-fluidics thrust lead for the Transformational Challenge Reactor (TCR) project. Prashant is a recipient of the American Nuclear Society (ANS) Mark Mills Award for his doctoral research on lattice Boltzmann methods and UT-Battelle's 2019 Mission Support Award for his contributions towards the HFIR event causal analysis.

## Education

- **Ph.D. in Nuclear Engineering,** 2006 – 2010  
University of Illinois, Urbana-Champaign
- **M.S. in Nuclear Engineering,** 2004 – 2006  
University of Illinois, Urbana-Champaign
- **Bachelor of Technology in Mechanical Engineering,** 2000 – 2004  
Indian Institute of Technology, Bombay, INDIA

## Research Experience

**Group Leader** 2020 – present  
*Thermal Hydraulics Group*  
*Reactor and Nuclear Systems Division, ORNL*

- Leads a research group of staff scientists, engineers, postdoctoral candidates and students to strategically advance research and development in computational fluid dynamics (CFD), multi-physics modeling and thermal hydraulics for nuclear and other energy systems.
- Develop and implement plans to expand research directions and exploit new opportunities to position the group for future success.
- Thermofluidic Thrust Lead – Transformational Challenge Reactor (TCR) Project
- Multiphysics CFD Lead – HFIR LEU Conversion Program
- Principal Investigator – HPC4Manufacturing Projects
- Contributor – ARPA-E INTEGRATE, SNS Proton Power Upgrade, SNS Second Target Station Projects

**Thermal Hydraulics Team Lead**

2018 – 2020

*Advanced Reactor Engineering Group**Reactor and Nuclear Systems Division, ORNL*

- Led a team of staff scientists, engineers and postdoctoral candidates to advance research in CFD and nuclear systems safety analysis.
- Established multiphysics research capabilities for nuclear applications to benefit from advancement in high-performance computing technologies.
- Successfully expanded existing research efforts and assisted group leader to recruit a high-quality diverse pool of qualified candidates for the team.

**Nuclear Computational Fluid Dynamics Engineer**

2012 – 2018

*Thermal Hydraulics and Irradiation Engineering Group**Reactor and Nuclear Systems Division, ORNL*

- Led the development of advanced multi-physics modeling and simulation capabilities for the HFIR low-enriched uranium conversion project under the auspices of the DOE National Nuclear Security Administration Office of Material Management and Minimization.
- Served as an independent safety reviewer for the Plutonium-238 production program sponsored by the National Aeronautics and Space Administration.
- Responsible for performing independent safety reviews for the low-flow qualification of HFIR beam tubes and numerous other material irradiation tests and experiments using advanced CFD simulations.
- Supported proposal and program development activities for the ORNL seed money and laboratory-directed R&D programs, nuclear energy advanced modeling and simulation program, nuclear regulatory commission, advanced manufacturing office, nuclear energy university program, nuclear safety research and development program, and high-performance computing for manufacturing program.
- Supported development of a high-temperature capable centrifugal pump technology for molten salt reactors through advanced CFD simulations.

**Postdoctoral Research Associate**

2010 – 2012

*Thermal Hydraulics and Irradiation Engineering Group**Reactor and Nuclear Systems Division, ORNL*

- Led the development of an ORNL lattice Boltzmann method code, PRATHAM, Parallel Thermal Hydraulics using Advanced Mesoscopic Methods.
- Led the development of a parallel Cartesian mesh generator code, CartGen++ for high-performance computing applications.
- Supported DOE Fukushima accident analysis efforts using exploratory hydrogen explosion simulations through time-dependent, explicit finite element methods in LS-DYNA, and computational fluid dynamics simulations using COMSOL Multiphysics and STAR-CCM+.
- Developed and published infinite-series exact analytical solutions for a variety of multi-layer heat conduction problems.

**Summer Research Internships**

2006 – 2009

- Idaho National Laboratory (2008, 2009)

Supported development of an advanced utility toolkit to enable multi-variable couplings between different neutronics and thermal-hydraulics code systems.

- Argonne National Laboratory (2007)  
Guest graduate appointment to collaborate on the development of an advanced multiphase lattice Boltzmann code package.
- Oak Ridge National Laboratory (2006)  
Coupled ATHENA (Advanced Thermal Hydraulic Energy Network Analyzer) code with the National Institute of Standards and Technology Reference Property Database to include cryogenic and other fluid properties.

### Graduate Research Assistant

2004 – 2010

*Nuclear Plasma and Radiological Engineering*

*University of Illinois, Urbana-Champaign*

- Developed a parallel two-phase dynamics simulation toolkit using the lattice Boltzmann method to improve fundamental understanding of nuclear boiling water reactor applications.
- Developed a flow-stability analysis code to predict flow instabilities in a natural circulation loop with supercritical water and CO<sub>2</sub> fluids.

### Technical Skills

- Experienced nuclear safety professional with specific focus on advanced multi-physics software and technology for high-fidelity modeling and simulation of nuclear systems.
- Expert in industry leading computational fluid dynamics technologies, including COMSOL Multiphysics, STAR-CCM+ and ANSYS Workbench.
- Expert in many programming and scripting languages, including Fortran 90, C, C++, Python, Perl, and MATLAB.
- Expert in parallel programming paradigms, including Message Passing Interface – MPI, OpenMP, and knowledgeable in GPU-based code acceleration methods, CUDA and OpenCL on leadership computing facilities.
- Experience with other engineering tools and packages, including RELAP5, ATHENA, Pro-ENGINEER, SpaceClaim, LS-DYNA, MATLAB, Mathematica, VisIt, ParaView, and TecPlot.

### Awards and Honors

- **UT-Battelle Mission Support Award** 2019  
For distinguished performance and dedication in determining the causes of the first fuel element failure in 52 years of HFIR operation.
- **ORNL Significant Event Award** 2012  
Nuclear Science and Engineering Directorate at ORNL conferred this award to recognize significant project accomplishments in developing Plutonium-238 production capabilities at the High Flux Isotope Reactor.
- **COMSOL Best Paper Award** 2012  
Paper on design and safety basis simulations for Pu-238 bare pellet irradiation was selected as the best paper for COMSOL's annual conference in Boston in 2012.



Eaton Corporation  
HolosGen LLC

Praxair, Inc  
X-energy

- Academic and research collaborations with  
Indian Institute of Technology, Bombay India  
University of Illinois, Urbana-Champaign IL  
Kansas State University, Manhattan KS  
University of Michigan, Ann Arbor MI  
University of Tennessee, Knoxville TN  
University of Missouri, Rolla MO  
Virginia Commonwealth University, Richmond VA  
Argonne National Laboratory, Lemont IL  
Idaho National Laboratory, Idaho Falls ID

### Publications: Journal Articles

- B.R. Betzler, B.J. Ade, A.J. Wysocki, P.K. Jain, P.C. Chesser, M.S. Greenwood, and K.A. Terrani. Transformational Challenge Reactor Preconceptual Core Design Studies. Submitted to Nuclear Engineering and Design, 2020.
- M. Sandlin, K. Nawaz, B. Fricke, V.M. Rao, C. Cramer, E.L. Curzio, A. Elliott, and P.K. Jain. An Overview of the Design of High Temperature Heat Exchangers: State of the Art Developments and Prospects. Submitted to Renewable and Sustainable Energy Reviews, 2020.
- D. Franken, D. Gould, P.K. Jain, H. Bindra. Numerical Study of Air Ingress Transition to Natural Circulation in a High Temperature Helium Loop. In Press, Annals of Nuclear Energy, Vol. 111, January 2018.
- C.J. Hurt, J.D. Freels, P.K. Jain, G.I. Maldonado. Thermo-Mechanical Safety Analyses of Preliminary Design Experiments for Pu-238 Production. In Press, ASME Journal of Nuclear Engineering and Radiation Science, 2017 (NERS-16-1069).
- C.J. Hurt, J.D. Freels, P.K. Jain, G.I. Maldonado. Thermo-Mechanical Safety Analyses for Pu-238 Production Target at the HFIR. In Press, ASME Journal of Nuclear Engineering and Radiation Science, 2017 (NERS-16-1070).
- S. Singh, P.K. Jain, Rizwan-uddin. Analytical Solution for Three-Dimensional, Unsteady Heat Conduction in a Multilayer Sphere. Journal of Heat Transfer, Paper 101301, Vol. 138, October 2016.
- D. Wang, I.C. Gauld, G.L. Yoder, L.J. Ott, G.F. Flanagan, M.W. Francis, E.L. Popov, J.J. Carbajo, P.K. Jain, J.C. Wagner, J.C. Gehin. Study of Fukushima Daiichi Nuclear Power Station Unit-4 Spent Fuel Pool. Nuclear Technology, 180(2):205-215, 2012.
- S. Singh, P.K. Jain, Rizwan-uddin. Finite Integral Transform Method to Solve Asymmetric Heat Conduction in a Multilayer Annulus with Time-Dependent Boundary Conditions. Nuclear Engineering and Design, 83(2):144-154, 2011.
- P.K. Jain, S. Singh, Rizwan-uddin. An Exact Analytical Solution for Two-Dimensional, Unsteady, Multilayer Heat Conduction in Spherical Coordinates. International Journal of Heat and Mass Transfer, 53(9-10):2133-2142, 2010.
- P.K. Jain, A. Tentner, Rizwan-uddin. A Lattice Boltzmann Framework to Simulate Boiling Water Reactor Core Hydrodynamics. Computers and Mathematics with Applications, 58(5):975-986, 2009.
- P.K. Jain, S. Singh, Rizwan-uddin. Analytical Solution to Transient Asymmetric Heat Conduction in a Multilayer Annulus. Journal of Heat Transfer, 131(1):011304(1-7), 2009.
- S. Singh, P.K. Jain, Rizwan-uddin. Analytical Solution to Transient Heat Conduction in Polar Coordinates with Multiple Layers in Radial Direction. International Journal of Thermal Sciences, 47(3):261-273, 2008.
- P.K. Jain, Rizwan-uddin. Numerical Analysis of Supercritical Flow Instabilities in a Natural Circulation Loop. Nuclear Engineering and Design, 238(8):1947-1957, 2008.

- P.K. Jain, Y. Gu, Rizwan-uddin. Broadcasting Engineering Laboratories, Audio/Video and Data, in Real Time over the Internet. *Advances in Engineering Education*, 1(2):1-17, 2008.

### Publications: Technical Proceedings

- V.M. Rao, M. Delchini, P.K. Jain and M.T. Ahmad. HPC to Enable Next-generation Low-temperature Waste Heat Recovery. Proceedings of the 2020 28th Conference on Nuclear Engineering, ICONE28-POWER2020, August 2-6, 2020, Anaheim, California, USA.
- J. Weinmeister, P.K. Jain. Cooling Channel Optimization in Additively Manufactured Gas Cooled Reactor Core. Research Summary. In: Transactions of American Nuclear Society Annual Meeting, June 2020.
- P.K. Jain. Challenges and Opportunities in Thermal Hydraulics of High-Temperature Gas Cooled Reactors. Technical Panel Discussion. In: Transactions of American Nuclear Society Annual Meeting, June 2020.
- B. Betzler, B. Ade, A. Wysocki, P.K. Jain, S. Greenwood, J. Rader, J. Heineman, R. Kile, N. Brown, K. Terrani. Power Level Down-Selection for the Transformational Challenge Reactor. Research Summary. In: Transactions of American Nuclear Society Annual Meeting, June 2020.
- P.K. Jain. Thermal Hydraulics Modeling and Simulation Capabilities for Advanced Reactor Design and Safety Evaluations. Technical Presentation. In: 2019 Global Center for Nuclear Energy Partnership (GCNEP) Working Group Meeting, December 2019.
- P.K. Jain. An Overview of Research on Molten Salt Reactors. Technical Presentation. In: 2019 Global Center for Nuclear Energy Partnership (GCNEP) Working Group Meeting, December 2019.
- D. Chandler, B.R. Betzler, P.K. Jain, J.W. Bae, D.H. Cook, V.D. Fudurich, T.K. Howard, C.J. Hurt, G. Ilas, J.L. Meszaros, E. Popov. High Flux Isotope Reactor Conversion from High-Enriched to Low-Enriched Uranium Fuel – a 2019 Progress Update. Abstract and Presentation. In: Reduced Enrichment for Research and Test Reactors (RERTR) 2019 Meeting, Zagreb, Croatia, October 6-9, 2019.
- T.K. Howard, P.K. Jain and E.L. Popov. Verification and Validation of COMSOL for Heat Transfer in Thin Rectangular Channels using NASA Test Results. Research article. In: 18th International Topical Meeting on Nuclear Reactor Thermal Hydraulics, Portland, Oregon, August 18-23, 2019.
- P.K. Jain. Renewed Emphasis on Advanced Modeling, Simulation and Testing for the LEU Silicide Fuel in Response to the Recent HFIR Event. Technical Presentation. In: U.S. High Performance Research Reactors (USHPRR) 2019 Meeting, July 2019.
- D. Chandler, B. Betzler, J.W. Bae, C. Carathers, D. Cook, V. Fudurich, T. Howard, C.J. Hurt, G. Ilas, P.K. Jain, J. Meszaros, E. Popov, D. Renfro. High Flux Isotope Reactor Low-Enriched Uranium Conversion Activities with Focus on Design Studies. Technical Presentation. In: U.S. High Performance Research Reactors (USHPRR) 2019 Meeting, July 2019.
- P.K. Jain. High Performance Computing to Enable Next-generation Low-temperature Waste Heat Recovery. ORNL CRADA NFE-18-07223. Technical Review Presentation for the U.S. DOE Advanced Manufacturing Office Program Review Meeting, Washington DC, June 11-12, 2019.
- V.M. Rao, M. Delchini, M.T. Kao, P.K. Jain and S. Subramanian. HPC to Enable Next-generation Low-temperature Waste Heat Recovery. Technical Poster for the U.S. DOE Advanced Manufacturing Office Program Review Meeting, Washington DC, June 11-12, 2019.
- D. Renfro, B. Betzler, D. Chandler, D. Cook, V. Fudurich, C.J. Hurt, G. Ilas, P.K. Jain, E. Popov. Continuing LEU Conversion Activities at the High Flux Isotope Reactor. Abstract and Presentation. In: Reduced Enrichment for Research and Test Reactors (RERTR) 2018 Meeting, Edinburgh, UK, November 4-7, 2018.
- P.K. Jain. Improving Nuclear Safety Through Multiphysics Modeling and Simulations. Technical Poster. In: COMSOL Conference 2018, Boston, MA, October 3-5, 2018.

- D. Renfro et al. Continuing LEU Conversion Activities at the High Flux Isotope Reactor. In: Transactions of Reduced Enrichment for Research and Test Reactors (RERTR 2017) Meeting, Chicago, IL, USA, November 12-16, 2017.
- P.K. Jain, J.D. Freels, D.H. Cook, E.L. Popov and D.G. Renfro. Advanced Multiphysics Computational Fluid Dynamics Models for the High Flux Isotope Reactor. In: Proceedings of RRFM-2017 (European Research Reactor Conference), Rotterdam, Netherlands, 14-18 May 2017.
- J.J. Carbajo and P.K. Jain. Comparison of HFIR Core Hydraulic Models with Operational Data. In: Transactions of ANS Winter Meeting, Las Vegas, NV, November 6-10, 2016.
- D. Renfro et al. Continuing LEU Conversion Activities at the High Flux Isotope Reactor. In: Transactions of Reduced Enrichment for Research and Test Reactors (RERTR 2016) Meeting, Antwerp, Belgium, October 23-26, 2016.
- D. Renfro et al. Continuing LEU Conversion Activities at the High Flux Isotope Reactor. In: US High Performance Research Reactors (USHPRR) Working Group Meeting, Gaithersburg, MD, USA, July 2016.
- P.K. Jain and J.D. Freels. Advanced Multiphysics Thermal Hydraulic Models for the High Flux Isotope Reactor. In: Transactions of the COMSOL 2015 Conference, Boston, MA, USA, October 2015.
- D. Renfro et al. Continuing LEU Conversion Activities at the High Flux Isotope Reactor. In: Transactions of Reduced Enrichment for Research and Test Reactors (RERTR 2015) Meeting, Seoul, South Korea, October 2015.
- P.K. Jain and J.D. Freels. Advanced Multiphysics Thermal Hydraulic Models for the High Flux Isotope Reactor. In: Nuclear Reactor Thermal Hydraulics (NURETH-16) Conference, Chicago, September 2015.
- P.K. Jain. Learn from COMSOL Multiphysics: 25 must have User-Centric features for any engineering analysis software. ORNL RNSD M&S Forum, July 2015.
- D. Renfro et al. Continuing LEU Conversion Activities at the High Flux Isotope Reactor. In: US High Performance Research Reactors (USHPRR) Working Group Meeting, Argonne, IL, USA, June 2015.
- P.K. Jain and J.D. Freels. 3D Multi-Physics Analyses to Support Low Enriched Uranium (LEU) Conversion of HFIR. In: Transactions of the 2014 COMSOL Conference in Boston, MA USA, October 2014.
- D. Renfro et al. Continuing LEU Conversion Activities at the High Flux Isotope Reactor. In: US High Performance Research Reactors (USHPRR) Working Group Meeting, Richland, WA, USA, July 2014.
- V.B. Khane, P.K. Jain. Steady State COMSOL Thermal-Hydraulics Models for ORNL's High Flux Isotope Reactor. In: 2013 ANS Winter Meeting and Nuclear Technology Expo, Washington DC, November 10-14, 2013.
- J.D. Freels, P.K. Jain, C.J. Hurt. Investigation of Thermal Contact Gas Gap Conductance using COMSOL Version 4.3b. In: 2013 COMSOL Conference, Boston, MA, October 9-11, 2013.
- D. Wang, P.K. Jain, J.D. Freels. Application of COMSOL Pipe Flow Module to Develop a High Flux Isotope Reactor (HFIR) System Loop Model. In: 2013 COMSOL Conference, Boston, MA, October 9-11, 2013.
- A.S. Joshi, P.K. Jain, J.A. Mudrich, E.L. Popov. PRATHAM: Parallel Thermal Hydraulics Simulations using Advanced Mesoscopic Methods. In: 2012 ANS Winter Meeting and Nuclear Technology Expo, San Diego, CA, November 11-15, 2012.
- J.N. Cantrell, E.J. Inclin, A.S. Joshi, E.L. Popov, P.K. Jain. CartGen++: Extending a CAD-Based Cartesian Mesh Generator for the Lattice Boltzmann Method. In: 2012 ANS Winter Meeting and Nuclear Technology Expo, San Diego, CA, November 11-15, 2012.
- V.B. Khane, P.K. Jain, J.D. Freels. Development of CFD Models to Support LEU Conversion of ORNL's High Flux Isotope Reactor. In: 2012 ANS Winter Meeting and Nuclear Technology Expo, San Diego, CA, November 11-15, 2012.

- V.B. Khane, P.K. Jain, J.D. Freels. COMSOL Simulations for Steady State Thermal Hydraulics Analyses of ORNL's High Flux Isotope Reactor. In: COMSOL Conference, Newton, Mass, October 3-5, 2012.
- J.D. Freels, P.K. Jain, R.W. Hobbs. Design and Nuclear Safety Related Simulations of Bare-Pellet Test Irradiations for the Production of Pu-238 in the High Flux Isotope Reactor using COMSOL. In: COMSOL Conference, Newton, Mass, October 3-5, 2012.
- J.D. Freels, P.K. Jain. Multiphysics Simulations in the Complex 3D Geometry of the High Flux Isotope Reactor Fuel Elements Using COMSOL. In: COMSOL Conference, Newton, Mass, October 13-15, 2011.
- P.K. Jain, J.D. Freels, D.H. Cook. COMSOL-based Multiphysics Simulations to Support HFIR's Conversion to LEU Fuel. In: Trans. Amer. Nucl. Soc., 104:1064-1066, 2011.
- P.K. Jain, Rizwan-uddin. Artificial Interface Lattice Boltzmann (AILB) Model for Simulation of Two-Phase Dynamics (invited). In: Proceedings of 2010 American Nuclear Society (ANS) Winter Meeting, Las Vegas NV, USA, November 7-11, 2010.
- P.K. Jain, E.L. Popov, G.L. Yoder, Rizwan-uddin. Parallel Simulation of 2D/3D Flows using Lattice Boltzmann Models (LBM). In: Proceedings of 2010 American Nuclear Society (ANS) Winter Meeting, Las Vegas NV, USA, November 7-11, 2010.
- P.K. Jain, Rizwan-uddin. Advances in Lattice Boltzmann Modeling (LBM) to Simulate Two-Phase Dynamics. In: Proceedings of the 1st International Nuclear & Renewable Energy Conference (INREC-10), Amman, Jordan, March 21-24, 2010.
- S. Singh, P.K. Jain, Rizwan-uddin. Analytical Solution of Time-Dependent Multilayer Heat Conduction Problems for Nuclear Applications. In: Proceedings of the 1st International Nuclear & Renewable Energy Conference (INREC-10), Amman, Jordan, March 21-24, 2010.
- P.K. Jain, A. Tentner, Rizwan-uddin. LBM Simulation of Liquid Drop Coalescence driven by Surface Tension. In: Proceedings of 2009 American Nuclear Society (ANS) Winter Meeting, Washington DC, USA, November 15-19, 2009.
- P.K. Jain, A. Tentner, Rizwan-uddin. A Lattice Boltzmann Framework for the Simulation of Boiling Hydrodynamics in BWRs. In: Proceedings of 2008 American Nuclear Society (ANS) Annual Meeting, Anaheim CA, USA, June 8-12, 2008.
- P.K. Jain, Rizwan-uddin. A 3D, Parallel LBM to Simulate Gravity driven Bubbly and Slug Flows. In: Proceedings of 2007 American Nuclear Society (ANS) Winter Meeting, Washington DC, USA, November 11-15, 2007.
- P.K. Jain, Rizwan-uddin. Lattice Boltzmann Method (LBM) for Nuclear Engineering Applications. In: Proceedings of 2007 American Nuclear Society (ANS) Annual Meeting, Boston MA, USA, June 24-28, 2007.
- P.K. Jain, S. Markidis, B.G. Jones, Rizwan-uddin, J.R. White, L.M. Bobek. Web-casting of Nuclear Reactor Experiments. In: Proceedings of American Nuclear Society (ANS) Winter Meeting, Albuquerque NM, USA, November 12-16, 2006.
- K.D. Kim, P.K. Jain, Rizwan-uddin. Web- and System-code based, Interactive, Nuclear Power Plant Simulators. In: Proceedings of 5th International Topical Meeting on Nuclear Plant Instrumentation Controls, and Human Machine Interface Technology (NPIC & HMIT 2006), Albuquerque NM, USA, November 12-16, 2006.
- P.K. Jain, J.F. Stubbins, Rizwan-uddin. Interactive Virtual Laboratory for Distance Education in Nuclear Engineering. In: Proceedings of PHYSOR-2006, American Nuclear Society's Topical Meeting on Reactor Physics, Vancouver BC, Canada, September 10-14, 2006.
- P.K. Jain, Rizwan-uddin. Steady State and Dynamic Analyses of Supercritical CO<sub>2</sub> Natural Circulation Loop. In: Proceedings of ICONE-14, 14th International Conference on Nuclear Engineering, Paper 89103, Miami FL, USA, July 17-20, 2006.

- P.K. Jain, Y. Gu, J.F. Stubbins, Rizwan-uddin. Broadcasting Nuclear Engineering Laboratories – Video and Data – in Real-Time over the Internet. In: Proceedings of American Society of Engineering Education (ASEE) Annual Conference, Chicago IL, USA, June 18-21, 2006.
- E. Edwards, A. Sweet, M. Blanchard, R. Agasie, P.K. Jain, Rizwan-uddin. Distance Reactor Laboratory and Virtual Tours. In: Proceedings of 2006 American Nuclear Society (ANS) Annual Meeting, Reno NV, USA, June 4-8, 2006.
- P.K. Jain. LabVIEW-based, Interactive Virtual Laboratory for Nuclear Engineering Education. In: Proceedings of 2006 American Nuclear Society (ANS) Student Conference, Troy NY, USA, March 30-April 1, 2006.
- P.K. Jain. Development of a Real-Time Web-Casting Interface for System Codes. In: Proceedings of 2006 American Nuclear Society (ANS) Student Conference, Troy NY, USA, March 30-April 1, 2006.

### Publications: Technical Reports

- B.R. Betzler et al. Transformational Challenge Reactor Conceptual Design Report. ORNL/SPR-2020/1433, February 2020.
- V.M. Rao, M.G. Delchini, M.T. Ahmad, P.K. Jain. High-Performance Computing to Enable Next-Generation Low-Temperature Waste Heat Recovery. ORNL/TM-2019/1455, December 2019.
- B.R. Betzler, B.J. Ade, A.J. Wysocki, M.S. Greenwood, J.J.W. Heineman, P.C. Chesser, P.K. Jain, F. Heidet, A. Bergeron. Advanced Manufacturing for Nuclear Core Design. ORNL/TM-2019/1258, August 2019.
- P.K. Jain. Independent Review of HFIR Fuel Plate Welding Failure Analysis. C-HFIR-2019-002, R1, August 2019.
- C. Carathers, et al. Oak Ridge National Laboratory HFIR OFE-488 Fuel Element Failure Causal Theory Evaluation Interim Report. ORNL/TM-2019/1120, February 2019.
- K. Nawaz, M. Sandlin, C. Cramer, A. Elliot, P. Jain, E. Lara-Curzio and B. Fricke. Development of Next-Generation Heat Exchangers for Hybrid Power Generation. ORNL/SPR-2018/1063, October 2018.
- B.R. Betzler, B.J. Ade, A.J. Wysocki, M.S. Greenwood, K.G. Field, J.M. Risner, P.K. Jain, J.R. Burns, B.D. Hiscox, K.A. Terrani. Transformational Challenge Reactor Preconceptual Design Incorporating Rapid Prototyping via Advanced Manufacturing. ORNL/SPR-2018/1008, September 2018.
- D. Chandler, B. Betzler, D. Cook, G. Ilas, P.K. Jain, and D. Renfro. Feasibility Studies for High Flux Isotope Reactor Conversion to Low-Enriched Uranium  $U_3Si_2$  Fuel. In Press, ORNL TM Report, Oak Ridge National Laboratory, Oak Ridge, Tenn., October 2017.
- P.K. Jain. Independent Review of C-HFIR-2017-023 titled Design and Analysis of an Irradiation Target Capsule for the Production of Pu-238 using NpO<sub>2</sub> pellets. August 2017.
- P.K. Jain. Independent Review of C-HFIR-2016-041 titled Safety Basis Temperature and Expansion Calculation for Low Heat Flux SiC Cladding Rabbit Capsules. March 2017.
- R.J. Belles, P.K. Jain, J.J. Powers. Oak Ridge National Laboratory Support of Non-Light Water Reactor Technologies: Capabilities Assessment for NRC Near-term Implementation Action Plans for Non-Light Water Reactors. ORNL/TM-2017/117, Oak Ridge National Laboratory, Oak Ridge, Tenn., March 2017.
- C.J. Hurt, J.D. Freels, R.W. Hobbs, P.K. Jain, G.I. Maldonado. Thermal Safety Analyses for the Production of Plutonium-238 at the High Flux Isotope Reactor. ORNL/TM-2016/234, Oak Ridge National Laboratory, Oak Ridge, Tenn., July 2016.
- K.R. Robb, P.K. Jain, T.J. Hazelwood. High-Temperature Salt Pump Review and Guidelines – Phase I Report. ORNL/TM-2016/199, Oak Ridge National Laboratory, Oak Ridge, Tenn., May 2016.
- P.K. Jain. Independent Review of C-HFIR-2015-033 Rev.0 - Thermo-Mechanical Safety Analysis of a Pu-238 Fully Loaded Target Assembly for up to Three Irradiation Cycles in HFIR using COMSOL Multiphysics v5.1. July 2016.

- P.K. Jain. Independent Review of C-HFIR-2015-041 - Extension and Improvements to the Steady-State Thermal Qualification of the HFIR HB-1 Beam Tube. June 2016.
- P.K. Jain. Independent Review of C-HFIR-2015-019 - Temperature Verification and Expansion Calculation for SiC Cladding Specimens in a Rabbit Housing. September 2015.
- P.K. Jain. Independent Review of C-HFIR-2013-029 Rev.4 - COMSOL Thermal-Structure Interaction Simulations of NpO<sub>2</sub> Fully Loaded Targets in HFIR. July 2014.
- D.G. Renfro, D. Chandler, D. Cook, G. Ilas, P.K. Jain and J. Valentine. Preliminary Evaluation of Alternate Designs for HFIR Low-Enriched Uranium Fuel. ORNL/TM-2014/154, Oak Ridge National Laboratory, Oak Ridge, Tenn., October 2014.
- P.K. Jain. Independent Review of C-HFIR-2013-029 Rev.2 - COMSOL Thermal-Structure Interaction Simulations of NpO<sub>2</sub> Fully Loaded Targets in HFIR. February 2014.
- D. Chandler, D.H. Cook, G. Ilas, P.K. Jain, D.G. Renfro. Conceptual Design Parameters for HFIR LEU U-Mo Fuel Conversion Experimental Irradiations. ORNL/LTR-2013/132, Oak Ridge National Laboratory, Oak Ridge, Tenn., June 2013.
- P.K. Jain, J.D. Freels, D.H. Cook. 3D COMSOL Simulations for Thermal Deflection of HFIR Fuel Plate in the “Cheverton-Kelley” Experiments. ORNL/TM-2012/138, Oak Ridge National Laboratory, Oak Ridge, Tenn., August 2012.
- J.D. Freels, I.T. Bodey, R.V. Arimilli, F.G. Curtis, K. Ekici, and P.K. Jain. Preliminary Multiphysics Analyses of HFIR LEU Fuel Conversion using COMSOL, ORNL/TM-2011/7, Oak Ridge National Laboratory, Oak Ridge, Tenn., June 2011.
- P.K. Jain. Simulation of Two-Phase Dynamics using Lattice Boltzmann Method. Ph.D. Dissertation, University of Illinois at Urbana Champaign, Urbana IL, USA, 2010.
- P.K. Jain. Numerical Analysis of Flow Stability in a Natural Circulation Loop with Supercritical Fluid. M.Sc. Dissertation, University of Illinois at Urbana Champaign, Urbana IL, USA, 2006.
- P.K. Jain. Heat Removal Mechanisms in a Pressurized Heavy Water Reactor (PHWR) during Off-Normal Conditions. B.Tech. Dissertation, Indian Institute of Technology (IIT) Bombay, Mumbai, INDIA, 2004.