

Koroush SHIRVAN

John Clark Hardwick (1986) Career Development Professor
Nuclear Innovation in Fission Technologies
Co-Director of RTC for Utility Executives
Executive Director of ATF IRP
PI of MIT ARC-20 ARDP Project
Department of Nuclear Engineering, MIT
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EDUCATION

- Sept. 2012** **Ph.D. Nuclear Science and Engineering**
Massachusetts Institute of Technology, Cambridge, Massachusetts
Major: Reactor Design and Analysis
Minor: Probabilistic Risk Assessment

Ph.D. Dissertation Title: Development of Optimized Core Design and Analysis
Methods for High Power Density BWRs
Ph.D. Supervisor: Professor Mujid Kazimi (late)
- May 2010** **Masters of Science in Nuclear Science and Engineering**
Massachusetts Institute of Technology, Cambridge, Massachusetts

MS Thesis Title: Optimization of Small Integral Light Water Reactors
MS Supervisor: Professor Mujid Kazimi (late)
- May 2008** **Bachelor of Science in Nuclear Engineering**
University of Florida, Gainesville, Florida
Graduated with Summa Cum Laude (Highest Honors)

WORK EXPERIENCE

- | | |
|------------------------------|--|
| Sept 2008 – Sept 2012 | Research / Teaching Assistant |
| Sept 2012 – Dec 2016 | Research Scientist |
| Jan 2017 – June 2017 | Principal Scientist |
| July 2017 – June 2022 | Assistant Professor |
| July 2019 – Present | John Clark Hardwick (1986) Career Development Professor |
| July 2022 – Present | Associate Professor |
| | Center for Advanced Nuclear Energy Systems (CANES) |
| | Department of Nuclear Engineering |
| | Massachusetts Institute of Technology |

Research Activities

Research work primarily includes integrated modeling and simulation (M&S) informed experimentation, advanced data analytics and their applications for advanced reactor technology. Specific recent research/education responsibilities include:

- Present: Supervise 14 PhD, 12 Masters, 2 Post-Docs and 5 research scientists.
- 2022-Present: **Executive Director of MITR ATF** (Accident Tolerant Fuel) IRP on in-pile and out-of-pile testing of coated Zircaloy and SiC/SiC cladding to study impact of water chemistry, CRUD and irradiation on ATF normal operation in collaboration with all nuclear vendors in the U.S.
- 2022-Present: PI of **ATF impact on SMR** (Small Modular Reactors) Safety and Performance in collaboration with NuScale, Lightbridge, Holtec, Rolls-Royce and GE-Hitachi.
- 2022-Present: Co-PI of Requirements for Nuclear Reactors for decarbonization of oil/gas industry and lead nuclear designer of **cost-effective microreactor** technology in collaboration with EDF, ExxonMobil, Shell and Equinor.
- 2022-Present: Co-PI and Lead on cost of **Graphite Disposal** for Advanced Reactors including development of a tool to support advanced reactor fuel cycle backend and decommissioning supported by DOE IRP grant.
- 2021-Present: **PI of ARC-20 DOE Award as part of ARDP** (Advanced Reactor Demonstration Program) on Horizontal High Temperature Gas Reactor Design to reduce both Cost and Construction Risk in collaboration with University of Michigan, Buffalo and Argonne National Lab.
- 2020-Present: **PI of nuclear thermal propulsion fuel** accelerated testing funded by NASA focused on construction and deployment of high temperature (>2000 K) facility under hydrogen flow inside the MIT reactor.
- 2020-Present: PI of use of **additive manufacturing** for nuclear energy including high-fidelity analysis and uncertainty quantification of the transformational challenge reactor concepts funded by DOE NEUP and multi-component nanostructured fast reactor cladding funded by Plasma Processes under DOE SBIR.
- 2020-Present: **PI of Compact Steam Generator (CSG)** development for advanced reactor applications, by focusing on two-phase flow dynamics in small diameter channels funded by DOE NEUP.
- 2020-Present: **Co-PI of ARPA-E GEMINA** grants to lower the operation and maintenance of advanced reactor through use of digital twinning and rethinking the lifetime of structures and components.
- 2020-Present: PI of development of **economic tool** for small modular reactor cost and uncertainty assessment (LWRs) funded by Fortum. The tool has been **open-sourced** < <https://github.com/mit-crpg/TIMCAT> > and cited in various nuclear energy studies.
- 2019-Present: **PI of development of reinforcement learning (RL) code package for core design optimization** (PWRs and BWRs) funded by Exelon/Constellation. The software is in active use by industry. The RL hybrid algorithms have been open-sourced: < <https://neorl.readthedocs.io/en/latest/> >
- 2019-Present: Co-PI of development of fiber optics sensors for advanced reactors, focusing on implications for fast MSR funded by ARPA-E and led by NETL.
- 2018-Present: **PI of optimization of EDF Small Modular Reactor** focusing on improving Economics, Safety and deployment.
- 2018-Present: PI of ATF-FLEX NEUP focused on combining ATF and FLEX technologies to improve plant coping time.
- 2018-Present: Co-PI of impact of equipment based seismic isolation on advanced reactor economics funded by ARPA-E and led by University of Buffalo.
- 2015-2019: **Executive Director of Accident Tolerant Fuel Integrated Research Project** – Responsible for project organization involving multiple universities and

industry partners. Technical lead on both experimental and simulation effort at MIT related to coated Zircaloy cladding with Chromium and Moly/FeCrAl and fuel with additives/dopants. Simulation work is focused on development of ATF material models and their validation in TRACE and MOOSE/BISON tools.

- 2015-2022: Principal Investigator of Fuel-in-Fiber Concept (SBIR subcontract) – Responsible for project on use of additive manufacturing technique to produce high purity SiC fibers and allow online fuel deposition to produce more compact TRISO-type fuel. Work involves investigating SiC fibers corrosion performance in autoclave and characterize their mechanical behavior to inform M&S models to design an optimum new fuel concept.
- 2012-2020: Reduced Moderated Boiling Water Reactor Safety Assessment (DOE NEUP, HITACHI-GE Nuclear) – Responsible for code development capability for system level safety and stability assessment and fuel performance of MOX fuel.
- 2012-Present: SiC clad for LWRs (CTP, Lockheed Martin, Westinghouse, General Atomics, Plasma Pros) – Responsible for the R&D of the ceramic matrix composite SiC cladding and coated composite cladding.
- 2015-16: PI of Uranium Nitride fuel performance for AP1000 (ExxonMobil)
- 2015-16: PI of Thorium-Plutonium fuel performance (Lockheed-Martin).
- 2013-2020: Chair of MIT CASL (simulation hub) Education activities – Responsible for development of fuel performance education material with MOOSE/BISON and co-organizer of a two week CASL school covering multi-physics simulation topics.
- Co-instructor of design, nuclear safety and nuclear systems class.
- Development of reactor system and perform safety analysis for nuclear reactors including BWRs, PWRs, Small Modular Reactors, Sodium and Lead Bismuth Fast Reactors and Light Water Breeders.
- Performing both Validation through experimentation and Verification through high fidelity simulation in areas of thermal hydraulics and fuel performance.
- Development of methodology for design of Light Water Reactor (LWR) cores using coupled multi-physics analysis.
- Power cycle optimization including Rankine and Supercritical CO₂ cycles
- Development of single and two-phase CFD and empirical models for performance analysis of nuclear fuels and safety systems.
- Development of methods for BWR two-phase stability in both frequency/ time domains.
- Technology selection of nuclear reactor concepts for different energy applications.

May 2007 – August 2008

**Core Design Intern
Southern Nuclear Company
Birmingham, Alabama**

PWR Core Analysis, Summer 2008

- Worked extensively on PWR Pellet Clad Interaction risk assessment and created new methodologies to analyze fuel performance during power changes.

Plant Vogtle Core Analysis, Summer 2007

- Created a new core design methodology used by industry to reduce CRUD deposition on fuel rods through utilization of neutronics, thermal hydraulics and plant chemistry assessment tools.

Teaching Experience

Teaching Instructor

Fall 14/Spring 18-21 MIT Nuclear Engineering 22.06: Engineering of Nuclear Systems

Fall 15/17 MIT Nuclear Engineering 22.033: Undergraduate Design (co-Instructor)

Spring 2016 MIT Mechanical Engineering 2.006: Fluids/Heat transfer (Recitation Ins.)

Fall 2017/19-22 MIT Nuclear Engineering 22.39: Nuclear Reactor Design and Safety
 Spring 2022 MIT Nuclear Engineering 22.251: Nuclear Fuel Cycle
Instructor of several professional courses on nuclear technology for executives and nuclear community including RTC by INPO and MeV School.

SKILLS/EXPERIENCE

- **Computer and Computational**
 - CANES Manager of Computer Software Repository and Cluster Systems
 - Proficient in Fortran language and familiar with Python, C++, C#, Xml, JAVA, Visual Basic, Maple, Matlab, MOOSE, Goldsim, GNU, CMake, HDF5, git
 - Open Source Software Development: NEORL ([GitHub](#)), TIMCAT ([GitHub](#))
 - Expert User of major Nuclear Engineering modeling, analysis and licensing codes including:
 - **Radiation Transport:** ANC, CASMO, SIMULATE, S3K, MCNP5/X, SERPENT, SCALE, PARTISN, DRAGON, ROSA, MPACT, PARCS
 - **Thermal Hydraulics/CFD:** RETRAN, RELAP, TRACE, VIPRE, COBRA, MAAP, MELCOR, TRANSAT, FLUENT, CFX, STARCCM+, ASPEN
 - **Structural Materials and Nuclear Fuel:** ABAQUS, BOA, FRAPCON, FRAPTRAN, MOOSE, BISON, FALCON, SOLID WORKS, ADINA
- **Experimental**
 - Design and conduct experiments with high temperature/pressure/voltage/radiation
 - Materials characterization using Scanning Electron Microscopy (SEM), Focused Ion Beam (FIB) milling, energy-dispersive X-ray spectroscopy (EDX)

PROFESSIONAL ACTIVITIES

MIT Climate Policy Working Group, Member	2022-Present
NEI Task Force for Power Uprate, Co-Organizer	2022-Present
Nuclear in District Application EPRI Working Group, Member	2022-Present
Clean Core Thorium Energy, Head of Fuel Design	2022-Present
Advisory Board Member, NUWARD™ Delivery Model	2022-Present
Scientific Advisory Board Member, SMR for an Eu Energy Mix (TANDEM)	2022-Present
PHYSOR Fuel Management Track Leader	2022
Advisory Board Member, DOE Industry FOA on Seismic Isolation Constellation, Independent Contractor	2021-Present
NAC's Nuclear Fuel Manufacturing Oversight Certificate	2021
Probabilistic Safety Assessment Technical Program Committee	2021
American Nuclear Society Annual Meeting Asst. Tech. Prog. Chair	2021
American Nuclear Society Task Force on R&D Needs	2020-2021
American Ceramic Society, Member	2017-Present
American Society of Mechanical Engineers, Member	2017-Present
American Nuclear Society National/Annual Meeting Reviewer for 5 Tracks	2017-Present
Co-Director of Reactor Technology Course (RTC) for Utility Executives	2016-Present
Consultant, Nuclear Technology (SMR, Coal Repower, etc.) and Fuels	2013-Present
Technical Thermal Hydraulic Track Leader for ICAPP Conference	2013-Present
Chair of the MIT CASL Education Activity	2013-Present
Technical Program Committee for Nuclear Innovation Bootcamp	2016-2018
Director of Accident Tolerant Fuel (ATF) DOE Integrated Research Project	2015-2018
Assistant Technical Program Chair for ICAPP Conference	2018
Organizer, Identifying Failure Modes of ATF Concepts Workshop	2018

American Society of Mechanical Engineers Member	2018-Present
Completed Multiphysics Model Validation Workshop	2017
Organizer, Modeling and Simulation of Near Term ATF Workshop	2017
Technical Program Member, Int. Conf. on Advanced Ceramics & Composites	2015
Technical Advanced Reactor Track Leader for ICAPP Conference	2015
Member, EPRI Gen-IV Reactor Group	2015
Completed Micro and Nanotechnologies in Medicine Workshop	2014
Tech. Prog. Com. member for Nuclear Fuels and Structural Materials Conf.	2014
Technical Program Committee member and chair for TopFuel Conference	2013
Referee, major nuclear journals including NED, NT, Progress, Anals, JNM	2012-Present
Member, ANS Small and Medium Sized Reactor Committee	2011-2012
Short Course: Modeling & Computational Multi Phase Flow (ETHZ)	2011
Co-Developers and Administrator of MIT NSE website in response to Fukushima-Daiichi Accident (more than one million hits in the first 5 days)	2011-2013
Delegate and Presenter at the Global Conference on Energy (Ishigaki, Japan)	2010
MIT International Energy Conference Organizer and Presenter	2010-2015
American Nuclear Society Member	2006-Present

HONORS & AWARDS

Elite Nuclear Engineering Fellowship (Univ. of Florida)	2006-08
Alpha Nu Sigma Nuclear Honor Society	2007-Present
TAU BETA PI Honor Society	2007-Present
Reinhold Rudenberg Memorial Award – MIT	2011
Signature Fission Doctorate Seminar Selectee – MIT	2012
Outstanding Student Service Award – MIT	2012
Outstanding Assistant Technical Program Chair – ICAPP	2018
NRC Young Faculty Fellowship Award	2018-2021
Young Professional TH Research Competition – ANS	2018
Best Paper – Nuclear Emerging Technologies for Space – ANS	2021
Faculty of the Year – Nuclear Science and Engineering – MIT ANS	2021
Best Poster – Nuclear Science and Engineering Research Symposium – MIT	2022
Reactor Technology Award, American Nuclear Society	2022
Best Paper of Year (2021) - Journal of Nuclear Materials Editors	2022
Best Paper Award, Nuclear Reactor TH, Operation, and Safety (NUTHOS-13)	2022
Landis Young Member Engineering Achievement Award	2023

PUBLICATIONS

Peer-Reviewed Journals/Conference Proceedings

<i>Focus Area</i>	<i># Of Published Peer Reviewed Papers</i>
<i>Design and System Modeling</i>	>25
<i>Reactor Physics Modeling</i>	>25
<i>Thermal Hydraulic Testing/Modeling</i>	>25
<i>Structural Materials/Nuclear Fuel Testing/Modeling</i>	>25

Peer-Reviewed Accepted/Published Journals:

Stewart W.R., **Shirvan K.**, “Construction schedule and cost risk for large and small light water reactors,” Nuclear Engineering and Design, Vol. 407, 112305, June 2023

<https://doi.org/10.1016/j.nucengdes.2023.112305>

Seshadri A, **Shirvan K.**, “Development of hydrothermal corrosion model and BWR metal coating for CVD SiC in light water reactors,” Journal of Nuclear Materials, Vol. 576154252, April 2023.

<https://doi.org/10.1016/j.jnucmat.2023.154252>

Stewart W.R., Gregory J., Shirvan K., “Impact of modularization and site staffing on construction schedule of small and large water reactors,” Nuclear Engineering and Design, Vol. 397, 111922, Oct. 2022. <https://doi.org/10.1016/j.nucengdes.2022.111922>

Radaideh M., **Shirvan K.**, “PESA: Prioritized experience replay for parallel hybrid evolutionary and swarm algorithms - Application to nuclear fuel,” Nuclear Engineering and Technology, October 2022

<https://doi.org/10.1016/j.net.2022.05.001>

Jeong Y.S., Buric M., **Shirvan K.**, “Informing Performance Metrics of Advanced I&C Systems for Liquid Fueled Fast Molten Salt Reactors”, Nuclear Science and Engineering, Special Issue on Advanced Reactor Thermal Hydraulics Experiments and Modeling Supporting Verification and Validation Needs, Aug, 2022. <https://doi.org/10.1080/00295639.2022.2102388>

Stewart W.R., **Shirvan K.**, “Capital cost estimation for advanced nuclear power plants,” Renewable and Sustainable Energy Reviews, Vol. 155, March 2022, 111880 <https://doi.org/10.1016/j.rser.2021.111880>

Che Y., Yurko J., Seurin P., **Shirvan K.**, “Machine learning-assisted surrogate construction for full-core fuel performance analysis,” Annals of Nuclear Energy, April 2022, 108905

<https://doi.org/10.1016/j.anucene.2021.108905>

Parsi S. S., Lal, K., M., Kosbab, B., Ingersoll E.D., **Shirvan K.**, Whittaker A., “Seismic Isolation: A Pathway to Standardized Advanced Nuclear Reactors,” Nuclear Engineering and Design, Vol. 387, 111445, Feb. 2022, 111445 <https://doi.org/10.1016/j.nucengdes.2021.111445>

Halimi A., **Shirvan K.**, “Impact of core power density on economics of a small integral PWR,” Nuclear Engineering and Design, Volume 385, 15 December 2021, 111488

<https://doi.org/10.1016/j.nucengdes.2021.111488>

Yook H., K. **Shirvan**, B. Phillips, Y. Lee, “Post-LOCA ductility of Cr-coated cladding and its embrittlement limit,” Journal of Nuclear Materials, Volume 558, January 2022, 153354

<https://doi.org/10.1016/j.jnucmat.2021.153354>

Stewart W.R., Velez-Lopez, E., Wiser R., **Shirvan K.**, “Economic solution for low carbon process heat: A horizontal, compact high temperature gas reactor,” Applied Energy, Volume 304, 15 December 2021, 117650 <https://doi.org/10.1016/j.apenergy.2021.117650>

Seshadri A., Philips B., **Shirvan K.**, “Impact of Nuclear Environment on Hydrothermal Corrosion and Silica Transport for CVD SiC in Light Water Reactors,” Journal of Nuclear Materials, Vol. 556, Dec. 2021 <https://doi.org/10.1016/j.jnucmat.2021.153155>

Ma Z., **Shirvan K.**, Wu Y., Su G.H., “Numerical investigation of ballooning and burst for chromium coated zircaloy cladding,” Nuclear Engineering and Design Vol. 383, Nov. 2021

<https://doi.org/10.1016/j.nucengdes.2021.111420>

Bailly-Salins L., Borrel L., Jiang W., Spencer B.W., **Shirvan K.**, Couet A., “Modeling of High-Temperature Corrosion of Zirconium Alloys Using the eXtended Finite Element Method (X-FEM),” Corrosion Science, Volume 189, 15 August 2021, 109603 <https://doi.org/10.1016/j.corsci.2021.109603>

- Jin Y., **Shirvan K.**, “Study of the Film Boiling Heat Transfer and Two-Phase Flow Interface Behavior Using Image Processing,” *International Journal of Heat and Mass Transfer*, Vol. 177, May, 2021. <https://doi.org/10.1016/j.ijheatmasstransfer.2021.121517>
- Sukjai Y., **Shirvan K.**, “Fuel performance analysis of reduced moderated boiling water reactor for transuranic waste incineration,” *Progress in Nuclear Energy*, Vol. 137, 103738, July 2021. <https://doi.org/10.1016/j.pnucene.2021.103738>
- Hazan J., Gauthier A., Pouillier E., **Shirvan K.**, “Semi-integral LOCA test of cold-spray chromium coated zircaloy-4 accident tolerant fuel cladding,” *Journal of Nuclear Materials*, Vol. 550, 152940, July, 2021. <https://doi.org/10.1016/j.jnucmat.2021.152940>
- Radaideh M., Forget B., **Shirvan K.**, “Large-scale Design Optimisation of Boiling Water Reactor Bundles with Neuroevolution *Annals of Nuclear Energy*,” *Annals of Nuclear Energy*, Available Online, April 2021.
- Radaideh M., **Shirvan K.**, “Rule-based reinforcement learning methodology to inform evolutionary algorithms for constrained optimization of engineering applications,” *Knowledge-Based Systems*, Vol. 217, 106836, April 2021. <https://doi.org/10.1016/j.knsys.2021.106836>
- A. Seshadri, B. Philips, A.J. Dave, S. Harrison, J. Pegna, K. **Shirvan**, “Hydrothermal corrosion of laser printed SiC fibers under extreme environment,” *Journal of Nuclear Materials*, Vol.548, 2021, 152805. <https://doi.org/10.1016/j.jnucmat.2021.152805>
- X. Zhao, R.K. Salko, K. **Shirvan**, “Improved departure from nucleate boiling prediction in rod bundles using a physics-informed machine learning-aided framework,” *Nuclear Engineering and Design*, Vol. **374**, April 2021, 111084 <https://doi.org/10.1016/j.nucengdes.2021.111084>
- He Y., **Shirvan K.**, Wu, Y., Su, G. “*Preliminary prediction for survival time of fuel rod under critical heat flux*,” *Annals of Nuclear Energy*, Vol. 151, 107896, Feb. 2021. <https://doi.org/10.1016/j.anucene.2020.107896>
- Li W. **Shirvan K.**, “Multiphysics phase-field modeling of quasi-static cracking in uranium ceramic nuclear fuel,” *Ceramics International*, Vol. 47, Issue 1, P. 793-810, Jan. 2021 <https://doi.org/10.1016/j.ceramint.2020.08.191>
- Jin Y., **Shirvan K.**, “Assessment of Coated Cladding Impact on Large-Break LOCA with TRACE-DAKOTA”, *Nuclear Engineering and Design*, Vol. 374, 111036, April 2021.
- Che Y., Wu X., Pastore G., Li W., **Shirvan K.**, “Application of Kriging and Variational Bayesian Monte Carlo method for improved prediction of doped UO₂ fission gas release,” *Annals of Nuclear Energy*, Vol. 153, April 2021. <https://doi.org/10.1016/j.anucene.2020.108046>
- Radaideh M., Wolverton I., Joseph J., Tusar J., Otgonbaatar U., Roy N., Forget B., **Shirvan K.**, “Physics-informed reinforcement learning optimization of nuclear assembly design,” *Nuclear Engineering and Design*, 110966, Vol. 372, Feb 2021, 110966. <https://doi.org/10.1016/j.nucengdes.2020.110966>
- Cooper MWD, G Pastore, Y Che, C Matthews, A Forslund, CR Stanek, **K Shirvan**, T Tverberg, KA Gamble, B Mays, DA Andersson, “Fission Gas Diffusion and Release for CrO-Doped UO: From the Atomic to the Engineering Scale,” *Journal of Nuclear Materials*, in-Press 152590, Jan. 2021. <https://doi.org/10.1016/j.jnucmat.2020.152590>
- Ryabikovskaya E., A. French, A. Gabriel, H. Kim, T. Wang. **K. Shirvan**, F. A. Garner, L. Shao, “Irradiation-induced swelling of pure chromium with 5 MeV Fe ions in the temperature range 450–650 °C,” *Journal of Nuclear Materials*, Vol. 543, 152585, Jan. 2021. <https://doi.org/10.1016/j.jnucmat.2020.152585>
- Li W., **Shirvan K.**, “Implications of SiC irradiation creep and annealing to UN-SiC fuel rod behavior,” *Journal of Nuclear Materials*, Vol. 542, 152479, Dec. 2020. <https://doi.org/10.1016/j.jnucmat.2020.152479>

Ma Z., **Shirvan K.**, Wu Y., Su G., “A three-dimensional axial fuel relocation framework with discrete element method to support burnup extension,” *Journal of Nuclear Materials*, Available Online, August 2020.

Jin Y., Wu X., **Shirvan K.**, “System Code Evaluation of Near-term Accident Tolerant Claddings during Pressurized Water Reactor Station Blackout Accidents,” *Nuclear Engineering and Design*, Available Online, August 2020.

Jin Y., Cheung FB., **Shirvan K.**, Bajorek S.M., Tien K., Hoxie C.L., “Development of a New Spacer Grid Pressure Drop Model in Rod Bundle for the Post-Dryout Two-Phase Flow Regime during Reflood Transients,” *Nuclear Engineering and Design*, Available Online, August 2020.

Jin Y., Cheung FB., **Shirvan K.**, Bajorek S.M., Tien K., Hoxie C.L., “Numerical investigation of rod bundle thermal-hydraulic behavior during reflood transients using COBRA-TF,” *Annals of Nuclear Energy*, Vol. 148, 107708, Dec. 2020.

Seshadri A., Forrest E.C., **Shirvan K.**, “Why ionizing radiation enhances surface wettability,” *Applied Surface Science*, Vol. 514, 145935, June 2020. <https://doi.org/10.1016/j.apsusc.2020.145935>

Li W., **Shirvan K.**, Pegna J., Harrison S., “Innovative accident tolerant fuel concept enabled through direct manufacturing technology,” *Applied Energy*, Vol. 264, 114742 April 2020. <https://doi.org/10.1016/j.apenergy.2020.114742>

White P., **Shirvan K.**, “Impact of technology hazards and regulatory methods on commercial fusion development,” *IEEE Transactions on Plasma Science*, Special Issue, Available Online. 10.1109/TPS.2020.2975183

Silva R. B., **Shirvan K.**, Cruz J.J., Marques R.P., Marques A.L.F., Piqueira J.R.C., “Advanced method for neutronics and system code coupling RELAP, PARCS, and MATLAB for instrumentation and control assessment,” *Annals of Nuclear Energy*, October 2019. <https://doi.org/10.1016/j.anucene.2019.107098>

Shirvan K., “Implications of accident tolerant fuels on thermal-hydraulic research” *Nuclear Engineering and Design*, Vol 358, March 2020. <https://doi.org/10.1016/j.nucengdes.2019.110432>

Zhao X., **Shirvan K.**, Salko R., “On the prediction of critical heat flux using a physics-informed machine learning-aided framework” *Applied Thermal Engineering*, Vol 164, 5, Available Online Oct 2019.

Li W., **Shirvan K.**, “Finite Element Analysis of the SiC/SiC Composite Clad Deformation in the Presence of Spacer Grids,” *Annals of Nuclear Energy*, Available Online Oct 2019.

Wu X. **Shirvan K.**, “System code evaluation of near-term accident tolerant claddings during boiling water reactor short-term and long-term station blackout accidents,” *Nuclear Engineering and Design*, Available Online Oct 2019.

He Y., **Shirvan K.**, Wu Y., Su G., “Fuel performance optimization of U3Si2-SiC design during normal, power ramp and RIA conditions,” *Nuclear Engineering and Design*, Vol. 353, P. 110256, 2019.

Jin Y., Cheung FB., **Shirvan K.**, Bajorek S.M., Tien K., Hoxie C.L., “Development of a droplet breakup model for dry spacer grid in the dispersed flow film boiling regime during reflood transients,” *International Journal of Heat and Mass Transfer*, Vol. 143, P. 118544, 2019. <https://doi.org/10.1016/j.ijheatmasstransfer.2019.118544>

Wu X., **Shirvan K.**, Kozłowski T., “Demonstration of the relationship between sensitivity and identifiability for inverse uncertainty quantification,” *Journal of Computational Physics*, Vol. 396, pp. 12-30, 2019. <https://doi.org/10.1016/j.jcp.2019.06.032>

He Y., **Shirvan K.**, Wu Y., Su G., “Integrating a multi-layer deformation model in FRAPTRAN for accident tolerant fuel analysis,” *Annals of Nuclear Energy*, Vol. 133, P. 441-454, 2019.

Li W., **Shirvan K.**, “U3Si2-SiC fuel performance analysis in BISON during normal operation,” *Annals of Nuclear Energy*, Vol. 132, P. 34-45, 2019.

Hiscox B., **Shirvan K.**, “*Reactor Physics Analysis of a New Accident Tolerant Fuel Called Fuel-in-Fibers*,” *Annals of Nuclear Energy*, Vol. 130, P. 473-482, 2019.

Sukjai Y., **Shirvan K.**, “*Enhancing FRAPCON fuel performance code for physical phenomena at high temperature and high burnup*,” *Journal of Nuclear Materials*, Vol 517, pp. 113-127, 2019.

Deng, Y., **Shirvan, K.**, Wu, Y., Su, G. “*Utilization of 3D fuel modeling capability of BISON to derive new insights in performance of advanced PWR fuel concepts*,” *Journal of Nuclear Materials*, Vol 516, pp. 271-288, 2019.

Li W., **Shirvan K.**, “*ABAQUS analysis of the SiC cladding fuel rod behavior under PWR normal operation conditions*” *Journal of Nuclear Materials*, Vol 515, pp. 14-27, 2019

Zhao X., Salko R., Wysocki A., **Shirvan K.**, “*Validation and Benchmarking of CTF for Single- and Two-Phase Flow*,” *Nuclear Technology*, Vol 205 pp. 338-351, 2019.

Seshadri A., Philips B., **Shirvan K.**, “*Towards Understanding the Effects of Irradiation on Quenching Heat Transfer*,” *Journal of Heat and Mass Transfer*, Vol 127 pp. 1087-1095, 2018.

Seshadri A., **Shirvan K.**, “*Quenching Heat Transfer Analysis of Accident Tolerant Coated Fuel Cladding*,” *Nuclear Engineering and Design*, Vol. 338 pp. 5-15, 2018.

Wagih, M., Spencer, B., Hales, J., **Shirvan, K.**, “*Fuel performance of chromium-coated zirconium alloy and silicon carbide accident tolerant fuel claddings*,” *Annals of Nuclear Energy*, Vol 120, pp. 304-318, 2018.

Che, Y., Pastore, G., Hales, J., **Shirvan, K.**, “*Modeling of Cr₂O₃-doped UO₂ as a near-term accident tolerant fuel for LWRs using the BISON code*,” *Nuclear Engineering and Design*, Vol 337 pp. 271-278, 2018.

Gurgen, A., **Shirvan, K.**, “*Estimation of coping time in pressurized water reactors for near term accident tolerant fuel claddings*”, *Nuclear Engineering and Design*, Vol 337 pp. 38-50, 2018.

Wu, X., Kozlowski, T., Meidani, H., **Shirvan, K.**, “*Inverse uncertainty quantification using the modular Bayesian approach based on Gaussian process, Part 1: Theory*,” *Nuclear Engineering and Design*, Vol 335, pp. 339-35, 2018.

Wu, X., Kozlowski, T., Meidani, H., **Shirvan, K.**, “*Inverse uncertainty quantification using the modular Bayesian approach based on Gaussian Process, Part 2: Application to TRACE*” *Nuclear Engineering and Design*, Vol 335, pp. 417-431, 2018.

Deng, Y., **Shirvan, K.**, Wu, Y., Su, G. “*Probabilistic view of SiC/SiC composite cladding failure based on full core thermo-mechanical response*,” *Journal of Nuclear Materials*, Vol 507, pp. 24-37, 2018.

Shirvan, K., Forrest, E.C. “*Modeling physical vapor deposition of energetic materials*,” *Journal of Vacuum Science and Technology A: Vacuum, Surfaces and Films* Vol 36 Issue 3, Article 03E103, 2018.

Li W., Wu X., **Shirvan K.**, Su G., “*An Investigation of Numerical Performance Enhancement of RELAP5: Numerical Stability, Higher Resolution and an Alternative Constitutive Relation*”, *Nuclear Engineering and Design*, Vol 328 pp. 309-320, March 2018.

Sevecek M., Gurgen A., Seshadri A., Che Y., Wagih M., Phillips B., Champagne V, **Shirvan K.**, “*Development of Cr Cold-Sprayed Fuel Cladding with Enhanced Accident Tolerance*,” *Nuclear Engineering and Technology Journal*, Vol 50, pp. 229-236, 2018.

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Seshadri A., **Shirvan K.**, “*Accelerating Introduction of Innovative Claddings through Microscale Phenomenological Understanding of Thermal Hydraulics*,” ANS Winter Meeting: Advances in thermal-hydraulics Topical, Orlando Nov 2018.

Zhao X., **Shirvan K.**, Salko R., “*Machine Learning-Based Critical Heat Flux Predictors in Subcooled and Low-Quality Flow Boiling*” ANS Winter Meeting: Advances in thermal-hydraulics Topical, Orlando 2018.

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Borrel L., Fournelle J., **Shirvan K.**, Couet A., “*Physically Based Model and Experimental Validation of Zirconium Alloy Corrosion for LOCA Scenario*,” ASTM 19th International Symposium on Zirconium in the Nuclear Industry, Manchester, UK May 2019.

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Zhao X., **Shirvan K.**, Salko R.K., “*A Physics-Informed Machine Learning-Aided Framework for Predicting Departure from Nucleate Boiling in Rod Bundles*,” Transaction to ANS Winter Conference, Washington D.C. Nov 2019.

Che Y., **Shirvan K.**, “*Application of Variational Bayesian Monte Carlo Method for Improved Prediction of Doped UO₂ Fuel Performance*,” Proceeding of TMS Annual Meeting & Exhibition, San Diego, Jan 2020.

Ma Z., Li W., **Shirvan K.**, “*Modeling Axial Relocation of Fragmented Fuel during Loss of Coolant Conditions by using ABQUS*,” Proceeding of International Conference on Nuclear Engineering (ICONE), ICONE28-POWER2020, Anaheim, Aug 2020.

Radaideh M. I., Forget B., **Shirvan K.**, Assembly Combinatorial Optimisation with Deep Reinforcement Learning, ANS Winter Meeting, Chicago, Nov 2020.

Jin Y., Seshadri A., **Shirvan K.**, Investigation of the Two-Phase Flow Interface Behavior during Quench based on Advanced Imaging Processing, ANS Winter Meeting, Chicago, Nov 2020.

Shirvan K. Seshadri A., Forrest E., Philips, B., Impact of Ionizing Irradiation on Surface Wettability: Fundamentals and Application in Engineering Superhydrophobic Surfaces, ANS Winter Meeting, Chicago, Nov 2020.

Seshadri A., **Shirvan K.**, 8 Corrosion Studies at MIT on CVD SiC and Additive Manufactured SiC fibers, 46th International Conference and Expo on Advanced Ceramics and Composites (ICACC), Feb, 2021.

Wei Li, **Shirvan K.**, Modeling Studies at MIT on the Performance of SiC-based Nuclear Fuel and Cladding Designs, 46th International Conference and Expo on Advanced Ceramics and Composites (ICACC), Feb, 2021

Shirvan K., Carpenter D., Kohse K., Snead L., MIT Reactor Irradiation Capabilities for Space Nuclear Technology Deployment, Nuclear Emerging Technologies for Space (NETS), ORNL, April 2021.

Park G., Schulte F., Snead L., **Shirvan K.**, Increasing cermet fuel thermal margin with Thoria for nuclear thermal propulsion, Nuclear Emerging Technologies for Space (NETS), ORNL, April 2021.

Jin Y., Zhao X., **Shirvan K.**, Unified Domain Knowledge Informed Machine Learning Model for CHF Prediction, ANS Annual Meeting, June 2021.

Feng J., Lopez-Velez E., W.R. Stewart, Wisner R., Baglietto E., **Shirvan K.**, “Heat Transfer Analysis of a conceptual Horizontally-Oriented High Temperature Gas-Cooled Reactor,” Proc. of 28th International Conference on Nuclear Engineering, Virtual Aug 2021.

Jiragoontansiri W., Woravisuttsarakul T., Sae-pueng R., Sukjai Y., **Shirvan K.**, The Effect of flow channel geometry on thermomechanical performance of printed circuit heat exchanger (PCHE), Proc. of 28th International Conference on Nuclear Engineering, Virtual Aug 2021.

Radaideh, M.I., Forget, B., **Shirvan, K.**, “Application of Reinforcement Learning Optimisation Methodology to BWR Assemblies,” In: Proc. International Conference on Mathematics & Computational Methods Applied to Nuclear Science & Engineering (M&C 2021), Raleigh, North Carolina, USA, October, 2021.

Jeong Y., **Shirvan, K.**, “Multiphysics Modeling of Fast Liquid-Fuel Molten Salt Reactor Using STARCCM+,” In: Proc. International Conference on Mathematics & Computational Methods Applied to Nuclear Science & Engineering (M&C 2021), Raleigh, North Carolina, USA, October, 2021.

Shirvan K., “*Accident Tolerant Fuels: Misconceptions and Opportunities*,” Proceeding of International Congress on Advances in Nuclear Power Plants (ICAPP), Abu Dhabi, March 2020

Velez Lopez E., Kennard J., Buongiorno J., **Shirvan K.**, Einstein H. H., “*Is embedding the reactor building below grade a cost-effective proposition?*” Proceeding of International Congress on Advances in Nuclear Power Plants (ICAPP), Abu Dhabi, March 2020.

Stewart W. R., Buongiorno J., **Shirvan K.**, Velez E., Baglietto E., Forsberg C., Driscoll M., “*Requirements and Technologies for Japan’s Future Energy Systems (JNext)*,” Proceeding of International Congress on Advances in Nuclear Power Plants (ICAPP), Abu Dhabi, March 2020.

Halimi A. A., **Shirvan K.**, “*A Five-Year Soluble Boron Free iPWR Core Design*,” Proceeding of International Congress on Advances in Nuclear Power Plants (ICAPP), Abu Dhabi, March 2020.

Halimi A. A., **Shirvan K.**, “*Impact of Core Power Density on Economics of a Small Integral PWR*,” Proceeding of International Congress on Advances in Nuclear Power Plants (ICAPP), Abu Dhabi, March 2020.

Lal K., Parsi S. S., Charkas H., **Shirvan K.**, Cohen M. Kirchman P., Kosbab B., Whittaker A., “Impact of Seismic Isolation on the Overnight Capital Cost of Safety-Related Equipment in Nuclear Reactors,” Proceeding of International Congress on Advances in Nuclear Power Plants (ICAPP), Abu Dhabi, March 2020.

Bailly-Salins L., Borrel L., Jiang W., Spencer B., **Shirvan K.**, Couet A., “Modeling of High-temperature Corrosion of Zirconium Alloys Using the eXtended Finite Element Method (X-FEM)”, MS&T21: Materials Science & Technology, Columbus, Oct 2021.

Shirvan K., “Advanced Methods to Support High Burnup Fuel and EATF Value Assessment and Accelerated Development,” Proc. Of Top Fuel, Santander 2021.

Stewart W.R., **Shirvan K.**, “Insights from Capital Cost Estimation of GENIII+ Plants,” ANS Winter Meeting, Washington DC, Nov 2021.

Jeong Y.S., Li W., **Shirvan K.**, Independent Assessment of Transformational Challenge Reactor Fuel Lattice,” ANS Winter Meeting, Washington DC, Nov 2021.

Seshadri A., **Shirvan K.**, “Hydrothermal Corrosion of CVD SiC: New Corrosion Model and Mitigation Strategies,” 46th International Conference and Expo on Advanced Ceramics and Composites (ICACC), Jan, 2022.

Katoh Y., Koyanagi T., Xu P., Deck C., **Shirvan K.**, Snead L., “Silicon carbide composite technology for accident-tolerant fuels – recent progress and updated R&D needs,” 46th International Conference and Expo on Advanced Ceramics and Composites (ICACC), Jan, 2022.

Seshadri A., Pegna J., Harrison S., **Shirvan K.**, “Hydrothermal Corrosion behavior of Additively Manufactured SiC fibers: Effect of Irradiation and Thermal pre-treatment,” 46th International Conference and Expo on Advanced Ceramics and Composites (ICACC), Jan, 2022.

Jin Y., Zhao X., **Shirvan K.**, “Constructing a New CHF Look-Up Table Based on the Domain Knowledge Informed Machine Learning Methodology,” NURETH 19, March 2022.

Wang Y.J., **Shirvan K.**, Baglietto E., Tsilifis P., Amer A., Khan G., Liping K., “High Fidelity Digital Twin for Critical System Assessments,” NURETH 19, March 2022.

Seurin P., **Shirvan K.**, “PWR Loading Pattern Optimization with Reinforcement Learning,” PHYSOR, Pittsburgh, May, 2022.

Shirvan K., “Mechanism and implication of Gamma radiation on two-phase flow dynamics”, 12th Japan-U.S. Seminar on Two-Phase Flow Dynamics, May, 2022.

Jin Y., Seshadri A., **Shirvan K.**, “Visualization of the two-phase flow quench behavior using image,” 12th Japan-U.S. Seminar on Two-Phase Flow Dynamics, May, 2022.

Aranda B.A., Baglietto E., **Shirvan K.**, “Validation of Multi-Phase-CFD Frameworks for High Void Fraction Flow in Large Diameter Systems,” Advances in Thermal Hydraulics (ATH 2022), Anaheim, June, 2022.

Wang C., **Shirvan K.**, Sun X., “Benchmark of RANS Simulations against LES for Helium Flow in Mini-zigzag Channels.” 13th International Topical Meeting on Nuclear Reactor Thermal-Hydraulics, Operation, and Safety (NUTHOS-13) Sept, 2022 [Virtual].

Shirvan K., Csontos A., “Achieving Sizable Power-Uprate for Existing Fleet Through LEU+ and ATF,” TopFuel 2022 Light Water Reactor Fuel Performance Conference, Rayleigh, Oct, 2022.

Halimi A., **Shirvan K.**, “Investigation of Achievable Peak Rod Average Burnup with Full Core Fuel Performance for 4-Loop PWRs,” TopFuel 2022 Light Water Reactor Fuel Performance Conference, Rayleigh, Oct, 2022.

Witham J., Moneghan D., **Shirvan K.**, “Conceptual Study of Hydrogen Generation with Cobalt-60 Through Radiolysis,” ANS Winter Meeting, Phoenix, Nov, 2022.

Stewart W.B., **Shirvan K.**, “Analysis of Construction Delay Risks for Nuclear Projects,” ANS Winter Meeting, Phoenix, Nov, 2022.

Radaideh M., **Shirvan K.**, “NEORL: An Open-source Python Framework for Optimization with Machine Learning Neuroevolution,” ANS Winter Meeting, Phoenix, Nov, 2022.

Candido I., **Shirvan K.**, “Graphite Life-Cycle Cost Model for HTGRs,” ANS Winter Meeting, Phoenix, Nov, 2022.

Aranda B., Baglietto E., **Shirvan K.**, “Validation of Multi-Phase CFD Frameworks for High Void Fraction Two-Phase Flows in Large Diameter Systems,” 11th International Conference on Multiphase Flow, ICMF-2023.

Seshadri A., **Shirvan K.**, "Hydrothermal Corrosion behavior of Neutron Irradiated Additively Manufactured SiC fibers"47th International Conference and Expo on Advanced Ceramics and Composites (ICACC), Jan, 2023.

Williams D.J., Seurin S.R., **Shirvan K.**, “A Novel Framework for Accelerating Core Loading Pattern Optimization with Deep Learning Surrogate Models,” ANS Annual Student Conference, Knoxville, April 2023.

Seurin S.R., **Shirvan K.**, “Can Advances in Artificial Intelligence Surpass Legacy Algorithms for PWR Core Optimization?,” ANS Annual Student Conference, Knoxville, April 2023.

Carayannopoulos L., **Shirvan K.**, Carpenter D., “Simulation of Salt Loop Irradiation at the MITR,” International Congress on Nuclear Power Plants (ICAPP), Gyeongju, Korea, April 2023.

Choi Y., K. **Shirvan K.**, “Assessment of NuScale Core Design with Helical Cruciform Fuel Rods,” International Congress on Nuclear Power Plants (ICAPP), Gyeongju, Korea, April 2023.

Germonpré E., Buongiorno J., **Shirvan K.**, Lee J.I., Macdonald R., “An Economic Analysis of the Use of Nuclear Microreactors in Hydrogen Production,” International Congress on Nuclear Power Plants (ICAPP), Gyeongju, Korea, April 2023.

Hines L., **Shirvan K.**, “Preliminary Investigation on Improving Economic Competitiveness of HTGRs with Design-to-Build Approach,” April 2023.

Invited Talks

Shirvan K., “*Annular Fuel Design for LWRs*,” University of Reno-Nevada, April, 2013.

Shirvan K., “*Fuel Performance with BISON*,” Consortium for Advanced Nuclear Simulation of LWRs Summer Workshop at ORNL, Knoxville, Tennessee, 2014 & 2015 & 2017 & 2018 & 2019.

Shirvan K., Kazimi M.S., “*Neutronic Challenges of Advanced Boiling Water Reactor Designs*,” Reactor Physics of Non-Traditional LWR Fuel Design Special Session, PHYSOR, Kyoto, Japan, 2014.

Shirvan K., “*Multi-layer Ceramic Matrix Composite Silicon Carbide Cladding for Light Water Reactors*,” Advanced Materials for Sustainable Nuclear Fission and Fusion Energy Special Session, International Conference on Advanced Ceramics & Composites, Daytona, Florida 2016.

Shirvan K., “Assessment of the V&V Challenges of Accident Tolerant Fuels” Multiphysics Models Validation Workshop, NC State University, Raleigh NC, July 2017.

Shirvan K., “Innovation in Nuclear Technology: Past, Present and Future,” Nuclear Innovation Bootcamp, UC Berkeley, Berkeley, CA, July 2017

Shirvan K., “Advanced Fuels R&D: Challenges and Opportunities” Nuclear Power Institute of China (NPIC) Advanced Methods in Nuclear Reactor Design Workshop, Chengdu, China, October 2017

Shirvan K., “Acceleration of Fuel Qualification using Modeling and Simulation” INL EROB & MFC Seminar, Idaho Falls, Idaho, April 2018

Shirvan K., “Accident Tolerance Fuels R&D: Challenges and Opportunities”, GE-Hitachi Nuclear, Wilmington, North Carolina, Aug 2018.

Shirvan K., “Implication of LWR Mechanical Failure Modes, Reactor Environment and Accident Tolerant Fuels on Thermal-Hydraulic Research,” International Seminar on Nuclear Reactor Core Thermal Hydraulics Analysis (ISReCTHA), Lecco, Italy, Aug 2018.

Shirvan K., “The Safety and Economic Implications of ATFs,” International Uranium Fuel Seminar, Boston, MA, October, 2018.

Shirvan K., “Accident Tolerant Fuel Data Gaps and Failure Modes” Advanced Fuels Campaign Annual Meeting, Gainesville, Florida, Dec 2018.

Shirvan K., “Discussion on role of Modern Experimentation, Simulation and Data Processing to Support Nuclear Fuel R&D” Materials and Fuels Complex, Idaho National Laboratory, Feb 2019.

Shirvan K., “Acceleration of Innovative Nuclear Fuel Development for Sustainability of the Existing Fleet,” Key Note Speaker, Applied Energy A+B Conference, May, 2019.

Shirvan K., “Nuclear Material Study Using a Combined M and E,” MeV Summer School, Oakridge National Laboratory, July, 2019.

Shirvan K., “System Codes Comparison for Time-to-Fuel Failure Analysis,” Enhanced Resilient Plant (ERP) Workshop, Idaho National Laboratory, July 2019.

Shirvan K., “AI for Nuclear Core Design” Idaho National Laboratory, ML/AI Symposium 2.0, July, 2020.

Shirvan K., “ATF Modelling,” MeV Summer School, Idaho National Laboratory, July, 2020.

Shirvan K., “Impact of Licensing Methodology on High Burnup Fuel Assessment” Risk-Informed Systems Analysis (RISA) Pathway Stakeholder Engagement Virtual Meeting, Idaho National Laboratory, October, 2020

Shirvan K., “Application of Artificial Intelligence Technology for Commercial Nuclear Fleet” Naval Nuclear Laboratory webinar, produced by Cutter Consortium, October, 2020.

Shirvan K., “Nuclear Safety Characteristics of Generation III+ Large and Small Light Water Reactors,” Xi’an Jiaotong University, November, 2020.

Shirvan K., “SMR Research and Development Trends in the U.S.,” Future Vision of Nuclear R&D WEBINAR – SMR, Korea Nuclear International Cooperation Foundation(KONICOF), November, 2020.

Shirvan K., “MIT Contributions to CASL Education Program,” CASL Education Panel, CASL Symposium, ANS Winter Meeting, November, 2020.

Shirvan K., “AI Application for Nuclear Engineering,” EPRI AI Reserve Pitch Symposium Lecture, May 2021.

Shirvan K., "Peering Over the Horizon & Meeting Closeout" EPRI AI Reserve Pitch Symposium Closing Panel, held virtually, May 2021

Shirvan K., "Machine Learning and Artificial Intelligence in Reactor Physics and Design" 2021 ANS Virtual Annual Meeting Panel, June 2021

Shirvan K., "Recent Silicon-Carbide Research and Development Activities" 2021 SiC Annual Technical Workshop, July 2021

Shirvan K., “Nuclear Energy Cost and Innovations that Matter,” Key Note Speaker, MIT A+B Applied Energy Symposium (Virtual Conference), Aug, 2021,

Shirvan K., “Advanced Nuclear Technologies,” Nuclear Energy In a Low-Carbon Future: Key Facts and Issues, Clean Air Task Force (Virtual), Aug, 2021.

Shirvan K., “Application of Studsvik Tools to LWR core optimization and advanced fuels engineering,” 2021 Studsvik International User Group Meeting, San Diego, California. Sept 2021

Shirvan K., “Nuclear Energy Cost Drivers and Innovations that Matter,” University of California-Berkley Nuclear Engineering Colloquium Series, Oct 2021.

Shirvan K., “Deep Dive in SMR Cost Drivers,” International Congress on Advances in Nuclear Power Plants (ICAPP), Plenary Chair (Virtual), Oct 2021 .

Shirvan K., “Economic Solution for Low Carbon Process Heat: A Horizontal, Compact HTGR,” GAIN-EPRI-NEI Artificial Intelligence/Machine Learning Technologies for Advanced Reactors Virtual Workshop, Oct 2021.

Shirvan K., “Advanced Nuclear Technologies” Infrastructure Design for Climate Change Course, Massachusetts Institute of Technology, Nov, 2021.

Shirvan K., “Economic Solutions for Advanced Reactor Technologies,” Oak Ridge/Knoxville American Nuclear Society Local Section, Dec, 2021.

Shirvan K., “Compact Steam Generator Technology R&D at MIT,” 3rd International Workshop on the Printed Circuit Steam Generator, Korea Atomic Energy Research Institute (Virtual), Dec, 2021.

Shirvan K., “Nuclear Construction Estimation Tool (NCET),” Seminar to Nuclear Energy Institute (NEI) Task Force on Nuclear Construction Projects (Virtual), March, 2022.

Shirvan K., “What is Exciting about Nuclear Fuel? Pretty Much Everything!,” NRE/MP Seminar series, Nuclear & Radiological Engineering and Medical Physics Programs, Georgia Institute of Technology (Virtual), April, 2022.

Shirvan K., “Advanced Nuclear Prospect in U.S. and International Markets,” Nuclear Fireside Chat Series, J.P. Morgan (Virtual), April, 2022.

Shirvan K., “Nuclear Cost Estimation Tool: Overview and Application,” Naval Nuclear Laboratory Special Seminar Series, May, 2022.

Shirvan K., “Construction Cost Drivers and How to Address them by Design,” Construction Innovation Workshop for Advanced Nuclear Reactors, Charlotte, May, 2022.

Shirvan K., “Economics of Nuclear Reactors,” MeV Summer School, Oakridge National Laboratory, July, 2022.

Shirvan K., “Validation of Robustness in TCR Design Strategies,” DOE’s AMMT NEUP and Industry Project Meeting, Sept, 2022.

Shirvan K., “Overview of SMR Research Activities at MIT,” TANDEM SMR Advisory Board Meeting, Sept, 2022.

Shirvan K., “Progress on Fuel Performance Modeling of Accident Tolerant and High Burnup Fuels,” FAST User Group Meeting by NRC, Oct, 2022.

Shirvan K., “Experiences from NE Advanced Reactor Demo Program: Horizontal Compact High Temperature Gas Reactor.” Public-Private Partnerships for Fusion Energy III, INFUSE Workshop, Seattle, Oct. 2022.

Shirvan K., “Value Proposition and Challenges for Power Upgrading of Existing Fleet under IRA,” Nuclear Energy Institute Advanced Technology Fuel Task Force, Oct, 2022 (Virtual)

Shirvan K., “Harnessing the 100 million fold potential of fission energy: Fuel and Design Optimization,” Chevron Webinar Series, Nov, 2022 (Virtual).

Shirvan K., “Nuclear Fuel Design and Performance: Keys to Unlocking Economical Nuclear Energy” Oregon State University Seminar, Jan, 2023 (Virtual)

Shirvan K., “Insights into Nuclear Energy Cost Drivers,” DOE’s Market Analysis Community of Practice (MACOP) Monthly Invited Talks, DOE’s Office of Technology Transitions, March, 2023

Shirvan K., “Accident Tolerant Fuel Irradiations at MIT Reactor” NEI-EPRI-INL ATF Workshop, April, 2023 (Virtual)

Shirvan K., “Enabling Technologies: Power Cycles, Heat Exchangers and Fuels,” Nuclear Everywhere Symposium, MIT, March, 2023.

Shirvan K., “Nuclear Energy Overview and Cost Drivers,” Halliburton Labs Nuclear Energy Landscape Event, April, 2023

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