INTRODUCTION

Change is in the air at Studsvik Scandpower as we pursue innovative partnerships to deliver high value solutions and new capabilities for the nuclear energy community. This Spring, Studsvik Scandpower began a partnership with Blue Wave AI Labs which seeks to apply Artificial Intelligence (AI) and Machine learning (ML) to optimize fuel efficiency and operational excellence for operating nuclear plants around the world. If your team is struggling with an optimization problem or unexplained physical phenomena which are limiting your operations, our partnership team is ready to engage in solving those problems to increase output or decrease costs in the plant.

Studsvik is committed to supporting the latest nuclear technology advancements, including Small Modular Reactor (SMR) and Advanced Reactor (AR) applications as well as supporting more efficient radiation transport, criticality, and shielding calculations. Studsvik has partnered with Finland's leading nuclear laboratory, VTT, creating an MOU this month to provide a code branch to their Serpent offering, a continuous energy Monte-Carlo neutronics code. This new product will bring Serpent under the NQA-1-2015 standards. This will also add the support, maintenance, error reporting, and development strength of Studsvik's world-class team to this advanced code base. The addition of Serpent to the Studsvik Scandpower family of products will bring easier criticality analyses to operating utilities, and broaden potential applications to radiation shielding and medical physics.

Studsvik Scandpower has a global team ready to solve the latest problems facing the industry. We are leaders in the nuclear industry and look forward to participating in the journey to advance the nuclear industry for the benefit of the world. Enjoy your Summer, and don't hesitate to engage with us to talk through the latest state of your plants and designs!

Rob Whittle

Studsvik Scandpower President & CEO

CMS5 MAINTENANCE RELEASE

Studsvik Scandpower continues to release updates for its CMS5 software suite. Highlights of new features and capabilities, and minor software corrections available in these new versions can be found in the Changes and Release Notes documents in the "Software Updates" section of the
Studsvik Support Site (login required).

CMS5 software has been qualified under the Studsvik, Inc., NQA1 1994, 10 CFR 50 Appendix B, 10 CFR 21 Quality Assurance Program and HELIOS2 under ISO-9001.

CASMO

CASMO5 v3.05.00
2D lattice physics transport code for PWR and BWR (VVER capability available in a separate version)
• Support of the optional JEF-2.2 data library jef22.300.586.bin (commercially available)
• Nuclide-dependent delayed fission spectrum option
• New BWR S5C HPR option with PRM base depletion
• Miscellaneous minor bug fixes and code enhancements

HELIOS

HELIOS2 v2.03.03
2D general geometry lattice physics transport code
• Linear source MoC option
• Fission source convergence option
• Added non-resonance XS data for Al-27, Cl-35, Cl-37, and Sc-45 to XS library

SNF

CMSLINK5 v1.18.00

Linking code between C5 and S5/S3/S3K/S5K

SIMULATE5 v1.23.00

3D steady state nodal simulator code for PWR and BWR
• Improvements to the microscopic cross-section model for the shutdown-cooling modeling, particularly for long outages (5 years and longer).
• General run time improvements with additional OpenMP parallelization. SIMULATE5 v1.23.00 runs typically ~15% faster than the previous version.
• Added 2D/3D map edits of Residual Gd worth, in pcm, to the output and HDF5 files
• Enhancements to the PWR in-core detector reaction-rate comparisons module: Comparisons can now be generated in both the fuel and the detector nodalization.

SNF v1.08.00

Spent Nuclear Fuel analyses
• Decay library update
• USNRC RG 3.54 Rev2
• Decay heat power uncertainties model
• Updated and extended power history model
• Support for cross-units fuel shuffling
• Extensions in the multi-pin model to support different pin radii

MARLA v3.06.00

• Added loading characteristics rules for additional types of casks

Current code versions for other Studsvik software include:
CASMO5_VVER v3.05.00, SIMULATE5_VVER v1.23.00, SIMULATE-3 v6.23.01, SIMULATE-3K v2.10.00, S5POST v1.00.00, CMSView5 v1.0.6, NORDIC v3.02.00

If you would like to receive an update to your software under your current software maintenance agreement, please contact your Studsvik representative.

SEVERAL STUDSVIK SCANDPOWER EXPERTS PRESENTED AT THE PHYSOR 2022 CONFERENCE

International Studsvik Scandpower Experts Presented at PHYSOR 2022 Conference

Studsvik Scandpower recently made a strong showing the at the Physor-2022 conference (International Conference on the Physics of Reactors), held in Pittsburgh, PA, May 15-20, 2022. SSP participation and leadership was on many levels, all the way from technical papers presented, and technical sessions chaired, to participating in lively panel discussions on the future of reactor physics methods, and vendor independence. **SSP Technical Papers** (login required).

"Development and Benchmarking of Transient Nodal Code SIMULATE5-K Neutron Kinetics Solver"

T. Bahadir

"Application of Linear Prolongation to Coarse Mesh Finite Difference Acceleration in CASMO5"

R. Ferrer, J. Hykes

"Verification of SIMULATE5 Pin Powers for Large Assembly Bow"

J. Hykes, T. Bahadir

"Linear Source Method of Characteristics in HELIOS2"

C. Wemple, R. Ferrer

"Simulation of Peach Bottom Turbine Trip TT1, TT2, and TT4 with SIMULATE-3K"

G. Grandi (SSP), C. Henry (Constellation), B. Ivanov (Constellation)

"KONVOI Core Analysis with CASMO5 and SIMULATE5"

E. Georgieva (SSP), M. Seidl (PreussenElektra), G. Anton (SSP)

Of course, CMS5 papers were not limited to just SSP:

Other CMS5 related papers from Physor-2022:

"Comparison of CASMO-5, MPACT, and Serpent 2 for the Modeling of Advanced BWR Lattices"

M. Hursin (PSI), P. Mala (PSI),
A. Vasiliev (PSI), H. Ferroukhi (PSI),
Y. Liu (UMICH), S. Choi (UMICH),
B. Kochunas (UMICH)

"Comparisons of Nodal Diffusion and Whole-Core Transport Methods for Multiple Cycles of a Small Light Water Reactor"

J. Rader (ORNL), A. Godfrey (ORNL),
A. Graham (ORNL), C. Lietwiler (Holtec),
H. Smith (Holtec), M. Saia (Holtec)

PAST TECHNICAL CONFERENCE PAPERS PRESENTED BY STUDSVIK SCANDPOWER EXPERTS

Mathematics & Computational Methods Conference 2021 ANS
(Oct. 3-7, 2021, Raleigh, NC)

"Improved Rational Approximation for Spatially Dependent Resonance Self-Shielding in CASMO5"

R. Ferrer, J. Hykes

"Parallel Computing in CASMO5"

R. Ferrer, J. Hykes

Top Fuel 2021 ANS
(Oct. 24-28, 2021, Santander Spain)

"Modeling Lithium Uptake in PWR Fuel Cladding Oxide"

U. Svensson, G. Grandi, D. Schire, K. Johnson, D. Jadernas

RECENT JOURNAL ARTICLES AND PUBLICATIONS BY STUDSVIK SCANDPOWER EXPERTS

"Analysis for the ARIANE GU3 Sample: Nuclide Inventory and Decay"

D. Rochman (PSI), A. Vasiliev (PSI),
H. Ferroukhi (PSI), M. Hursin (PSI),
R. Ichou (IRSN), J. Taforeau (IRSN),
and T. Simeonov (SSP),

EPJ Nuclear Science & Technology 7 (2021)

"Spatially Dependent Resonance Self-Shielding in CASMO5"

R. Ferrer, J. Hykes

Nucl. Sci. Eng., DOI:10.1080/00295639.2022.2053491 (2022)

UPCOMING CONFERENCES/EVENTS

Studsvik Scandpower staff are planning to attend a variety of industry events – feel free to contact us and chat about your favorite topics with us!

August 7-10, 2022 // Marco Island, FL

Utility Working Conference and Vendor Technology Expo (UWC 2022) (ANS)

September 12-15, 2022 // Portoroz, Slovenia

NENE 2022 – 31st International Conference Nuclear Energy for New Europe

October 9-13, 2022 // Raleigh, NC

TopFuel 2022

October 10-11, 2022 // Rez, Czech Republic

VVER 2022 – 8th International Conference

November 13-17, 2022 // Phoenix, AZ

ANS Winter Meeting

DID YOU KNOW…

Did You Know? That CASMO5 users can substantially reduce single-assembly case matrix run time by as much as 15x by using the parallel S3C/S5C option? Users can also reduce multi-assembly reflector case matrix calculations by at least 2x by using the OMP option in CASMO5.

# BUDAPEST, HUNGARY SELECTED FOR THE 2023 USERS GROUP MEETING

Studsvik Scandpower is actively planning its 2023 Users Group Meeting for March of 2023 in Budapest, Hungary. More information on the program, workshops, and hotel registration will be forthcoming. We hope to see you at UGM 2023!

STUDSVIK SCANDPOWER EXPANDS TEAM

William Dawn recently joined the Studsvik Scandpower Methods Development Team in the Idaho Falls office in June 2022. William recently completed his PhD at North Carolina State University under Prof. Scott Palmtag (Thesis:"Multiphysics Modeling of Microreactors with Unstructured Mesh Neutron Transport and Exascale Computing Architectures") and has previous experience at GEH, ORNL, INL and was a Graduate Assistant in the CASL program. William was the recipient of the Alan F. Henry/Paul A. Greebler ANS Scholarship in 2021 and holds three US patents. William is a welcome addition to the CMS5 team and will undoubtedly bring new and exciting ideas into SSP software.
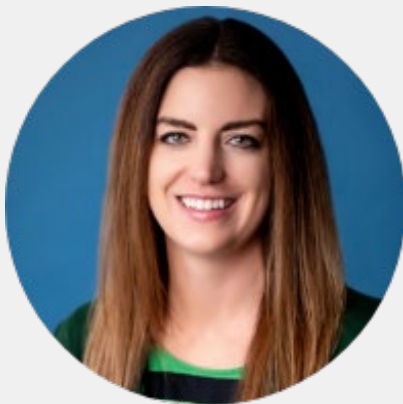
Melanie Joseph joined Studsvik Scandpower in May 2022 as the Marketing and Business Development Manager. She will be based in Pittsburgh, Pennsylvania and will carry responsibilities for global Marketing activities and be a part of the commercial operations team for ongoing market and business development activities. Melanie comes with over 13 years of experience at Westinghouse, where she recently was the Marketing Manager for their Nuclear Fuel organization. She holds a bachelor's degree in Mathematics, a Statistics minor, and a Masters in Systems Engineering also from The Pennsylvania State University.

STUDSVIK SCANDPOWER NAMES ITS FIRST FELLOW SENIOR NUCLEAR ENGINEER

Congratulations go to **Tamer Bahadir** who has been named Studsvik Scandpower's very first Fellow Senior Nuclear Engineer. Tamer started working with Studsvik as an intern in 1993 and graduated from MIT with a PhD in Nuclear Engineering under Alan F. Henry in 1995. Tamer has made many foundational contributions to the CMS/CMS5 methodology over the years and has been integral to the success of CMS5 and SSP. Tamer's dedication and hard work over the last 29 years has earned him the right to be SSPs first Fellow Senior Nuclear Engineer. Congratulations Tamer!

SIMULATE5-K UPDATE

SSP has been actively working on the development of SIMULATE5-K (S5K), which is the next-generation best estimate transient code with an advanced neutronic core model that is based on the steady-state SIMULATE5 (S5) code and features a detailed thermal-hydraulic channel model. SSP's goal is to deliver an industry leading transient analysis code that seamlessly interfaces with the S5 steady state code. For the user, S5K allows the easy analysis of complicated core transients with consistent core conditions and minimal input.

By offering fully compatible neutronic and thermal hydraulics modeling capability between the steady-state and transient calculations, S5K can take full advantage of the very detailed S5 models developed by the user. S5K can be linked with VIPRE (detailed sub-channel analysis) and industry systems codes (RELAP, TRACE, RETRAN, and APROS) for analysis of a wide range of transients.

Increased fuel burnup associated with longer cycles and evidence of fuel failures in highly burned fuel when subjected to rapid power surges, has led to recent revisions in the fuel safety limits for reactivity insertion accidents (PWR CRE and BWR CRD) and the release of Regulatory Guide 1.236 by the USNRC in June 2020. The S5K methodology addressing RG 1.236 is currently under development. Improvements to the pin-by-pin fuel temperature and enthalpy calculations comprise initial steps to satisfy the new regulatory requirements.

S5K Neutronics: The S5K neutronic model is a direct extension of the existing two-group Analytical Nodal Model (ANM) kinetics model to multi-group. The transient multi-group, three dimensional neutronic equations are derived in a consistent manner with the static analytical nodal model implemented in S5. Unlike S3K, an arbitrary number of energy groups and delayed neutron precursor group can be used in S5K. The axial and radial homogenization models in S5 have been extended to the transient domain in S5K using the time frequency transformation that converts the time dependent equations to pseudo-static equations.

S5K Thermal-Hydraulics: The S5K thermal-hydraulic and fuel pin models are a direct extension of the S5 models. Each assembly in the core is described as an active channel plus several parallel internal bypass channels (water rods). In addition, for Boiling Water Reactors (BWRs), the interstitial bypass is explicitly modeled. The S5K power deposition model is consistent with the S5 model: the energy source (i.e., fission plus decay heat) are deposited in the fuel pellet, active coolant, water rods, common bypass etc.

The PWR version of S5K is complete relative to S3K features and can perform typical PWR transients such as: control rod movements, inlet coolant temperature transients, inlet flow transients, and pressurization transients.

The BWR version of S5K is currently under development and scheduled for release in April of 2023 (beta version available earlier). S5K BWR functions involving the core only (no peripheral systems) such as control rod drop are currently available now.

FALL 2022 WEBINAR: STREAMLINE SPENT FUEL CHARACTERIZATION AND MANAGEMENT USING STUDSVIK'S SNF SOFTWARE

Studsvik Scandpower will be hosting a virtual webinar demonstrating the improved isotopics, decay heat, and source term calculations of SNF. These calculations provide improvements from current U.S. utility methods (which currently use ORIGEN) to save operating cost and improve margin recovery.

To register for the webinar, please choose one of the links below:

September 7, 2022 1:00 PM (U.S. EST/EDT) **Register here**

September 8, 2022 1:00 PM (U.S. EST/EDT) **Register here**

To access previous webinar videos and presentations, visit the **"Studsvik Scandpower Support Site"**.

Studsvik AI
Powered by **BLUE WAVE AI LABS**

STUDSVIK SCANDPOWER AND BLUE WAVE AI LABS ANNOUNCE STRATEGIC PARTNERSHIP TO DELIVER NEXT GENERATION ACCURACY TO NUCLEAR POWER ANALYTICS

Studsvik Scandpower, Inc. is pleased to announce a strategic partnership with Blue Wave AI Labs to deliver enhanced diagnostic and predictive capabilities to nuclear energy facilities around the globe. The partnership will create a growing product line for Studsvik Scandpower: Studsvik AI, Powered by Blue Wave AI Labs.

To learn more about this strategic partnership, visit the press release **here**

STUDSVIK SCANDPOWER AND VTT PARTNER TO BRING QA SERPENT TO NUCLEAR INDUSTRY

To address the growing need for Quality Assured neutronic simulation in the Advanced Reactor market, Studsvik Scandpower, the global leader in neutronic simulation software, and VTT Technical Research Centre of Finland, the cutting-edge leader in the development of

advanced software for nuclear reactor and power plant modelling such as the Serpent Monte Carlo code, initiated a strategic partnership to expand the commercial uses of Serpent software to the advanced civil nuclear community around the globe. The partnership will continue the growth of the Studsvik product line with a new version of Serpent under Studsvik's NQA-1 and 10 CFR50 Appendix B Quality Assurance program, Serpent-SSP.

To learn more about this strategic partnership, visit the press release here -
Press releases - Studsvik

If there is information that you would like us to include in Studsvik announcements or add to the Support Site, please send an e-mail to cms-info@studsvik.com. You can also opt-out of receiving the newsletter by sending an e-mail to the same address.