The Antenna

NEWSLETTER FROM A.N.T. INTERNATIONAL No.53 2022

A.N.T. INTERNATIONAL SEMINARS, ONLINE EDUCATION, CONSULTATION SERVICES AND NEW EXPERTS

A.N.T. International is very grateful to Iberdrola in Spain and Idaho National Laboratory in Idaho Falls, US, that kindly hosted the nuclear fuel (ZIRAT) and coolant chemistry/structural material degradation (LCC) Seminars. We also want to thank all the 100+ customer participants from 24 different organisations/10 countries for coming to the seminars.

The Seminars are valuable for all engineers with different backgrounds from engineers with little experience to experts in their fields.

Our Seminars in the US and in Spain were very well appreciated by our customers. The overall opinion on the different Seminars ranked from 4.3 to 4.4 on a scale from 1 (bad) to 5 (excellent).

Editor & publisher: Mikaela Strand © A.N.T. INTERNATIONAL 2022

It is encouraging to see that the number of younger engineers was the largest ever which is a reflection of the nuclear energy renaissance in the world.

The figure to the right shows the situation of the future of nuclear power about 6 months ago. At that time 5 countries, including Sweden, planned to phase out nuclear power, while 32 countries were building or planned to build nuclear power plants while 6 countries, having nuclear power but did not plan to build more nuclear power plants. However, due to the extremely high electricity prices we experienced already in 2021, the interest for nuclear power is dramatically increasing and as of today only Germany is adamant about to phase out nuclear power by the end of this year even though there is a clear majority of Germans in favor of not phasing out nuclear power in Germany.

Nuclear and hydro power electricity generation are the ONLY electricity production sources that produce reliable inexpensive electricity today. For more information see: Nuclear Power – The only obvious energy source for the future – Energy Education and visit our blog at: Energy Education – A blog about clean and reliable energy.

SITUATION OF THE FUTURE OF NUCLEAR POWER ABOUT SIX MONTHS AGO:

CLICK HERE TO ZOOM IN

Our Online Education Courses continue to draw the attention of young engineers. Our courses provide training and knowledge in the areas of nuclear fuel, structural materials and coolant chemistry. Our Online Education can help transfer the expertise from the older to the younger generation of engineers. It cannot be stressed enough that to maintain and improve nuclear safety and profitability education is crucial. The online approach provides the freedom to complete the course at each individual's pace which is highly cost effective for the customer while still providing a required qualification with up to date nuclear training. Currently more than 100 Engineers from 12 different organisations are taking one of our 40 courses, for more information, please see: Online Education – A.N.T. International (antinternational.com).

Our ZIRAT and LCC members get 12 months access to all our Online Education Courses at a discounted price.

The renewed interest for nuclear power has also increased the consultation services A.N.T. International provides our customers.

The A.N.T. International team of Experts are continuously expanding and I am proud to announce three additional experts: Prof: Arthur Motta, Dr. Brian Cheadle and Mr. Juan de Dios Sánchez.

We are most grateful to all our customers that make it possible for ANT International to continuously develop new products that will help the nuclear industry to maintain and improve nuclear safety and profitability.

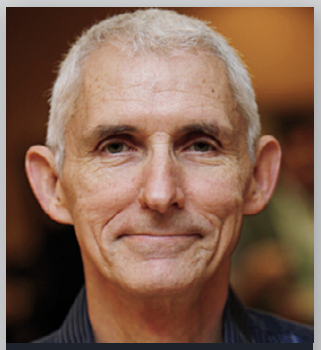
Yours sincerely,

Mikaela Strand
President

FOLLOW UP - LCC17 SEMINAR

THE LCC17 SEMINAR PRESENTATIONS WERE GIVEN BY:

Dr. Jiaxin Chen



Mr. Francois Cattant

Prof. Gary Was

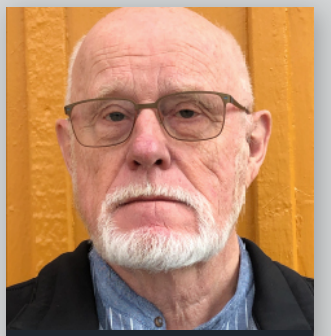
Dr. Jim Henshaw

Dr. Daniel Parrat

Dr. Daniel Parrat is research engineer and was an International Expert at the Nuclear Energy Division of the CEA. He has been working in the field of nuclear fuel behavior in Light Water Reactors and was responsible of fuel irradiation programs dealing with the release of fission products out of failed rods in normal, incidental and accidental conditions. He developed new methods and techniques for detection and characterization of failed LWR fuel rods in power plants, for which he won a CEA prize.

He served several times as a lecturer for training sessions or workshops organized by the IAEA or the French INSTN.

He has been involved in the definition of fuel experimental programmes for the future Jules Horowitz material testing reactor (JHR) and in the design of its experimental capacity: irradiation hosting systems, non-destructive examination benches and analysis laboratories in support.



Mr. Klas Lundgren

Mr. Klas Lundgren graduated 1973 in M.S Engineering Physics, Chalmers University of Technology, Gothenburg, Sweden. Joined ASEA-ATOM (later ABB Atom) in 1973. Was one of the founders of ALARA Engineering in 1995, which from 2008 was incorporated in Studsvik Nuclear.

Main areas of interest have been:

- BWR water chemistry, radiation and materials - sampling and analysis, cleanup systems, condensate, feed and reactor water chemistry, gamma scanning and radiation measurements, Hydrogen Water Chemistry, radiochemistry evaluations, ALARA reviews in European and US BWRs, computer models for activity build-up in BWRs, post-accident analysis, computerized plant chemistry and activity data systems, radioactivity monitoring systems, radwaste and offgas systems. Plant-Life-Extension (PLEX)
- PWR water chemistry and radiation – Radiolysis chemistry, activity build-up, safety analysis and source terms
- Radiation shielding and radiation technology - computer code development, shielding design of BWRs and waste handling facilities, neutron transport calculation for activation and criticality analysis, radiation surveillance at power plants, reactor decommissioning analysis, safety analysis reports. shielding and neutron activation calculations of proton cyclotrons.

LCC17 EVALUATION & FEEDBACK

A summary of the evaluation from the participants of the 2022 Seminars is provided in the table below. The grade ranged from 1 (poor) to 5 (excellent). These values represent the average.

QUESTION	AVERAGE
What is your overall opinion of the seminar?	4.4
What is your opinion of the Presentation material?	4.7
How were the presentation?	4.5
How were the speakers?	4.6
How well did we meet your expectations with the Seminar?	4.1
How did the level of information fit your background?	3.9
How do you rate the meeting premises and meals?	4.2

"The topics were very interesting, the speakers were well experienced. Everything was well organized"

DEJAN KRALJ
NEK

"Very well organized meeting. Also great presentation material presented by experienced personnel"

SANJA SMIRIĆ
NEK

"Very interesting presentations"

TATIANA MARTIN ABENZA
IBERDROLA GENERACION NUCLEAR

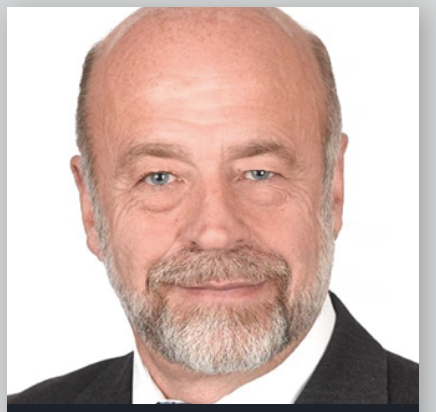
"The topics were interesting and relevant. The presentations were really of high quality as well as the presenters' expertise"

Jenni Laine
STUK

FOLLOW UP - ZIRAT26 SEMINARS

THE ZIRAT26 SEMINAR PRESENTATIONS WERE GIVEN BY:

Dr. Malcolm Griffiths



Dr. Albert Machiels

Prof. Clément Lemaignan

Prof. Gary Was

Dr. Audrius Jasiulevicius

Prof. Arthur Motta

Dr. Daniel Parrat

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Dr. Martin Steinbrück

Dr. Martin Steinbrück graduated in chemistry at the Friedrich Schiller University Jena and received his Doctor of science in 1990. He has been at Karlsruhe Institute of Technology (formerly Forschungszentrum Karlsruhe FZK) since 1991; in that time he worked mainly in the field of Nuclear Safety Research. Dr. Steinbrück is leader of the group High-Temperature Materials Chemistry at the Institute for Applied Materials. He is in charge of the KIT project QUENCH dealing with hydrogen source term and coolability during quenching of an overheated core in the framework of the KIT program on Nuclear Safety. His special interest is the materials behaviour as well as oxidation of and interactions between the various core components at very high temperatures.Dr. Steinbrück is organiser of the annual International QUENCH Workshop (http://quench.forschung.kit.edu/index.php).

Dr. Janelle P. Wharry

Dr. Janelle P. Wharry is an Associate Professor in the School of Materials Engineering at Purdue University and Editor of Materials Today Communications. Dr. Wharry's research aims to understand structure-property-functionality relationships in irradiated materials, with an emphasis on deformation mechanisms and mechanical behavior at the nano/microscale. Her active projects span nuclear structural and cladding alloys, structural materials produced by advanced manufacturing and joining methods, metal and oxide nuclear fuels, and electroceramic materials. She has published more than 60 peer-reviewed journal articles and conference papers, and has mentored 15 graduate and more than 40 undergraduate researchers. Dr. Wharry's work in nano/micro-mechanical behavior of materials has earned several awards, including the Department of Energy (DOE) Early Career Award, National Science Foundation CAREER Award, and American Nuclear Society (ANS) Landis Young Member Award. She serves as Chair of ASTM International Subcommittee E10.08 on Procedures for Radiation Damage Simulation, was the General Chair of the inaugural Materials in Nuclear Energy Systems (MiNES) Conference, and former Chair of the ANS Materials Science & Technology Division. She received her Ph.D. in Nuclear Engineering & Radiological Sciences from the University of Michigan in 2012. Previously, she was a Nuclear Engineer at Duke Energy, where she worked on core design for the Oconee Nuclear Power Plant.

ZIRAT26 EVALUATION & FEEDBACK

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How were the speakers?	4.8
How well did we meet your expectations with the Seminar?	4.5
How did the level of information fit your background?	3.7
How do you rate the meeting premises and meals?	4.7

"Great value for time, and good educational value"
RUWAN RATNAYAKE - EPRI

"I really appreciate the job that A.N.T. International is doing and I am honored to attend your seminars. Seminar provided very interesting information in sufficient quality and supported by ZIRAT reports creates excellent knowledge"
MILOSLAV ŠIPEK, ČEZ,a.s

"The speakers were very dynamic and were definitely among the leading experts in their fields. Great seminar, well worth time."
SCOTT MIDDLEMAS, INL

"This is my first ZIRAT attendance and I enjoyed it very much. The information was very detailed, and served as a great overview and introduction. Thank you very much for a very enjoyable and educational experience. The physical models were helpful."
KYLE COMBS, NuScale Power

"The presentations were excellent. The presenters are very experienced and knowledgeable, but also showed a passion for the subject matter and enthusiasm to share this with others."
HELEN HULME, Jacobs

"Very well delivered event. The subject material was accessible to those like myself who only have fundamental experience but was still relevant to experts. I look forward to attending again in the future."
CONNOR BARCLAY, Rolls Royce Nuclear

PHOTO GALLERY

Iberdrola support staff in Madrid

Introduction of the LCC17 and ZIRAT26 Seminars in Madrid by Dr. Alberto Concejal Bermejo of Iberdrola.

Networking at a break at Iberdrola conference facilities in in Madrid.

Dr. Daniel Parrat presenting “Fuel Reliability Assessment through Primary Water Radiochemistry Analysis in Operation and Poolside Examinations during Plant Outage” at the LCC Seminar in Madrid.

Lunch kindly hosted by Iberdrola

All participants and lecturers at the LCC and ZIRAT Seminars at the Iberdrola conference centre in Madrid. Dr. Alberto Concejal Bermejo of Iberdrola at the front of the photo.

Dr. Jim Henshaw presenting “PWR primary side fuel crud, how it forms and its consequences” at the LCC Seminar in Madrid.

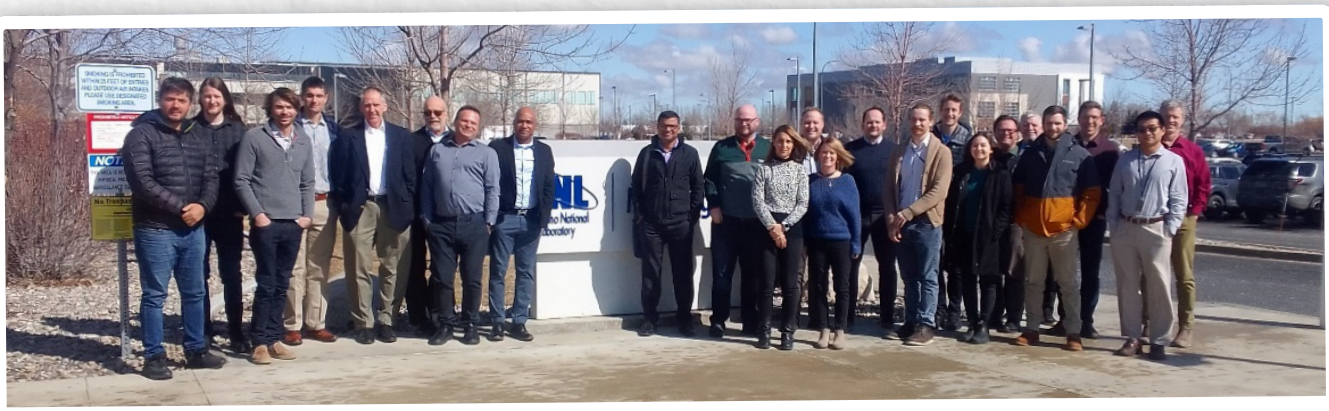
Dr. Audrius Jasiulevicius presenting “VVER fuel performance” at the ZIRAT Seminar in Madrid.

Prof. Gary Was presenting “ATF cladding concepts” at the ZIRAT Seminar in Madrid.

Dr. Martin Steinbrück presenting “High-temperature oxidation of promising ATF cladding materials” at the ZIRAT Seminar in Madrid.

Introduction of the ZIRAT Seminar in US by Dr. Colin Judge of INL.

Dr. Albert Machiels presenting “Interim Storage” at the ZIRAT Seminar in US.



All participants and lecturers at the ZIRAT Seminars at the INL conference centre in Idaho Falls, IN, US.

THE MOST RECENT A.N.T. INTERNATIONAL EXPERTS

I am very happy to announce three new Experts Prof. Arthur Motta, Dr. Brian Cheadle and Mr. Juan de Dios Sánchez. With Arthur and Brian, A.N.T. International has now access to 29 world class Experts that can provide various services to you.

PROF. ARTHUR MOTTA

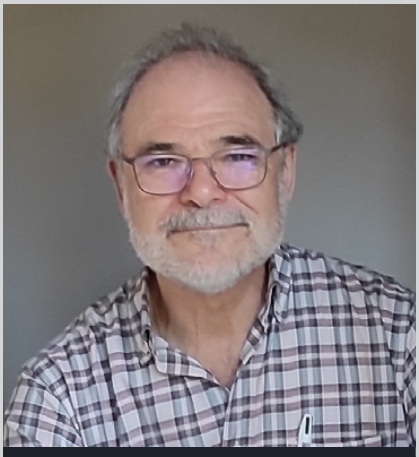
Arthur Motta is Professor of Nuclear Engineering and Materials Science and Engineering at Penn State University. He holds degrees in Mechanical Engineering and Nuclear Engineering from the Federal University of Rio de Janeiro, Brazil, and a Ph.D. in Nuclear Engineering from the University of California, Berkeley. Before joining the Penn State faculty in 1992, he worked as a research associate for the CEA at the Centre for Nuclear Studies in Grenoble, France, for two years and as a post-doctoral fellow for AECL at Chalk River Laboratories in Canada.

Prof. Motta works in the area of radiation damage and environmental degradation to materials with specific emphasis in Zr alloys, with projects in the areas of mechanical testing, corrosion and radiation damage. He has special interests in using advanced characterization techniques such as x-ray scattering from synchrotron radiation sources, transmission electron microscopy, and in situ irradiation to discern fundamental mechanisms of corrosion and radiation damage. He has published over 150 refereed papers and graduated more than 30 students, 7 of whom are now university professors and many others researchers at National Laboratories, government and industry.

Prof. Motta is a Fellow of the American Nuclear Society (ANS) and in 2015 he received the Mishima Award from the ANS for outstanding contributions in research and development work on nuclear fuel and materials. In 2016 he was awarded the ASTM William J. Kroll Medal for sustained impactful contributions to zirconium metallurgy including corrosion, hydriding, mechanical properties and irradiation effects. With his former advisor Don Olander, he co-wrote the two-volume textbook “Light Water Reactor Materials”, recently published by ANS, covering all aspects of materials in LWRs.

BRIAN CHEADLE

Brian Cheadle is an expert on the fabrication of Zr-2.5Nb pressure tubes, how their microstucture and crystallographic are developed and how they will perform during service. He studied Metallurgy at the University of Sheffield, England obtaining a B Met, an M Met and a PhD on the pearlite transformation in low alloy steels. In 1962 he joined AECL-CRNL and worked on the development of the alloy Zr-2.5Nb and also on a higher strength alloy Excel. He worked with the Chase Brass and Copper Company for many years developing the fabrication of cold worked Zr-2.5Nb pressure tubes which involved getting small batches of tubes made by different fabrication routes that would change the microstructure and texture in order to get better in-reactor properties. His last 10 years with AECL were as Director of the Reactor Materials Research Division. One of his last big tasks was to develop the fabrication of pressure tubes for the CANDU reactors that were sold to China as the USA had a nuclear embargo on China. After retiring from AECL he has worked for the Candu Owners Group (COG) and for several years was the Technical Director of their Fuel Channel Research Program. In 2010 he was awarded the ASTM William J. Kroll Medal for his work developing improved fuel channel components for CANDU reactors.



JUAN DE DIOS SÁNCHEZ

Juan de Dios Sánchez has a degree in Industrial Chemistry and has been linked to Cofrentes Nuclear Plant in Spain most of his career. Juan started his work at the nuclear industry in 1982 at Valdecaballeros project and, in 1983, he joined the Cofrentes project for the systems commissioning and startup test. He participated in the set up of the chemistry and radiochemistry laboratories and later on he was appointed as radwaste supervisor and he lead the waste cement system and condensate clean-up filters improvements. He took over Chemistry and Radiochemistry management in 1991 until mid 2006.

In this period he played an important role in different chemistry improvement projects such as Depleted Zinc addition, Hydrogen Water Chemistry, Recirculation System Chemical Decontamination and On Line Noble Metal Implementation, as well as in the Plant Environmental Management System. In 2006 he was appointed to lead the Plant Life Management Program, that aims to identify the degradation mechanisms of the safety related structures, systems and components and stablish and surveillance through the Aging Management Programs.

The Plant Life Management Program has been the main support for the last Cofrentes License Renewal application presented to the CSN regulatory body. This renewal covers a period that exceeds the initial 40 years life original design of Cofrentes and the operating license was granted in 2020. Juan has particitated in different international projects, such as EPRI BWRVIP, EPRI BWR Water Chemistry Guidelines, BWR European Forum, IAEA iGALL. He has lectured on Chemistry at the Master of Applied Nuclear Ingeneering (MINA) at Universidad Autónoma de Madrid and CIEMAT, and took part as a lecturer in several fuel and materials seminars.

CONSULTATION / TECHNICAL SUPPORT TEACHING / TRAINING

The Experts of A.N.T. International will be very happy to provide an independent analysis of operation issues and evaluation of reports or analysis to provide a second opinion of suggestions or recommendations made by others and, provide technical support services (reports, seminars, workshops), education and training in the following areas:

- **Basic Zr alloy knowledge**
- **Fuel design and manufacturing**
- **Licensing of nuclear fuel**
- **In-reactor performance during normal operation, anticipated operational occurrences and design basis accidents**
- **Fuel performance during interim dry/wet storage Testing examinations of claddings and fuel materials**
- **Thermal-hydraulic analysis**
- **BWR/PWR/VVER coolant chemistry/corrosion**
- **Radiochemistry**
- **Nuclear decommissioning & dismantling**
- **Structural material degradation**

Please contact me at:
mikaela.strand@antinternational.com
if you have questions about this service.
We would be very happy to assist you.

A.N.T. INTERNATIONAL®

CONTACT

For more information and/or an offer, welcome to contact us at sales@antinternational.com

Please also visit our website for the latest updated information www.antinternational.com