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North American Technical Center

ISOE NEWS is a project of the North American Technical Center Board of Directors

Message from NATC Board of Directors Chair;

I am pleased to provide ISOE members (utilities & regulators) with a summary of the highlights of the first virtual ALARA Symposium. My goal for the symposium was to provide the latest RP technology and ALARA lessons learned as the major part of the program. Also, the North American Symposium has become the premier regulator forum for the discussion of ALARA NRC findings with RPMs to avoid their reoccurrence. This year's symposium was particularly rewarding in accomplishing these focused objectives.

I wish to thank you for your support of the international ALARA information exchange program. Mr. William Magwood, Director-General, OECD NEA, recently emphasized to me the need for countries with many nuclear plants to share their good practices and ALARA lessons learned for countries with 1 or 2 nuclear sites to assure continued safe and efficient operations of the global, carbon-free, nuclear fleet.

If you have any comments or questions, please do not hesitate to contact [the NATC Board of Directors through either David Miller or Amy Moeller \(at \[almoeller88@gmail.com\]\(mailto:almoeller88@gmail.com\)\)](#).

Sincerely yours,
Colin Pritchard,
NATC Board Chair

2021 First Virtual North American ALARA Symposium

Highlights of First Virtual ALARA Symposium --- January 4-6, 2021

Symposium Theme: Resilience of Safe Nuclear Power Operations During Covid-19 Pandemic: Sharing of Good Practices & Lessons Learned

Executive Summary:

The first virtual North American ISOE ALARA Symposium was held on January 4-6, 2021 hosted on the University of Illinois ZOOM platform license. The theme of the 2021 Symposium was focused on sharing RPM experience with COVID-19 and sharing solutions to RPM identified problems in 2020 outages. The attendees were able to experience the virtual symposium presentations, award recognitions, vendor new technology videos and questions/comment sharing. Participants were visible to others and were able to mute their microphones and hide their video. About 100 attendees participated in the virtual symposium. The technical presentations were focused on RP management and ALARA good practices and lessons learned. Ten vendors provided video

presentations of new technology between technical presentations. Attendees were from six countries including Canada, Mexico, France, Switzerland, Japan, and USA.

Snapshot of 2021 Symposium Papers:

Day 1, January 4, 2021 Presentation Summaries-

Dr. John Palms, Honorary NATC Board Chair and Colin Pritchard, NATC Board Chair moderated the first NATC Virtual Symposium.

Eric M. Goldin, CHP, President of the Health Physics Society 2019-2021, provided the first plenary presentation on the mission of the Health Physics Society (HPS).

HPS is the largest health physics society in the world with members in many countries with local chapters throughout the US. The mission of HPS is to promote excellence in science and the practice of radiation safety. HPS sponsors Powernet, an operational HP technical exchange resource, and “Ask the Expert,” a public information radiation risk forum, which are popular with nuclear power health physicists. In 2020, the HPS Board of Directors adopted a statement on nuclear power, which states that nuclear power is a safe, reliable, low carbon energy source. Nuclear power thus meets the International Commission on Radiation Protection (ICRP) statement on unjustified dose/risk, ALARA and dose limits. In conclusion, Dr. Goldin quoted Madam Curie: “Nothing in life is to be feared, it is only to be understood. Now is the time to understand more, so that we may be fearless.” The HPS statement on nuclear power can be read on <http://hps.org/documents/nuclearpower.pdf>

The plenary session featured the BWR source term reduction challenges of the **LaSalle County**, Exelon nuclear plant, as presented by Joe Jaegers. Joe Jaegers presented an excellent discussion of the use of High Efficiency Ultrasonic Mitigation of CRUD on BWR plant components to significantly reduce dose rates and save the need to replace piping and components. Ultrasonic transducers are utilized in liberation of surface contaminants during nuclear fuel cleaning. The transducers have been observed to remove both tenacious and non-tenacious crud. They are also used to resuspend contaminants in AMFM filtration systems to allow consolidation of material, extending life of filters and reducing radwaste costs.

Chemical decontaminations or replacements of components are often difficult to cost justify. This has proven even more difficult in the current economic situation of the Nuclear Industry. This emerging technology opens the door to a new era of cost-effective dose reduction with a reusable solution that can be complimented with mobile regenerable filtration to minimize costs associated with disposing of liberated activated corrosion products. External ultrasonic cleaning allows liberation of corrosion layer from inside subject piping and suspension in solution to be sent to filter or tank for processing without system breach. For larger components, or when access is available inside a system such as an open valve after breach, introduction of ultrasonic transducers allows internal mitigation resulting in significant reduction of the radiological hazard with decon factors similar to chemical decontamination.

Mr. Jaeger, John Moser, and the LaSalle County team were awarded the **John M. Palms Outstanding Innovation Award** for the remarkable results of the HE-UMS at LaSalle County. Joe Jaegers was awarded the 2021 ISOE Young Professional’s Distinguished Paper Award.

World Class Performance Award-

The 2020 World Class ALARA Performance Award was presented to **Nathan Hogue**, RP & Chemistry Director, Palo Verde Nuclear Generating Station, Arizona Public Service. The Palo Verde ALARA staff and station employees completed the last three outages in record low occupational dose:

2020 Refueling Outages: U2R22 – 15.996 rem, U1R22 – 14.336 rem

2019 Refueling Outages: U1R21 – 21.932 rem, U3R21 – 13.631 rem

2018 Refueling Outages: U3R20 – 20.126 rem, U2R21 – 18.168 rem

The reasons for the ongoing improvements in CRE for 2R22 as well as all recent PVGS refueling outages include:

1. Optimized As Low As is Reasonably Achievable (ALARA) Planning based on lessons learned from past performances, and
2. Improved radiation worker performance and increased participation by work groups.

Microreactors New Technology-

Prof. Caleb Brooks from the University of Illinois described the design and nuclear safety aspects of the microreactor demonstration plant proposed for electricity generation on campus (see YouTube Microreactor for details).

COVID 19 Pandemic RPM Experiences-

Rich LaBurn, Fermi 2 started a panel discussion on COVID 19 impacts on refueling outages in 2020. He discussed the problems at Fermi 2 with reduction in contract RP Technicians reporting and staying for the duration of the outage, hot bunking, and the impact on job coverage due to loss of RP technicians due to quarantine mandates. A summary of global RPM discussions of COVID 19 management initiatives can be found on the ISOE website (isoe-network.net).

Bruce Power Refurbishment ALARA Program Highlights-

Colin Pritchard provided a detailed discussion of the extensive ALARA planning for the Bruce refurbishment. He discussed the new magnetic shielding installed on the boiler for feeder tube removal. New shielding was designed and installed to permit the online refueling trolley to transfer on the track below the refurbished unit to not affect continuous refueling of the operating units during the two-year refurbishment. The COVID 19 pandemic necessitated a two-month hold on the project while a pandemic health and safety program was instituted on site. Most Bruce staff are working remotely from home. The company provided computer and internet connections to facilitate an efficient and productive home office work environment.

Douglas Chambers discussed the international initiative to assess the long-term health risks of gamma ray, long-lived radionuclide (via inhalation), and radon and radon progeny exposures among uranium processing workers. One objective is to harmonize the dose assessment protocols. Canada, UK, France, Germany, Russia, Kazakhstan, and US participate in the study.

Dennis Chamberland, NASA Principal Investigator, discussed the domination of space frontier in 2021 including the significant

achievements of SpaceX in achieving reusable rockets. The exploration of the Moon and Mars were discussed, including the technological challenges due to cosmic radiation and the need to find sources of water to support human habitation.

Day 2, Tuesday, January 5, 2021 Presentation Summaries-

Juan Jesus Giron, Laguna Verde Plant, Mexico, presented the achievement in reduction of the BWR BRAC Point dose rates based on the use of high efficiency ultrasonic cleaning and metal filter technologies. The BWR units have a large inventory of mobile activity in the core of 20,000 to 30,000 Ci (estimated). The primarily crud and debris is plated out on the fuel bundles (approximately 90,000 ft² of surface area). During normal operation, recirculating reactor water redistributes this activity back to piping with 80-90% of collective dose in drywell during outages resulting from high dose rates on reactor recirculation and reactor water cleanup piping.

Laguna Verde Units 1, 2 removed a significant quantity of crud and activated debris using high efficiency-ultrasonic CRUD mitigation technology with up to 25,000 Ci of Co-60 removed. Also, the Co-60 concentration in reactor water was reduced. Approximately, 90% of the activity was removed from reactor recirculation piping (dose rates before were 690-1000 mr/hr & after were 20-160 mr/hr with 60 Ci of Co-60 removed). Reactor Water Cleanup piping achieved 95% removal of activity (dose rates before were 600-6000 mr/hr & after 10-750 mr/hr with 53 Ci of Co-60 removed).

Scott Stafford, Darlington ALARA Refurbishment Director, OPG, Canada provided an explanation of the CANDU design, the results of the Unit 2 completed refurbishment and the current achievements and challenges for the Unit 3 refurbishment. The CANDU refurbishment will allow the CANDU fleet to provide carbon-free electricity for Ontario until 2064.

David Goodman and Weiyi Wang, H3D, discussed the 6-year study of the Palisades plant to identify and improve characterization of Ag-110m in the Charging Pump and other plant components. The pixelated CZT 3D mapping instrumentation was first used during the fall 2016 refueling outage. Health physicists from Cook, Prairie Island and Palisades used 5 Polaris H units to make measurements on the charging pump cubicle during changing refueling source term conditions and characteristics. It was discovered that approximately 50% of the charging cubicle worker dose was from Ag-110m. Mr. Goodman showed pixelated CZT coolant measurements during outage evolutions during the fall, 2020 Palisades refueling outage. Trends in Ag-110m, Co-58 and Co-60 in plant piping were discussed. Preliminary analysis indicated new behaviors in Ag-110m in PWR piping were observed and will be validated with additional Ag-110m studies with pixelated CZT mapping technology.

Steven Garry provided the US Nuclear Regulatory Commission update during the Tuesday, January 5, 2021 regulatory update. The North American ALARA Symposia have served as a premier regulatory forum for US RPMs and attendees since 1997.

The NRC attendance at the symposium included 2 headquarters representatives, 3 Branch Chiefs, 2 inspectors from Region I, 3 inspectors from Region III and 5 inspectors from Region IV. The sharing of ALARA findings from the regional health physics inspectors was appreciated by the attendees due to the value of candid, neutral ground discussion of the individual events with emphasis on understanding the events, instrumentation and human behaviors and corrective action to avoid reoccurrence at other licensees' sites.

Ed Stutzcage discussed the NRR ALARA update. He indicated that separate ALARA inspections every two years will continue, based on the current perspective on this topic from NRC senior management.

Always the highest interest session of the ALARA symposium was the individual health physics inspector's discussion of the recent RP and ALARA NRC findings from licensees during the past several years. Over 35 findings were discussed by HP inspectors from Region I, III and IV.

Day 3, Wednesday, January 6, 2021 Presentation Summaries-

Dr. Dennis Chamberland, NASA, presented "The Shifting Dynamics of Human Space Exploration in 2021," which was highly rated by attendees on symposium evaluation forms. Dr. Chamberland provided information about the current "space race" by China, Europe, United Arab Emirates and USA to travel to the Moon. The race for commercial outer space flights by SpaceX is closer to becoming a reality.

Dr. Chamberland offered "golden tickets" in varying price ranges for space trips to outer space, Mars, and other future destinations. He noted that China is showing shielding on their proposed Mars space station. The recorded presentation has been repeated for North American RP staff on Wednesday noon hour RP Continuing Education Initiative with very positive feedback.

Marty Phalen, Nuclear Energy Institute RP Manager, provided a detailed summary of new or pending regulatory guidance which is of importance for operating plant RPMs to understand. The status of pending regulatory guidance revisions is as follows:

1. IMC 0609 Appendix D 'Public Radiation Safety', Incorporate **10 CFR Part 37 Physical Protection** of Category 1 and Category 2 Quantities of Radioactive Material'
2. **Revisions to Regulatory Guide 1.21 'Measuring, Evaluating, and Reporting Radioactive Material in Liquid and Gaseous Effluents and Solid Wastes.'** Draft for Public Comment Targeted for 01/31/2021 & Includes Instrument Calibrations to Xe-133 verses Kr-85.
3. **Revisions to NUREG/BR-0204 "Instructions for Completing NRC'S Low-Level Radioactive Waste Manifest" Waste Forms (Version 2 Forms - Version 3 Forms).** NRC is in the process of getting OMB clearance to continue using Version 2 (07/02/2020) forms; so, Version 3 implementation is delayed for now. NRC is planning to hold another meeting BEFORE setting the final Version 3 implementation date (e.g., 03/31/2021).
4. **Petition for Rule Making PRM-50-121, "Voluntary Adoption of Revised Design Basis Accident Dose Criteria,"** The petition requests the NRC to adopt revised accident dose acceptance criteria as an alternative to the accident dose criteria specified in § 50.67, "Accident source term." Specifying a uniform value of 100 milli-Sieverts (10 rem) for offsite locations and the control room. Specifically, Appendix A to Part 50 - "General Design Criteria for Nuclear Power Plants" states that design criterion for the main control room restricts the calculated 30-day accident dose to the annual occupational limit of 5 rem, while 10 CFR Part 100 "Reactor Site Criteria" allows for a calculated dose of 25 rem in 2 hours).
5. **Petition for Rule Making PRM-50-122, "NRC revise its regulations in § 50.67 of Title 10 of the Code of Federal Regulations (10 CFR), "Accident source term"** The petition requests the NRC to codify the source term methodologies and corresponding release fractions recommended in a report issued by Sandia National Laboratories Report SAND2008-6601,

“Analysis of Main Steam Isolation Valve Leakage in Design Basis Accidents...” The petition states that that much of the past and present source term methodologies, including release fractions, used by nuclear power plants to perform accident dose calculations are inaccurate and nonconservative. Additionally, the petition requests the NRC to update and finalize Draft Regulatory Guide DG-1199 (Proposed Revision 1 of Regulatory Guide 1.183), ‘Alternative Radiological Source Terms for Evaluating Design Basis Accidents at Nuclear Power Reactors.’

6. **Draft Regulatory Guide DG-1199 “Alternative Radiological Source Terms for Evaluating Design Basis Accidents at Nuclear Power Reactors”** (i.e., Update for RG 1.183), RG 1.183 revision 1 (DG), Draft for public comment, - Fourth quarter 2021. Plans to issue RG 1.183 revision 1 in the second quarter of calendar year 2022. NRC Public Meeting 11/20/2020 Staff Presentation (ML20296A425). Key Messages included:
 - a. Incorporate lessons learned from recent license amendment requests (LARs).
 - b. Incorporate relevant operating experience.
 - c. Respond to changes in regulatory environment (e.g., SRM-SECY-18-0049 & SRM-SECY-19-0036).
 - d. Ensure that guidance is in place for licensing advanced light-water reactors, accident tolerant fuel (ATF), high-burnup, and increased enrichment fuel.

David Raye, D. C. Cook Nuclear Plant, American Electric Power, presented the practical experience of a 7-year project to replace the Cook Nuclear Plant Units 1, 2 plant-wide radiation monitoring system. Cook was one of the first US utilities to implement like-for-like Radiation Monitoring System Replacement.

Challenges included:

1. Manufacturing in France
2. Calibration of high range noble gas channel with Xe-133. Improved noble gas sample skid design (small inside diameter) and energy compensated detector per Mirion design
3. Scheduling some replacement strategically during refueling outages
4. Even with previous walkdowns, some RMS skids would not fit into the previous Eberline SPING footprint
5. Minimizing installation time in Main Control Room
6. Warehousing delivered monitor skids for two years to facilitate plant scheduling windows
7. Failure of some detectors after storage
8. Change of Air Ejector monitor to 2 pi geometry shielding vs 4 pi which was specified. Later, experiencing alarms during Station blowdown which required installation of 4 pi geometry
9. Delivery of Co-60 check sources instead of Tc-99 sources. The short half-life of Co-60 was unacceptable and was rejected.
10. Field installation of tigon tubing for EOF air sample line to monitor skid. Rejected and replaced with ANSI 13.10 tubing
11. Detailed testing of vintage “ribbon” cabling from original Eberline system revealed the need for amp booster to permit proper operation after 40 years of communication link difficulties on “B” communication line. Ribbon cables have a limited distance to properly transmit the signal.
12. Use of existing RMS cabling whenever possible which saved significant installation costs.

Frank Owens, Clinton Power Station, Exelon, discussed the record low on-line annual dose for the Clinton Power Station. Effective plant staff engagement in the ALARA on-line dose minimization

initiative in 2020 achieved this significant result. Mr. Owens discussed the Station ALARA Committee actions to maintain the low source term at the BWR Mark III reactor. The RP Department has used gamma imaging detectors to identify in-plant areas for additional temporary shielding or RP controls.

Sanshiro Kobayashi Morimura Bros. & Koji Endo, RASA Industry, has developed truck-mounted mobile radioiodine removal silver zeolite (AgX) filtration systems for use by TEPCo and other nuclear facilities. The installed AgX filtration systems at TEPCo BWRs have allowed restart of reactors following regulatory and local approval.

Dr. Tadashi Narabayashi, Tokyo Institute of Technology, provided a comprehensive status of the restart of the Japanese nuclear plants since the Fukushima accident. He discussed the FCVSA (filtered containment ventilation) Technology developed for nuclear facilities. He showed 4 videos of the use of robots and cranes to decommission the damaged Fukushima units. Dr. Narabayashi described the measures adopted at Japanese plants due to the COVID 19 pandemic.

Andreas Ritter, RP Deputy Manager, Leibstadt BWR, Switzerland, discussed the status of the operating Swiss nuclear plants. Unfortunately, the Muhleberg BWR was permanently shut down on December 20, 2019 because the cost of installing Fukushima backfits was calculated to be prohibitive for continued operation. Zinc, noble metal, and hydrogen injection was maintained to the end of operation to get a minimal source term for the upcoming decommissioning work. The Leibstadt plant continues to experience high source term challenges. RP management is evaluating BWR source term reduction initiatives for possible future implementation.

Colin Pritchard, NATC Board Chair, Bruce Power, discussed the 2021-2022 Preliminary NATC Strategic Plan, including the expansion of the virtual meeting platform to foster more frequent and wider communication of RPM operating events and new technology to global ISOE members. Selected recorded presentations will be presented at various times in 2021 in accord with US Department of State import/export regulations. Notices of rebroadcasts will be announced by emails to approved ISOE members.

Sample of Symposium Evaluation Form Results

2021 NATC ISOE ALARA Symposium attendees provided responses to the Technical Program Committee on the following questions :

1. What 3 papers did you like the best and why?
 - a. Joe Jaeger / Source Term Challenges at LaSalle; the laser ablation on turbine blades was a process I was not previously aware of, this new information was very helpful.
 - b. Caleb Brooks / Micro-Reactor plants; The future of nuclear is SMR's, and the applications of microreactors are virtually limitless. Hearing about the newest, up to date systems development was great.
 - c. Colin Pritchard / Bruce Power Refurbishment; The use of MCNP as a modelling tool is not something that is often discussed, at least in my experience, for plant health physics/radiation protection.
2. What topics would you like presented at the 2022 ISOE ALARA Symposium?
 - a. I would be most interested in the use of MCNP as a modelling tool for health physics plans and procedures in reducing plant worker exposure.

3. Do you have “**Take Aways**” to bring to your plant for consideration and possible implementation?

>5 _____ 1-5 **X** None _____

Source term measuring techniques discussed by LaSalle will be useful for the future.

NATC Decommissioning News:

The NRC announced the approval of Three-mile Island Unit 2 license transfer to TMI-2 Solutions on December 2, 2019. Energy Solutions and Jingoli construction firm formed a joint venture to perform the decommissioning work.

Indian Point license was approved to be transferred from Entergy to Holtec International. Indian Point Units 1 & 2 were permanently shut down in 1974 and 2020 respectively. Unit 3 is scheduled to be shut down in April 2021.

Oyster Creek, Exelon and Pilgrim, Entergy decommissioning projects have also been approved by NRC to transfer to Holtec International. Pilgrim was shut down in May 2019.

Other North American News:

Ontario Power Generation has announced the resumption of planning for future nuclear power generation at its Darlington site. The goal is to host a grid-size small modular reactor as soon as 2028.

NextEra Energy has submitted a license renewal application to add twenty years to the Point Beach Units 1 & 2 operating license.

NATC Board of Directors Announce Results of Independent Vote on Future Host of the North American Technical Center:

To: Brad Boyer,

ISOE Bureau/MB Chair

From: Colin Pritchard,

NATC Board Chair

Re: Results of NATC Paid Members Ballot on Location of North American Technical Center

Dear Mr. Boyer:

The December 2020 ISOE Management Board recommended that the North American utility and regulatory members be asked to cast a ballot to decide if the location of the North American Technical Center should be changed. NATC ISOE members who had paid their 2020 annual dues and were in good standing were involved in this independent ballot.

In December, 2020, an independent ballot was sent to those RPMs and regulators by the Bruce Power Company Ethics & Compliance Manager. In January, 2021, the results of the NATC vote were tabulated by the independent neutral party.

The results of the ballot are that the North American Technical Center should remain at the Department of Nuclear, Plasma & Radiological Engineering, Grainger College of Engineering, University of Illinois. The results are being communicated to the ISOE Management Board. On behalf of the North American members, we wish the ISOE Management Board well in any continuing review of the results of the independent balloting.

Colin Pritchard
NATC Board Chair

Action Completed: On May 27, 2021, Mr. Pritchard conducted a ZOOM conference call with Mr. Greg Lamarrie and Jacqueline Garnier-Laplace, OECD NEA RP & Human Aspects of Nuclear Safety Managers NEA RP management agree the independent NATC dues-paying members ballot resulted complete the December 2020 ISOE Management Board action item. Mr. Bradley Boyer, ISOE Bureau Chair accepted the NATC independent ballot results on May 27, 2021..

2020 Spring USA BWR & PWR Spring Outage Data Entry Pilot Results:

The NATC Data Analysis Working Group collected and entered 2020 spring refueling outage ALARA RWP data into the ISOE Training ISOEDAT software. US RPMs and ALARA coordinators had requested the NATC Board find a way to provide current year spring outage data in the summer prior to the fall outages. The current practice of waiting a year to post the spring outage results creates a potential situation where outage ALARA lessons learned are not available for use in the planning of the fall refueling outages in the US.

The NATC staff was able to input RWP data for tables A, E, F and G, where available, for 6 US PWRs and BWRs including Braidwood, Palo Verde and Prairie Island. A proposal will be submitted to the 2021 ISOE Management Board agenda to formalize this new initiative for improved timeliness in the communication of the US PWR and BWR outage benchmarking information. This US initiative may only be of interest to US ALARA planners and RPMs (which may imply that some data may better be available only to NATC members, if that may be beneficial for overall ISOE software maintenance). The use of the ISOE IT training module allows the initiative to be achieved without inference with the formal ISOEDAT annual questionnaire. Consideration of enhancement to the security of the ISOEDAT training module (unique password) will be requested of NEA IT and ETC.

Future ISOE ALARA Symposia: June 1-3, 2021 Announcement

Dear Colleagues,

We are pleased to inform you that ETC is organising a virtual Symposium, free of charge, from 1 to 3 June 2021.

It will be held every day from 12:00 to 14:00 CEST.

You will find attached the Provisional Programme of the Symposium.

If you wish to participate, please send us your contact details (first name, last name, organisation, Email address) to isoe@cepn.asso.fr

Information regarding the connection to the Symposium will be sent the week before the event.

Updated information will be available on the ISOE website (<https://isoe-network.net>).

Best regards,

Lucie D'ASCENZO

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Next NATC Meetings/Symposia

The NATC Board has approved the following future ALARA information exchange meetings and symposia:

June 22-23, 2021 Virtual Spring Outage ALARA OEs from BWRs, CANDUs and PWRs.

August 24-25, 2021 65th Region III RPM virtual meeting with NRC health physics inspectors/branch chief on Day 1 and Decommissioning ALARA information exchange on Day 2.

January 4-6, 2022 North American ALARA Symposium in at Key West Marriot Beachside. Plenary session to start on Tuesday to avoid holiday weekend travel. Monday will be Professional Enrichment Continuing Education Training. Friday will be for NATC work management expert group meeting and Fleet RPM meeting, if needed.

January 9-11, 2023 International ALARA Symposium, to be held in New Orleans, LA.

January 8-10, 2024 North American ALARA Symposium to be held in San Antonio, Texas

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