



30th Anniversary of ISOE Program of Global Nuclear Utilities and Regulatory Agencies

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30 Years a Major International Accomplishment

- **ISOE Radiation Protection Professionals achieved an important milestone in organizing and conducting 30 years of international ALARA information sharing**
- **Over 340 nuclear plants from 30 countries participate in the ISOE program through one of the four ISOE Technical Centers**
- **All ISOE members can be proud of supporting the global information exchange**



30 Years of Achievement in Global ALARA Information Exchange

- **Information System on Occupational Exposure (ISOE) has become the largest ALARA database and international information sharing forum of RP Operational Events during its 30-year history**
- **OECD NEA & IAEA co-sponsorship of 350 nuclear units globally has served ISOE RPMs and regulators well in the past 30 years**



Commitments of Global RPMs

- The commitment of global RPMs to participate in ISOE data collection, ALARA Symposia, ISOE expert groups, RP Forum Q/A and ISOE Benchmarking site visits is commendable!
- Especially today in times of global instability, it is important to sustain the international collaboration by sharing operating events, symposium paper presentations and benchmarking site visits



Radiation Protection Culture

- **Radiation Protection culture: each operating reactor is encouraged to strive for RP excellence by constantly searching for good ALARA practices and lessons learned from ALARA events globally**
- **This is the core of the ISOE program**
- **This is why ISOE has earned the support of global RPMs**
- **Events are important to share to prevent reoccurrence at other nuclear plants**



ISOE Technical Centers

- Each ISOE Technical Center is different in their approach to fostering the ISOE program for their members
- Different cultures and languages are catered to by each technical center
- The decentralized nature of the ISOE program been a strength through the 30 years, to maintain the focus of supporting ISOE RPM and regulatory agency members



NATC Background

- **North American Technical Center was founded in 1992 by US and Canadian Power Reactor Section Members**
- **Mission to host ALARA Center for Canadian, Mexican and US RPMs and regulatory agencies**



North American Technical Center Accomplishments

- From the beginning, the North American Technical Center's mission was to identify new technologies from nuclear plants, National Laboratories and Universities to reduce worker dose
- For example, Los Alamos colloid removal technology achieved low outage doses at 15 PWR and now continues to preserve plant assets
- The involvement of senior nuclear utility management at symposia to recognize outstanding ALARA accomplishments as nominated by peer RPMs



NATC Board

- NATC Board is composed of Canadian, Mexican and US Utility RP Professionals
- **Gender Balanced** with 3 female RP professionals and 3 male RP professionals
- NATC has sponsored 25 radiological engineering undergraduate and graduate students since 1992 to learn about nuclear power ALARA technology
- After graduation, 22 students are employed at nuclear plants, 1 NRC, 1 US Navy and 1 PhD Health Physics Associate Professor
- In 2022, NATC initiated sponsorship of engineering intern from McMaster University, Hamilton, Ontario and France



Examples of ALARA Sharing

- **Selected ISOE new technology tools and innovations are shared in the following slides:**
- **Drone use at TVA**
- **Pixelated, 3D CZT at Palisades with Ag-110m***
- **Los Alamos colloid removal resin at Braidwood & Byron***
- *Presented by US RPMs at Tours RPM Day 7/20/2022



Using Innovation to Change Fundamental Behaviors at TVA

Sequoyah Outage
Drone Inspection of the
Unit 2 Keyway Sump



Drone Use for Aerial Inspections of Very High Rad

- TVA's Unmanned Aerial Services Team for an aerial drone inspection of the Keyway in Unit 2 Lower Containment.



TVA Drone Use in Lower Containment

- **Why?** Because the camera we had set up down there stopped working and we needed to check sump levels and dose rates without having to take a person into this very high radiation area.
- **Highest Dose Rate -** 933 Rad/hr



Drone Dose Results

- **Drone Dose-** The drone collected 7.6 Rem in just the few minutes it took to get the video we needed to monitor our equipment for deficiencies.



ALARA Planning Cost & Dose Savings Achieved

- **Safety** - this was the safer option for our plant staff! This inspection is just one example of how the use of new technology can enhance work in the field by keeping our workers safe, reducing the need for scaffolding, saving time and ensuring plant reliability.



- Highest dose rate seen was 933 Rad/hr
- 5-minute flight
- Accumulated 7.7 Rem of exposure



New Ways to Improve Radiological Safety of Workers

- The station realized dose savings of 400 to 500 mrem in the concrete inspection conducted in the Excess Letdown Heat Exchanger Room at TVA
- This inspection was completed without an individual having to enter into the 1.5 to 2 rem/hr radiation fields in this room.
- Besides eliminating the radiation exposure, the use of the drone eliminated or greatly reduced risk of injury and heat stress that is encountered when entering this room that has elevated temperatures and requires climbing of a scaffold ladder



Sharing New ALARA Technology with ISOE Community

- ISOE mission is to share new ALARA technologies with ISOE members
- Explain new technology
- Share Good Practices
- Share lessons learned
- Solicit new in-plant applications
- Examples of ISOE working groups:
 - Pixelated, 3D, CZT individual, isotopic monitoring – 2014 to present
 - Ag-110m detection and removal at Palisades – 2016 to present



ISOE Benchmarking Site Visits

- 30-years of ISOE benchmarking site visits
- Japanese 6 nuclear utilities visited Diablo Canyon, Peach Bottom, Susquehanna, Turkey Point, South Texas Project and Cook to improve programs
- French EDF site visits from 2003 to 2012 to Vogtle (remote monitoring), Cook (source term reduction*), Braidwood (outage RP management*), South Texas Project (street clothes containment entry), Indian Point 3 (emergency planning - 9/11)
- * Los Alamos colloid removal resins

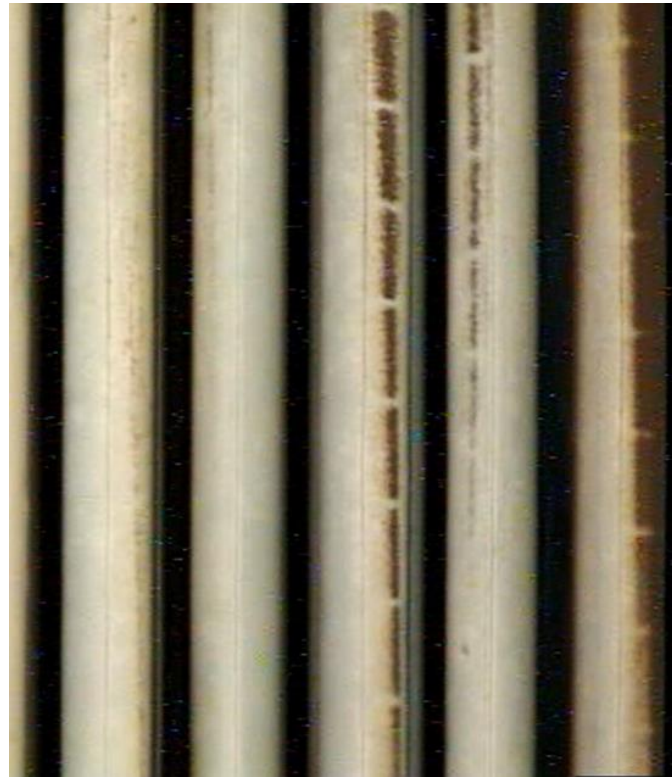


WHAT: Picture of Before and After PWR Fuel (no Zinc Addition or Ultra-Sonic Fuel Cleaning)

3rd Refueling Outage with
PRC-01m



After 6th Refueling
Outage with PRC-01m



Exelon Sr. Executives: Expanded Fleet Deployment Based on Comparison Results Byron-1 B1R19 March 2014



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ISOE Benchmarking Visits from 1992 to 2022

- French - Belleville, Bugey, & Gravelines
- Sweden - Forsmark & Ringhals
- Belgium- Doel
- Finland -Loviisa, TVO
- Germany- Philippsburg
- Czech Republic – Temelin
- Japan- Fukushima
- Switzerland- Leibstadt
- Spain- Cofrentes



ISOE ALARA Symposium

- **Founded by NATC-University of Illinois in March 1997**
- **Valuable in-person presentations of new ALARA technologies and worker dose reduction achievements**
- **Fosters sharing from nuclear utility and regulatory health physicists**
- **Creating continuing education opportunities for new health physicists coming into the nuclear industry**



Attendees Value January Symposia for OE Information



ISOE Symposium Popularity with consistent attendance of 100 to 185 individuals



Regulators Provide Observations on ALARA Improvements at Symposia



ISOE Expert Group RPM Meeting



2022- 2027 ISOE Strategic Plan Focus

- ISOE working group prepared the 2022-2027 ISOE strategic plan to primarily focus on-
- Importance of Continuing International Efforts through Effective and Efficient ISOE Technical Centers:
 1. Data Gathering and Distribution
 2. Symposia/Sharing of Good Practices & Lessons Learned
 3. Timely Information Sheets and other Analytical Reports
(and supported by the Administrative Personnel in NEA and IAEA)



Thank you for your Attention



- Bradley Boyer,
- ISOE Bureau Chairperson
- ISOE Management Board Chairperson
- Tennessee Valley Authority Fleet RP Manager
- Watts Bar 2 Steam Generator Replacement Outage Control Center Director



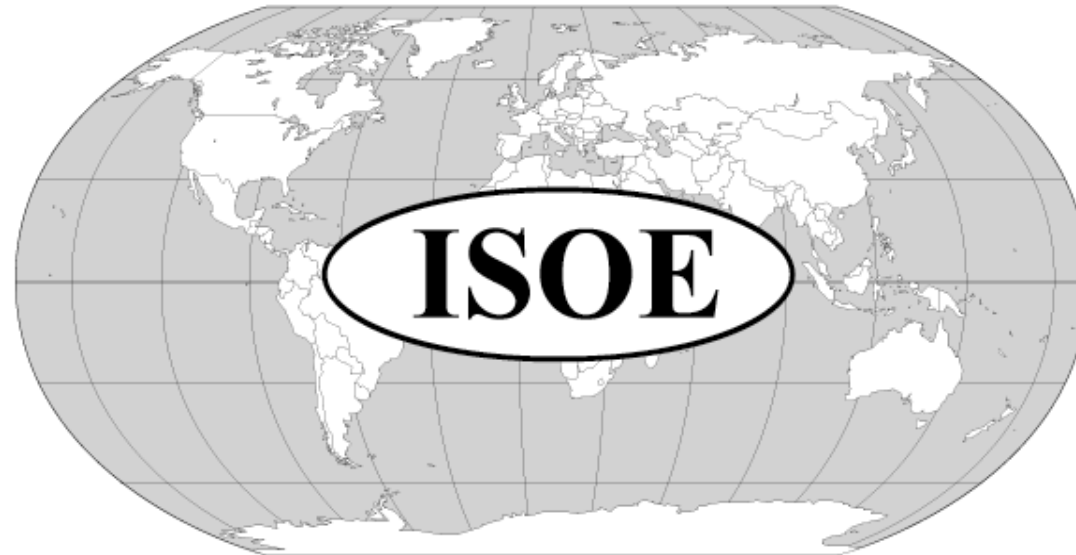
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OECD Nuclear Energy Agency
International Atomic Energy Agency



INFORMATION SYSTEM ON OCCUPATIONAL EXPOSURE

