NRRPT

The NRRPT NEWS

OFFICIAL NEWSLETTER of the *National Registry of Radiation Protection Technologists*

March 2017 **Incorporated April 12, 1976**

Chairman's Message

Greetings fellow RRPTs !

This is my first newsletter as Chairman and I couldn't imagine a better start than to congratulate Cheré Morgan, Charles D. (Bama) McKnight Award Recipient. I encourage you to read the great story of Chere's career and how she has supported the NRRPT, her employer, her community and her nation. She is truly an inspiration and a very worthy award recipient.

Speaking of inspiration, there is a great story in this edition of the Newsletter by Ed Lohr describing the awards presented to our past Chairs at the winter meeting. I have the distinct privilege of serving my term as Chair with four very active and contributing Past-Chairs. Each of them led the NRRPT through significant improvements – they are, collectively, a tough act to follow.

Most recently, Eddie Benfield completed his extremely successful terms as Chairman. Eddie started some very significant initiatives that will continue to be a major focus for the Board and Panel in the coming months and years. His efforts to establish stronger links with colleges offering RP Technologist programs will help us stay connected to the next generation of Registrants. Eddie also launched us on the critically important project of updating the task analysis which forms the basis of the exam. Led by Kelly Neal and with a huge contribution by Terry LaFreniere, we are now well into the workplan. The field has evolved significantly since the last task analysis was performed and there are now well-established industry standards for the training of RP Technologists in the various sectors of our industry. We have taken the sensible approach of aligning our objective set with those standards. A lot of work was done by Kelly and Terry in between the summer and winter meetings, with support from the ad hoc work group to get the objectives ready for review, discussion, discussion, some more discussion and adoption at the winter meeting. It was hard work and long days for the combined Board and Panel as we went through this step and went on to start mapping the questions from the exam bank onto the new objective set and identifying where we needed to create new questions and modify or discard some old ones. Exam Panel Chair Dave Wirkus and Panel Vice-Chair Karen Barcal were ruthless taskmasters, I mean, efficient leaders, guiding us through that phase of the work. Much work remains to be done but we have ambitious goals to push this ahead and offer exams on this new basis very soon. Aligning with these standards will help to ensure our relevancy and credibility in the industry for years to come – I

Inside This Issue

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truly feel this is some of the most important work we have undertaken as an organization.

The winter meeting is when we hold elections for the following year (starting in January 2018). Welcome to Michelle Kovach who was elected from the Panel to a five year term on the Board. And welcome back to the Board to Todd Davidson who was also elected for a five year term. Mark Bayless was elected to the position of Vice Chair for the final year of his Board term. Finally, as Past-Chair, Eddie has an ex-officio seat on the Board and so resigned his elected slot one year early. Dannie Green was elected to fill this slot – welcome also to Dannie!

One of the things I have enjoyed about being part of the NRRPT Board and Panel over the years is the approach of work hard – play hard (and usually work some more). As always, we did manage to have some fun with a great night out. Once again, our fantastic Executive Secretary DeeDee McNeill DeGrooth showed that she is as skilled at organizing a party as she is at organizing a great meeting and conducting the business of the Registry. One thing that made this night out special was that past-Chair Bill Peoples joined us. Bill was the originator of the wonderful tradition of having a Board and Panel "night out" when he was the Chair.

We had a chance to thank some of our corporate sponsors who were attending the PWR ALARA meeting. These folks are vitally important to the registry. If you have dealings with them, please take the opportunity to let our sponsors know that you notice and appreciate their support of the NRRPT.

I'm very pleased and honoured to be starting my term as Chairman of the Board and hope to serve you well. If you have ideas and suggestions, or you would like to get more involved, please contact me!

Respectfully,

Dave Tucker

NRRPT, Chairman of the Board

RRPTs of the McMaster Health Physics Department

Left to Right:

Diana Moscu, CHP, RRPT 2016

Chris Malcolmson CHP, RRPT 2016

Dave Tucker CHP, RRPT 1996

Glenn McClung RRPT 2013

Duane Lambert, RRPT 2013

Mike Giuliano, RRPT 2016

Arc Flash Event

Seth J. Kanter, Radiological Engineering Manager,
Idaho National Lab, NRRPT Panel of Examiners

In April 2015 an Arc Flash Event occurred at Idaho National Laboratory in the Central Facilities Area while performing preventative maintenance on high voltage potential vacuum circuit breakers at an electrical substation. While performing maintenance on a breaker, a lineman inadvertently made contact between a grounding cable and an overhead electrical connection. Because of the safety implications of this event, an extensive investigation was conducted. Those working in the nuclear industry can probably recall that in recent years there have been numerous arc flash events at DOE sites and commercial nuclear power facilities. These have resulted in serious injuries, some deaths, and substantial equipment and property damage.

Ok, so at this point most folks are probably curious as to why they are reading about a significant industrial safety event in a newsletter dedicated to radiological issues. Well, as famed pitchman Billy Mays was known to say, "but wait, there's more". It turns out that these breakers are also classified as incidental x-ray generating devices or *XGDs.* An XGD is a device that emits or produces x-rays or bremsstrahlung during operation. In this event, during overvoltage testing on the breakers, electrons are accelerated under a vacuum inside and bremsstrahlung x-rays are generated.

In this instance, the x-rays are classified as an unwanted byproduct of the device's intended purpose and since they are only generated during testing they have no constructive use for actual breaker operation and the radiation produced is not emitted beyond the contiguous vacuum area in which they are produced.

This type of x-ray production is not limited to high voltage potential vacuum breakers, other examples of XGDs include electron microscopes, high-voltage electron guns (cathode ray tubes) or electron pulse generators; electron beam welders; high-voltage switches and power supplies; field emission electron beam diodes; ion implantation devices; electron beam furnaces; magnetrons, klystrons, and other radiofrequency (RF) tubes; Auger electron generators; and vacuum ion sputterers. In this instance, the X-rays in vacuum interrupters are only produced when the contacts are opened and are insignificant at normal operating voltages.

This issue came to light during the incident investigation when it was noted that the preventative maintenance work package identified that x-ray radiation was present during vacuum breaker testing without further explanation of why x-rays are generated during testing and any possible associated risks. When the question was first posed, there was a general lack of knowledge on when and why x-rays are present during testing and any risks or mitigating actions that might be needed to be taken related to the hazard. It was also not clear to personnel involved that part of the basis for the listed panel standoff distance and cover closure requirement were there for both electrical safety and radiological dose minimization purposes. Further, although the hazard had been identified in the work package, it was not discussed or addressed in the field work control documents nor had these documents been sent to the Radiological Controls organization for review.

A subsequent evaluation by the RadCon organization was performed using ANSI/HPS 43.3, *Installations using Non-Medical x-Ray and Sealed Gamma-Ray Sources, Energies up to 10 MeV, 2008.* Using this criteria a device is consider an incidental X-ray generating device (XGD) if it produces exposures of less than 100 mrem in a year, equipment that produces this type of radiation is considered to be consumer product background radiation such as that produced by a television set or a computer monitor, and it does not require evaluation or labeling.

Technical guidance on XGD can also be found in DOE guide 441.1-1C, *RP Programs Guide for Use with 10CFR835 Occupational Radiation Protection*, this lists examples of incidental XGDs such as electron beam welders, electron microscopes, pulse generators, and microwave cavities used as beam guides. The DOE guide suggests that these devices should be inspected initially upon receipt but the inspection frequency requirements may be specified at the discretion of the radiological control manager. Furthermore, the DOE guide states that DOE's expectation of incidentally-exposed individuals who receive less than 0.1 rem total effective dose in a year does not require specific

controls to limit the individual doses. For example, 10 CFR 835.402 requires monitoring by personnel dosimeters when radiological workers under typical conditions are likely to receive an effective dose of 0.1 rem or more in a year.

One item of importance was noted here: regulatory guidance does not provide specific instruction on which XGDs do not generate greater than 100 mrem in a year. This requires that specific instances of incidental XGDs be evaluated to determine if they meet the definition. To assist in these types of determinations, the following screening process was established to evaluate XGD equipment:

1. Establish the exposure rate for personnel either through direct survey or documentation from the manufacturer.

   Note: It was determined that performing direct exposure rates during vacuum breaker tests would place workers in a hazardous environment).

2. Define the duration and frequency of the exposure including location and adjacent area occupancy.

   Note: ANSI C37.85-2002 indicated that there was a potential cumulative exposure of 0.25 mR at 1 meter when testing at 37.5 kV for a 15.5 kV rated vacuum interrupter. The breakers being tested at the Lab were Westinghouse Type R vacuum circuit breakers rated for 15.5 kV and they are normally installed within an electrical cabinet. The test duration typically does not exceed 1 minute and therefore the resultant cumulative exposure would be less than 0.25 mR. Of note, work instructions directed individuals to maintain a distance greater than 4 meters during testing; this would thereby result in a further dose reduction.

3. Determine if the cumulative annual dose has the potential to exceed 100 mrem/yr. Those instruments found to be less than 100 mrem/year are tagged as RGD exempt unless such tagging would cause a hazard to the worker or equipment.

In evaluating these particular breakers, it was concluded that the characteristic x-rays produced by bremsstrahlung would be shielded by the electrical cabinet during the performance of overvoltage testing. Further with the cabinet doors required to remain shut during testing this metal would further attenuate incidental x-rays produced. The evaluation concluded that the high potential test of the vacuum breakers did not meet the criteria of being an incidental XGD and therefore was exempt from RGD controls.

Although seemingly obscure, there are some good lessons here that you should look to apply in your own work environments. Work planning for legacy work processes should be scrutinized, even if they historically have been very successful, ask more questions. You may just potentially mitigate previously accepted or unrecognized hazards.

Welcome New NRRPT Members

Congratulations to the following individuals who successfully passed the Canadian **NRRPT** Examination on October 31, 2016:

Michelangelo Giuliano
Christopher T. Malcolmson
Diana F. Moscu

Cheré Morgan
Charles D. (Bama) McKnight Award Recipient

A graduate of Eastern Idaho Technical College (EITC) in 1986, Cheré started her career working as a health physics technician (HPT) at INL. Through a series of well-earned job promotions (Senior Radiological Control Technician, Radiological Control Foreman, Radiological Control Assistant Supervisor, Radiological Control Manager, and Environmental Safety and Health Manager) Cheré was promoted to the Radiological Control Director position at the Lab. During this time, Cheré received her Bachelor of Science degree from the University of Idaho and is currently working on her Master's Degree.

In her position, Cheré gives her full support to her staff and, in turn, expects the same from them. She strongly encourages a "team" concept and expects every person in RadCon to support one another. Cheré works diligently to ensure that the radiological control program at INL has a high standard of excellence. She often works seven days a week and well into the night to ensure the RadCon program achieves and maintains these high standards.

Cheré has an extraordinary passion for the radiological profession and a strong desire to always do the right thing no matter the challenges and pressures. She inspires those around her to always do the right thing through her passion, energy and continued commitment.

Chere' recognizes the importance of having radiological control technicians who possess fundamental radiological knowledge as measured by NRRPT certification. In addition to providing support for technicians such as providing copies of Gollnick, purchasing Datachem preparation software, and reimbursement for test fees for those that pass the exam, Cheré instituted a significant monetary incentive to encourage technicians to become **NRRPT** certified. All individuals who obtain and maintain the certification receive an additional $1.50 per hour in their pay. This demonstrates the importance and value that Cheré and INL place on the **NRRPT**.

Cheré has extended this passion for radiological excellence by being a volunteer member of the Region 6 Radiological Assistance Program (RAP) Team filling the assigned position of Health Physics Support which included deployments with the National Special Security Events (NSSE) group for which she received special recognition for her support during the 2002 Winter Olympic Games in Salt Lake City, Utah. Cheré was also honored by the Department of Army with a Certificate of Appreciation for dedicated service and support in training U.S. Army Preventive Medicine personnel in Emergency Response to Radiological Hazards. "Ms. Morgan's efforts resulted in developing operational health physics skill sets for U.S. Army Preventive Medicine in response to domestic or international radiological incidences in support of the Global War on Terrorism." And locally, Cheré received the Executive of the Year award from the Eagle Rock Chapter of the International Association of Administrative Professionals who described her as "A joy to be around with a sparkling – yet professional air that is remarkable to see…"

Cheré is very supportive of her staff continuing their education and career development. She supports alternate schedules to allow people to succeed and provides funding for education. She promotes and rewards educational success.

Cheré is aware of the aging workforce issue that faces our industry. She has been an instrumental leader for reinstituting the Radiological Protection Technology program offered at EITC. She has even acquired a portion of INL funding to aide in the execution of the program. Cheré is also a regular speaker and supports the on-site training of new Radiological Protection Technologists entering the field.

Cheré is an asset to not only the radiological protection community at-large, but she also an asset to the **NRRPT**.

Left to right: Juan Alvarez (INL Deputy Lab Director and Chief Operating Officer), Robert (Bob) Boston (Department of Energy-Idaho Operations Office Deputy Manager), Carol Mascarenas (ESH&Q Director), Chere' Morgan (Radiological Control Director), Michelle Kovach (RRPT) and Seth Kanter (RRPT, CHP)

NRC's Reevaluation of Category 3 Source Security and Accountability

Ed Lohr, RRPT

Since the events of 9/11, the Nuclear Regulatory Commission (NRC) has been enhancing the security and accountability of radioactive sources that pose a threat to the public. These enhancements have been focused on the most dangerous sources, those with Category 1 and 2 quantities of radioactive materials. The NRC has considered expanding these enhancements to Category 3 sources in the past, most recently in 2009, but determined that the existing requirements provide adequate protection. As a result of recent events, the Commission directed the NRC staff to once again reevaluate Category 3 source security and accountability.

Category 3 sources are those containing a quantity of radioactive material equal to or greater than one-tenth of the Category 2 threshold but less than the Category 2 threshold. These sources have a wide variety of uses in industry, medicine, and research and include applications such as fixed industrial gauges, high-dose-rate brachytherapy sources, research reactor start-up sources, and certain well-logging sources.

In 2007, the Government Accountability Office (GAO) conducted an investigation (GAO-07-1038T) into the NRC's materials licensing program. Using a fictitious company, GAO was successful in one of two attempts to obtain a radioactive materials license and used the license to place orders for radioactive material. The investigation demonstrated that GAO could have acquired an aggregated Category 3 quantity of material, although at no point in the investigation were radioactive materials actually shipped to the fictitious company. After the 2007 investigation, the NRC and the Agreement States made a number of significant changes to strengthen the licensing and regulatory processes to prevent individuals who have malevolent intent from obtaining a radioactive materials license.

In January 2009, licensees began reporting Category 1 and 2 source information to the National Source Tracking System (NSTS). In June 2009, NRC staff requested approval of the final rule amending 10 CFR Parts 20 and 32 to expand reporting to the NSTS to include Category 3 sources (SECY-09-0086). In June 2009, the Commission did not reach a decision on the proposed rulemaking (2-2 split vote), and the final rule was not approved (SRM-SECY-09-0086).

In 2014, the GAO initiated another audit of the materials licensing program to determine whether the licensing vulnerabilities identified in its 2007 investigation had been addressed by the NRC and Agreement States. As part of its audit, GAO conducted an investigation that went beyond the 2007 investigation in its sophistication and planning. GAO rented storefront/warehouse space to demonstrate the fictitious company's legitimacy during prelicensing visits and was successful in one of three attempts and acquired a license for a Category 3 well-logging source. GAO then placed an order for one Category 3 source, then altered the license and placed an order for a second Category 3 source. The investigation demonstrated that GAO could have acquired an aggregated Category 2 quantity of material, although at no point were radioactive materials actually shipped to the fictitious company. Notified by GAO in October 2015, the NRC and Agreement States took a number of actions, including forming two NRC-Agreement State working groups to evaluate vulnerabilities identified by the investigation. Specifically, one of the working groups evaluated the need for enhancements to existing requirements for license verification and source tracking beyond Category 1 and Category 2 thresholds.

On 15 July 2016, the GAO published its final report for the material licensing audit and investigation, GAO-16-330, titled "Nuclear Security: NRC Has Enhanced the Controls of Dangerous Radioactive Materials, but Vulnerabilities Remain." The report made three recommendations:

1. Include Category 3 sources in NSTS and add Agreement State Category 3 licenses to the Web-based Licensing System.

2. Require that transferors of Category 3 quantities of radioactive materials confirm the validity of the recipient's radioactive materials license with the appropriate regulatory authority or the License Verification System before making the transfer.

3. Consider requiring an on-site security review for all unknown applicants of Category 3 licenses to verify that each applicant is prepared to implement the required security measures before taking possession of licensed radioactive materials.

In response to the report, NRC-Agreement State working groups were formed to address the recommendations. The reports from the working groups were provided to the Commission, who then directed the staff to reevaluate Category 3 source accountability. Details of this reevaluation can be in a staff requirements memorandum dated 18 October 2016, COMJMB-16-0001, "Proposed Staff Re-Evaluation of Category 3 Source Accountability." Per the Commission direction, the reevaluation will build on the efforts resulting from the 2015 GAO investigation, integrate the recently completed comprehensive review of 10 CFR 37, and include the current threat landscape.

To conduct the Commission directed reevaluation of Category 3 source security and accountability, an NRC-Agreement State working group was established. The working group will evaluate and make recommendations on whether it is necessary to revise NRC regulations or processes governing source protection and accountability to continue to ensure adequate protection of public health and safety. The working group's evaluations have begun, and their recommendations will be documented in a paper to be provided to the Commission in August 2017.

With the number of NRC and Agreement State licensees that could be affected by this effort exceeding 5,000, an important part of NRC's evaluation is soliciting input from the affected regulatory community, many of whom have never been subject to enhanced security and accountability requirements. The NRC has published a *Federal Register* notices (FRN), 82 FR 2399, which contain specific questions for stakeholders to consider regarding Category 3 sources. The working group will hold public meetings and webinars and give presentations to industry and professional organizations to solicit feedback on the FRN. Further information on this effort and public meeting details can be found at the NRC website. Your input on this reevaluation is important in order to fully assess the regulatory impact of any recommendations that might be made regarding security and accountability of Category 3 sources.

NRRPT Annual Meeting

The 2017 **NRRPT** Board and Panel meetings will be held in conjunction with the HPS Annual Meeting in Raleigh, NC. The **NRRPT** Board meeting is Saturday (July 8 and Tuesday (July 11). The **NRRPT** Panel meeting is Sunday (July 9) and Monday (July 10).
All **NRRPT** members are welcome to attend!

Watch for These Articles in Our Next Issue!

1. **NRRPT** Panel Member visits the Hanford B Reactor
2. **NRRPT** Logo merchandise extremely discounted
3. Test, test, testing…..
4. Where are the Radiation Professionals?
5. 10 Year Canadian Exam Update

NRRPT Chairman of the Board Dave Tucker conducts business at the mid-year meeting

NRRPT Board of Directors—Officers

Left to right: Danny McClung (Vice-Chairman), Dave Tucker (Chairman) and Terry LaFreniere (Secretary/Treasurer)

NRRPT Board of Directors and Panel of Examiners working overtime in Key West, FL

Hours of work were put into the task analysis update and revision!

Early X-rays
by Peter Darnell

Pictured here is a Crookes X-ray Tube (circa late 1800's). William Crookes developed the tube to investigate electrical discharges in gas.

The disc on the left is the cathode. The smaller disc near the center bottom of the tube is the anode. The large flat end of the tube is the X -ray source.

German physicist Wilhelm Konrad Roentgen discovered the X-ray on November 8, 1895 and reported it to the world early in 1896.

As you can imagine, all hell broke loose. People loved the idea of an invisible ray that could pass through matter and make a picture of it on a photographic plate.

Crookes X-ray Tube

The first X-ray machines were made within a month of the announcement and anyone that could build a machine did so and started playing. By the end of 1896 reports of skin effects, like bad sunburns, appeared. One enterprising physicist, Elihu Thomson, exposed a finger for a half-hour a day, every day for several days. He reported pain, swelling, stiffness, erythema, and blistering. Many people lost fingers or hands because they used erythema to tell when the X-ray tubes were warmed-up enough to use on the patient.

These and other reports lead to development of basic techniques for X-ray protection. They were well-known by 1905 – but implementation was terrible. You could find medical X-ray units with almost no safety precautions into the 1940's. The grand-daddy of X-ray protection was William Herbert Rollins, a Boston dentist. He developed collimators, lead tube housings, and even high voltage tubes to reduce patient dose. Rollins was prolific in his research – he found out that X-rays could kill guinea pigs and even discovered that X-rays could kill a guinea pig fetus. These discoveries lead to limits on patient dose and protection practices for pregnant women.

Early Dupont and AEC Film Badges (year unknown)

Great news! But it was of little help to Rome Vernon Wagner, an X-ray tube manufacturer. In an October 1907 meeting of the American Roentgen Ray Society, Wagner described using a photographic plate he carried in his pocket. He would develop the film nightly to see if he had been exposed. There was no calibration for how much exposure he received. He died in 1908, just 6 months after his report, from cancer.

So here's to you William Rollins and you Rome Wagner – pioneers in health physics for developing X-ray protection and the predecessor to the film badge.

References: Health Physics Historical Instrumentation Collection
The First Fifty Years of Radiation Protection--A Brief Sketch by Ronald L. Kathern and Paul L. Ziemer

NRRPT Board Members—Then and Now

Presentation of the New NRRPT Chairman Award

Ed Lohr, Chairman Awards Committee

Last fall, a proposal for a new award was put forth by the incoming NRRPT Chairman, Dave Tucker. This new award would acknowledges the hard work and sacrifice that an individual makes when taking on the most difficult position in the NRRPT organization, the position of Chairman. The Awards Committee drafted a proposal for the award with the idea that each awardee would not receive a plaque or a standard item. Rather, each awardee would be presented with something different and tailored for each Chairman. An award that would capture their leadership style, their personality, and their flair and be more meaningful.

The Awards Committee proposed the following to the Board and Panel members, excluding the potential recipients, for discussion: "Chairman Award: This award is presented to active members who have served as the Chairman of the NRRPT Board. A person may receive this award for each term they have served. The award citation will be inscribed upon an object that will be selected by the Awards Committee and tailored to each individual." All feedback received was positive and a Board vote enacted the award in October of 2016.

The following past Chairmans were presented with their individual Chairman awards at the Key West NRRPT night out in January:

Left to right: Eddie Benfield, Kelly Neal, Dave Biela and Kelli Gallion

Kelli Gallion
Jan. 1, 2004 - Dec. 31, 2007

For Kelli, the engraving has **Crystal Clear Leadership**. Not just the obvious reference to the award being clear but also to how, as Chairman, she had a clear vision of what she thought the NRRPT should be doing and how to achieve it.

Dave Biela
Jan. 1, 2008 - Dec. 31, 2010

Dave's award is engraved with **Leadership by Example**. As many of us have noticed, Dave always leads from the front. As Chairman, he always showing the rest of us the way by doing, rather than by directing, whatever the task that needed to be done to support the NRRPT.

Kelly Neal
Jan. 1, 2011 - Dec. 31, 2013

Kelly's award is engraved with **Leadership Extraordinaire**. His style as the Chairman was to build consensus on solutions to problems. Kelly recognized and practice the concept of having the problem solve before it grew too big and that having the numbers necessary to solve it already on stand-by made it much easier to tackle.

Eddie Benfield
Jan. 1, 2014 – Dec. 31, 2016

Credible Leadership is engraved on Eddie's award. As the Chairman, he spoke the language of the technician (southern) and led the NRRPT from their perspective. He explain complex problems in simple terms and found sensible solutions to them. Eddie, through his actions and smooth southern gentleman style, brought credibility to the NRRPT.

NRRPT Night-Out in Key West, FL

*** Thank you to our generous NRRPT Night-Out sponsors ***

Denise Arlen (UniTech), John Arrowsmith (Frham Safety Products), Ken Baugh (B&B Environmental Safety), Eddie Benfield (Duke Energy), Tom Hansen (Ameriphysics), Bill Peoples (BHI Energy), Bob Wills (GEL), and Laura Davidson (Envirachem)

Dave Tucker, Bio on our Chairman of the Board

I have been a proud RRPT since 1996! I got actively involved with this excellent organization in 2004 when some friends and colleagues at Ontario Power Generation identified the need for a Canadian version of the NRRPT exam to encourage professional development and credentialing for their own radiation protection staff and contractors. Knowing that I was an RRPT and that I worked at a university, they asked me to see what I could do to help make that happen. I met with the Board and Panel that first year to start that work and knew that I had found an organization that I would be proud to commit to. I've been on the exam panel or board ever since and have loved every minute of it.

For the past 18 years, I have been the Senior Health Physicist and RSO for McMaster University. I work with an outstanding group of dedicated radiation safety professionals (including five other RRPTs with more to come) facilitating some truly inspiring work at our facilities at "Canada's Nuclear University". In addition to support for the research and education mission of our university, the McMaster Nuclear Reactor (a 5 MW MTR design pool reactor) is a global supplier of the medical isotope I-125. The production team has the slogan "100 dads a day" because every day of operation results in us shipping enough I-125 for 100 prostate cancer brachytherapy treatments for someone's dad – or brother or uncle. Actually, these days it is probably closer to 200 dad's a day. We also host a renowned institute, the Centre for Probe Development and Commercialization (CPDC) who are leaders in development and contract manufacturing of novel new radiolabelled diagnostic and therapeutic agents. We are currently supporting their work producing new cancer treatments for several clinical trials in locations around the world. In addition, the CPDC with support from the University, operates two cyclotrons supplying F-18 regionally for PET imaging. It is a very busy and inspiring place to work! I also have the great pleasure to teach graduate and undergraduate courses in health physics as an adjunct lecturer. This is an opportunity that I truly cherish. I have had some wonderful experiences during my time at Mac working with Health Canada on national radiological emergency preparedness and radiological terrorism response exercises and working with the city fire and police departments developing radiological emergency response capabilities.

From 1989 to 1998, I worked at Chalk River as a health physicist and section head with the Radiation Protection Branch. These were exciting times as we rebuilt the radiation safety programs. I got some great experience as the health physicist for the NRU and NRX reactors and leading RP support for the emergency preparedness program. One duty I particularly valued was running the radiation safety training school. That is where I first developed a passion for radiation safety training and especially radiation protection technologist training. Our team developed a year-long training program for radiation surveyors and formal radiation safety training program for all of the site's rad workers.

Before heading up to Chalk River, I graduated from McMaster with my bachelor's degree in health physics and worked as an Operator at the accelerator lab, continuing a job I had enjoyed part time through my undergraduate degree. I finished my master's degree in medical physics part time after coming back to McMaster, having attained my RRPT and CHP while working at Chalk River.

My wonderful wife Christine and I have been married for 29 years this May! We weren't quite high school sweethearts, but she tells me we could have been if I had hurried up and asked her out. Darn it! We have three terrific sons who we are very proud of. Our oldest, Michael is finishing up a five year program in engineering physics and management at McMaster this year and will be starting graduate school in nuclear engineering this spring. Our second son, Scott, is graduating with his civil engineering degree from the Royal Military College and will accept his commission as an engineering officer in the Canadian Army this May. Our youngest son, Jonathan, has one year of his environmental sciences BSc to go and plans to go to teacher's college after graduating. Did I mention we are proud? Christine and I spend what little spare time we have these days travelling and enjoying time with our family and friends.

We appreciate our NRRPT Corporate Sponsors!

Thank you sponsors!

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*(*Please reference NRRPT when sending in your resume)*

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- Tubing
- Outdoor/Indoor storage
- Shipping covers for contaminated equipment
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- Decontamination pads
- Underslab vapor retarders for critical applications
- Feed water heaters/rotor covers
- Soft-sided packaging for surface contaminated objects
- FME barriers

The advantages of using Griffolyn® containment products for new plant construction and maintenance projects are vast but the immediate recognized benefit is the reduction in the costs associated with improving project schedules. Griffolyn® products reduce the volume of radwaste, which in turn lowers disposal costs.

From assisting in the design of uniquely configured and fabricated products to one of a kind materials custom built from scratch, Reef Industries' highly experienced staff can fabricate a product that meets your exact requirements. Custom printing capabilities are also available to meet any message requirements. We can custom configure a product with nylon zippers, hook and loop fasteners, grommets, D-rings, webbing, pipe loops or many other possibilities. Reef Industries can work with exact dimensions, sketches and/or ideas to custom design and build a product specifically suited for your needs.

Stock rolls and sizes are available for immediate shipment. If you require dependable, long-lasting, cost-effective on-site fabrication tape, Reef Industries can supply you with pressure sensitive and/or double-sided tape. Custom design and fabrication are available in 7-10 days.

San Onofre Nuclear Generating Station

For more than 40 years, SONGS generated power for Southern California – in fact, units 2 and 3 were capable of generating 2,200 megawatts of electricity, enough power to serve 1.4 million average homes at any point in time. SCE announced in June 2013 that Units 2 and 3 will be permanently retired. Unit 1 was retired in 1992.

SCE is committed to a safe and timely decommissioning of the San Onofre nuclear plant that protects the environment and our customers' economic interests. SCE established a set of guiding principles focused on safety, stewardship and engagement that will guide the successful decommissioning of SONGS and can make San Onofre a model for the industry.

SONGS is proud of its' continued dedication of registered RRPT members that are represented in various organizations across the station.

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Among the nation's top utility companies in size and sales, Ameren is the parent of Ameren Missouri, based in St. Louis, MO, and AmerenCIPS, based in Springfield, IL. Ameren is also parent to several nonregulated trading, marketing, investment and energy-related subsidiaries. Ameren employees, totaling approximately 7,400, provide energy services to 1.5 million electric and 300,000 natural gas customers over 44,500 square miles in Illinois and Missouri.

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Detroit Edison Fermi 2

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(734) 586-1883 (fax)
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www.dteenergy.com

Detroit Edison operates the Fermi 2 Nuclear Power Plant located in Monroe, MI along the shores of Lake Erie. Fermi is a 1200 MW power plant supplying electricity to the metropolitan Detroit area.

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The new Duke Energy, which is the product of a merger with Progress Energy, is the largest electric power holding company in the United States with more than $100 billion in total assets. Its regulated utility operations serve more than 7 million electric customers located in six states in the Southeast and Midwest. Its commercial power and international business segments own and operate diverse power generation assets in North America and Latin America, including a growing portfolio of renewable energy assets in the United States. Headquartered in Charlotte, N.C., Duke Energy is a Fortune 250 company traded on the New York Stock Exchange under the symbol DUK.

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frhamsc@frhamsafety.com

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Incorporated in 1983, Frham Safety Products, Inc. continues its sole purpose of manufacturing and distributing products to the Nuclear Power Utilities, DOE, DOD, Naval facilities as well as several industrial accounts and related users of safety supplies and equipment.

From the creators of proven products such as the Totes Overshoe and the Frham Tex II, Frham continues their objective to provide products and services which meet or exceed the specifications set forth by customers and the industries that it serves. These revolutionary new concepts include Life Cycle Cost Management (LCCM), Mobile Outage System Trailer (MOST) and Certified Disposable Products (CDP).

- LCCM offers products through a systematic approach of life cycle pricing to include disposal at the purchase point.
- MOST provides onsite product storage stocked systematically specified by the customer for easy access and stringent inventory control.
- CDP consists of proven disposables for every application which includes standard and custom specifications to meet your disposable needs.

Among these services and products, Frham also supplies chemical, biological and radiological equipment which will support applications for domestic, biological, nuclear, radiological or high explosive incident sites. This equipment is able to sample, detect and identify chemical warfare agents and radiological materials as well as provide safe-barrier, personal protection from chemical warfare, biological warfare, radiological and TIC/TIM environments.

F&J Specialty Products, Inc.

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ISO 9001:2008 certified manufacturer of traditional and advanced-technology air sampling instruments, airflow calibrators, filter holders, consumables and accessories.
Air Sampler product lines include; high and low volume, tritium, C-14 and battery-powered air sampling systems. Various models are available for both portable and environmental sampling systems.
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F&J manufactures the premier line of small lightweight emergency response air samplers which can operate from line power, on-board batteries or an external DC power source. Battery powered units have on-board charging systems.

HI-Q ENVIRONMENTAL PRODUCTS COMPANY, INC.
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HI-Q Environmental Products Company is an ISO 9001:2008 certified designer/manufacturer that has been providing air sampling equipment, systems and services to the nuclear and environmental monitoring industries since 1973. Our product line ranges from complete stack sampling systems to complex ambient air sampling stations. HI-Q's customers include the National Laboratories and numerous Federal and State Agencies in addition to our domestic and international commercial customer base. Our product catalog includes: Continuous duty high & low volume air samplers, radiation measurement instrumentation, radiation monitoring systems, air flow calibrators, radioiodine sampling cartridges, collection filter paper and both paper-only or combination style filter holders. Along with the ability to design complete, turn-key, stack and fume hood sampling systems, HI-Q has the capability to test ducts and vent stacks as required by ANSI N13.1-1999/2011.

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Master-Lee is a leading supplier of refueling, maintenance, inspection, operations and outage management services for PWR Nuclear Power Plants in the U.S. Market and has supported the major NSSS companies in the performance of similar tasks at BWR sites. Master-Lee also designs, fabricates and supplies specialty products, tools and parts in support of our various product lines. These capabilities are provided by our broad range of Product Lines: Refueling and Related Services; Pump and Motor Services; NDE – Eddy Current Testing Services; Specialized Reactor Services; Decontamination Services; Decommissioning Services; Engineered Products; and Technical Services.

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Mirion Technologies is a leading provider of innovative products, systems and services related to the measurement, detection and monitoring of radiation. The company delivers high quality, state of the art solutions that constantly evolve to meet the changing needs of its customers. With the addition of the Canberra brand in 2016, Mirion expanded its portfolio and the breadth of its expertise to bring a new standard of solutions to the market. Every member of the Mirion team is focused on enhancing the customer experience by delivering superior products, exceptional service and unsurpassed support. Mirion Technologies: Radiation Safety. Amplified.

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RAD MOVIE REVIEWS!

The time, 1956. The place, Gudavia – behind the Iron Curtain deep in an Easter Bloc dictatorship!

The train mysteriously breaks apart and maroons a heroic reporter and his trusty sidekick photographer in the isolated village of Gudavia.

Of course, there's something afoot!

Could it be – yes it is!

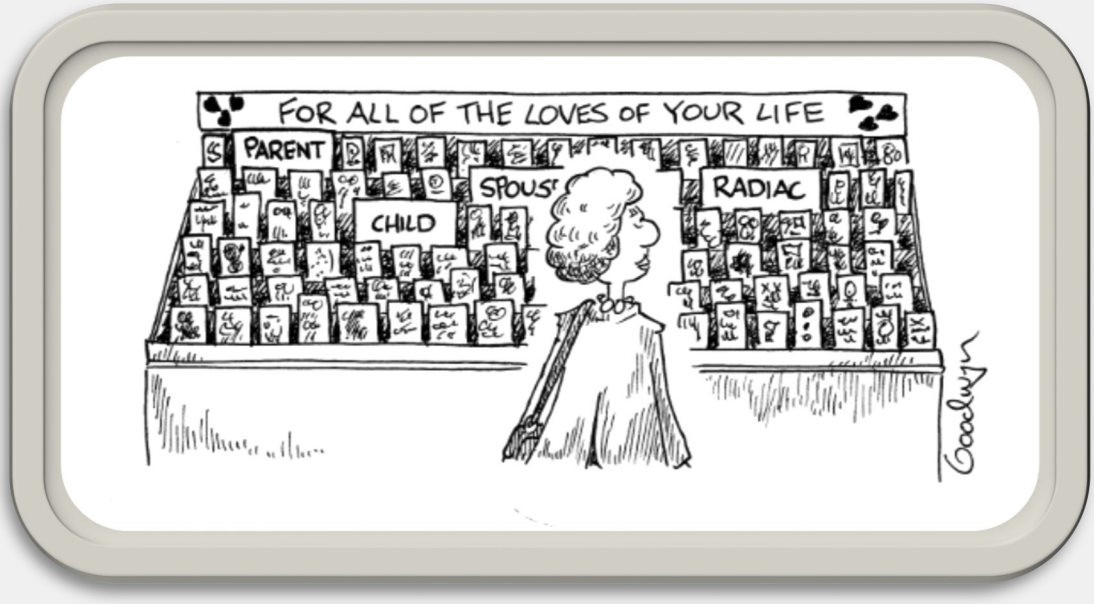
A mad scientist is on the loose!

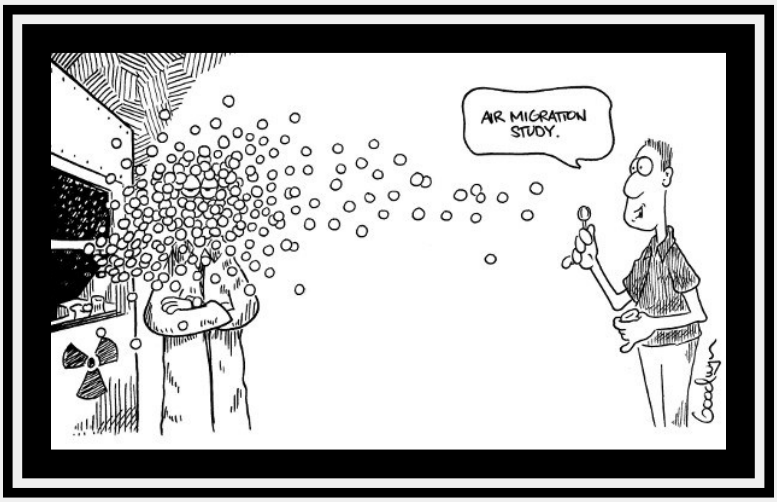
Using gamma rays – this foul physicist is turning the local youth into geniuses or into sub-humans.

Oh, the humanity – where were the rad techs to protect the innocent townsfolk? Does the hero survey the dastardly deeds of the scientist?

Watch the movie to find out!

Pete Darnell, RRPT, CHP, amateur movie critic





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