



Bulletin

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Canadian Radiation Protection Association
Association canadienne de radioprotection

Environmental Assessments at the Canadian Nuclear Safety Commission

A planning tool to help anticipate,
evaluate, mitigate, monitor, and
manage environmental impacts

Nuclear Energy

Climate Change or
Changes in Perception

How Radioactive Is Your Home?

Eva Sailerova takes her Ludlum 3 home to
test the radioactivity of her environment

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On Being CRPA President



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Prospectus

The Canadian Radiation Protection Association (CRPA) was incorporated in 1982. The objectives of the association are

- to develop scientific knowledge and practical means for protecting all life and the environment from the harmful effects of radiation consistent with the optimum use of radiation for the benefit of all,
- to further the exchange of scientific and technical information relating to the science and practice of radiation protection,
- to encourage research and scientific publications dedicated to the science and practice of radiation protection,
- to promote educational opportunities in those disciplines that support the science and practice of radiation protection,
- to assist in the development of professional standards in the discipline of radiation protection; and
- to support relevant activities of other societies, associations, or organizations, both national and international.

The association publishes the *Bulletin* four times a year and distributes it to all members. Subscription rates for non-members, such as libraries, may be obtained from the secretariat.

Members of the association are drawn from all areas of radiation protection, including hospitals, universities, the nuclear power industry, and all levels of government.

Membership is divided into five categories: full members (includes retired members), with all privileges; associate and student members, with all privileges except voting rights; honorary members, with all privileges; and corporate members. Corporate membership is open to organizations with interests in radiation protection. Corporate members are entitled to have their name and address listed in each *Bulletin*, a complimentary copy of each *Bulletin*, a copy of the *Membership Handbook* containing the names and addresses of all CRPA members, reduced booth rental rates at the annual meeting, and reduced advertising rates in the *Bulletin*.

Application forms are available on the CRPA website or from the secretariat.

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Les objectifs de l'Association canadienne de radioprotection, dont les statuts ont été déposés en 1982, sont les suivants:

- Développer les connaissances scientifiques et les moyens pratiques pour protéger toute forme de vie et l'environnement des effets dangereux des radiations, et ce, d'une manière compatible avec leur utilisation optimale pour le bénéfice de tous;
- encourager les échanges d'informations scientifiques et techniques relevant de la science et de la pratique de la radioprotection;
- encourager la recherche et les publications scientifiques dédiées à la science et à la pratique de la radioprotection;
- promouvoir les programmes éducationnels dans les disciplines qui soutiennent la science et la pratique de la radioprotection;
- aider à la définition des normes professionnelles concernant la radioprotection, et
- soutenir les activités pertinentes des autres sociétés, associations, organisations nationales ou internationales.

Les membres de l'association proviennent de tous les horizons de la radioprotection, y compris les hôpitaux, les universités, l'industrie nucléaire génératrice d'électricité et tous les niveaux du gouvernement.

L'association publie le *Bulletin* quatre fois par an et le fait parvenir à tous les membres. Le prix d'un abonnement pour les non-membres, par exemple une bibliothèque, peut être obtenu auprès du secrétariat.

Les membres sont classés selon cinq catégories: membres à part entière (y compris les membres retraités), avec tous les privilèges; membres associés et étudiants, avec tous les privilèges sauf le droit de vote; membres honoraires, avec tous les privilèges; et membres corporatifs.

Les membres corporatifs ont droit d'avoir leur nom et leur adresse indiqués dans chaque *Bulletin*, de recevoir un exemplaire du *Bulletin*, de recevoir un exemplaire de l'annuaire de l'association contenant les noms et adresses de tous les membres de l'association, d'avoir un kiosque à tarif réduit lors des conférences annuelles, d'avoir un espace publicitaire à tarif réduit dans le *Bulletin*.

Les formulaires de demande d'adhésion peuvent être obtenus sur le site Web ou auprès du secrétariat.



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President's Message / Message du Président

Le présent message sera mon dernier en tant que président de l'ACRP (au moment où vous lirez ces lignes, je serai devenu président sortant), puisque Sandu Sonoc a pris la relève lors de la récente assemblée générale annuelle au congrès d'Edmonton. En tant que président sortant, je suis content d'avoir la possibilité de poursuivre mon travail au sein du conseil au cours de la prochaine année et j'espère trouver d'autres moyens de contribuer à l'association dans les années à venir. Grâce à l'excellent soutien des membres du conseil, du secrétariat et de membres intéressés et impliqués au sein de nos divers comités, j'ai beaucoup apprécié mon mandat en tant que président. Nous pouvons vraiment être fiers de notre organisation : nous accomplissons beaucoup grâce au bénévolat et au dévouement de nos membres.

Récemment, nous avons abondamment parlé de notre processus électoral. Des préoccupations ont été soulevées par le comité des nominations, par les membres coordonnateurs et par plusieurs anciens présidents de l'association et l'on a amplement discuté de la meilleure façon de procéder. Deux préoccupations principales ont émergé au sujet du processus de nomination (et de la façon dont il est censé fonctionner) et quant à la pénurie fréquente de candidats pour les postes de président et de secrétaire. Vous êtes nombreux à savoir que ces problèmes ne sont pas nouveaux. Ces préoccupations seront analysées en partie par un groupe de travail spécial composé de membres du conseil (Valérie Phelan, Frank Tourneur et Petra Dupuis), de la présidente du comité des nominations (Debbie Frattinger) et d'une membre intéressée (Manon Rouleau). Le conseil a chargé le groupe de travail d'apporter les modifications nécessaires pour : a) établir des critères de mise en candidature clairs et objectifs; b) modifier le processus de nomination afin d'exiger l'acceptation par le candidat avant la soumission; c) éliminer les limites quant au nombre de candidats pour les postes; et d) remplacer le rôle du comité des nominations par un rôle à la fois de promotion à la participation au processus électoral et de surveillance de ce même processus. Le groupe examinera également le processus électoral en général, sollicitera la contribution des membres et fera des recommandations au conseil pour d'autres modifications qui pourraient être préconisées. Les membres du groupe de travail ont donné une présentation à l'assemblée générale annuelle.

Quels que soient les changements qui seront apportés, ils ne représentent que la moitié de l'équation. La plupart du temps, nous avons une abondance de membres intéressés à se présenter pour les postes de directeurs, mais les postes de président et de secrétaire sont comblés par acclamation. Nous avons eu la chance de pouvoir persuader des personnes compétentes à se présenter à ces postes, mais

suite à la page 18 . . .

This is my last message as president (actually as past president by the time this issue is published) of the CRPA—Sandu Sonoc will have taken the reins at the Annual General Meeting

at the Edmonton Conference. I look forward to being the “past president” of the Board for the coming year and to finding other ways to contribute to the association in the years ahead. I have greatly enjoyed my time as president, thanks to the excellent support I have received from the members of the Board, our outstanding Secretariat, and our many interested and involved committee members. We can be truly proud of our organization and what it has accomplished through the voluntary hard work and dedication of our members.

Recently, concerns about our electoral processes have been raised by the Nominations Committee, by members at large, and by several past presidents of the association. As many of you are aware, these concerns are certainly not new, and there has been considerable discussion about how to proceed. Two main concerns have emerged: how the nominations process works (and how it is supposed to work), and our frequent shortage of candidates for the positions of president and secretary. A special working group consisting of Board members (Valeria Phelan, Frank Tourneur, and Petra Dupuis), the chair of the Nominations Committee (Debbie Frattinger), and an interested member (Manon Rouleau) has been set up to address these concerns, in part. The working group has been charged by the Board to make the necessary changes to: 1) establish clear and objective criteria for nominations; 2) alter the nomination process to require acceptance by the candidate prior to submission; 3) eliminate limits for the number of candidates for positions; and 4) shift the role of the Nominations Committee to one of promotion of participation in the election process and oversight of the process. The group will also review the elections process in general, solicit input from the membership, and make recommendations to the Board on any other recommended changes. Group members are planning a presentation on these issues at the Annual General Meeting.

Whatever changes are made, they will only be half of the equation. In many years, we have an abundance of members interested in running for the position of director, while the posts of president and secretary are typically



photo by J.D. Howell

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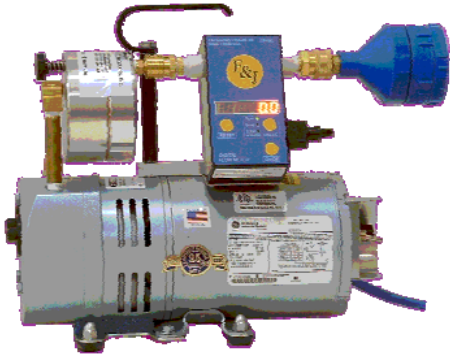


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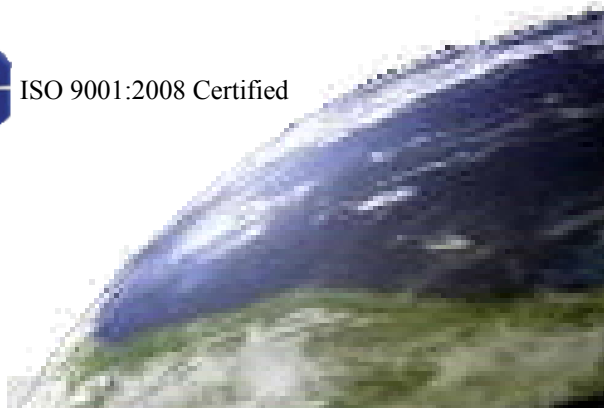
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Editor's Note/ Message du rédacteur en chef

Ils sont partout ces Verts !

Les derniers mois de 2009 ont été fertiles en débats environnementaux. En fait, un sujet principal occupait la place publique : les changements climatiques et la contribution humaine à ce phénomène. Pour la première fois, et probablement en conjonction avec le Sommet Copenhague 2009, le forum de discussion RADS SAFE a été la scène d'un échange fort particulier. Les participants se sont éloignés du sujet principal pour parler... de la théorie du changement climatique et de la lutte pour réduire les émissions de gaz à effet de serre (GES) dans l'atmosphère. Teintée de politique et d'idéologies personnelles, cette discussion s'est certainement poursuivie en privé, car j'ai envoyé moi-même autant de courriels aux particuliers qu'aux membres de la liste. Cet échange m'a donné l'idée de ramener la discussion au niveau des professionnels de la radioprotection. Que signifient pour vous la lutte contre les changements climatiques et la montée de la popularité de l'écologie dans votre quotidien?

Je vous avoue que j'aurais pensé que le nucléaire gagnerait instantanément en gallons puisqu'il s'agit d'une source d'énergie qui ne produit pas de GES. Mais cette option ne fait toujours pas l'unanimité. Sur RADS SAFE, certains faisaient même un parallèle intéressant entre la théorie linéaire sans seuil (LNT) et la théorie du réchauffement climatique. Cherche-t-on à faire peur pour mieux persuader? Sommes-nous capables de prouver les effets potentiellement catastrophiques du réchauffement planétaire? Comme dans le cas de la LNT, les réponses ne sont ni uniques, ni sans équivoque. Rappelez-vous qu'en 2008, à Saskatoon, nous avons assisté à des conférences qui donnaient le ton. Sylvain St-Pierre, de l'Association nucléaire mondiale, avait commencé son allocution en déclarant « ...l'énergie n'est pas une option... », ce à quoi Patrick Moore, co-fondateur de Greenpeace, avait répondu par un vif plaidoyer en faveur de l'énergie nucléaire, en affirmant « ...j'étais fatigué d'être toujours contre quelque chose... ». Les mentalités changent lentement, mais pourquoi si lentement et pourquoi ne réussissons-nous pas à convaincre le grand public?

Je vous propose donc un article de mon cru, fruit de mon observation personnelle au cours de mes trois années d'études à la maîtrise en sciences de l'environnement. Sans parti pris, je tente d'exposer la vision de ceux qui n'acceptent pas l'option nucléaire contre les changements climatiques. On verra que le concept de développement

suite à la page 19 . . .

The Greens are Everywhere!

The last few months of 2009 were rich in environmental debates, and one major environmental topic was discussed in the public arena: climate change and how human beings contribute to this phenomenon. And for the first time ever, probably in conjunction with Copenhagen 2010, the RADS SAFE discussion forum was the site of a very interesting exchange when participants went off the main topic and instead discussed the theory of climate change and the reduction of greenhouse gas emissions (GHG) in the atmosphere. This discussion, which was filled with politics and personal ideologies, most certainly continued privately afterward, as even I sent emails to both individuals and member organizations. It also motivated me to continue the discussion with the CRPA membership. What does the ecological build-up mean to you, as a radiation safety professional? What about the fight against climate change?

I must admit that, since nuclear energy is free of GHGs, I thought it would be a unanimous choice to combat climate change. Yet, opinion on this option is not unanimous. And during the RADS SAFE exchange, some people made an interesting parallel between the linear non-threshold theory (LNT) and the global warming theory. Are we trying to instill fear in order to be more persuasive? Can we prove that global warming will have catastrophic effects on our planet? As with the LNT, there is no single and unequivocal answer. In 2008 in Saskatoon, several of the conference sessions set the tone for a debate on nuclear energy. For instance, Sylvain St-Pierre of the World Nuclear Organization declared that "nuclear energy is not an option," while Patrick Moore, co-founder of Greenpeace, responded with a vibrant plea for nuclear energy, saying that he "was tired of always being against something." Although mentalities are slowly changing, why are they changing so slowly, and why are we unable to engage the public?

To encourage you, our readers, to become more involved in this debate, I would like to invite all of you to read my article "Nuclear Energy: Climate Change or Changes in Perception?" which is found in this issue of the *Bulletin*. It is based on my observations during the three years I spent working on my master's degree in Environmental Science, and, in it, I try to take an unbiased



continued on page 19 . . .

Environmental Assessments at the CNSC

by Nathalie Skov, Canadian Nuclear Safety Commission

What is an Environmental Assessment?

An Environmental Assessment (EA) is a planning tool that can help anticipate, evaluate, mitigate, monitor, and manage the environmental impacts of a proposed project before it is carried out.

For new or major projects and facilities requiring a licensing action from the Canadian Nuclear Safety Commission (CNSC), the commission conducts EAs in accordance with the *Canadian Environmental Assessment Act* (CEAA) and its regulations. EAs are typically conducted for projects related to the following:

- nuclear power plants
- heavy water production plants
- uranium mines, mills, or power plants
- uranium processing and research facilities
- nuclear substances and radiation devices
- radioactive waste management facilities

EAs may also be conducted for projects such as the following:

- refurbishments
- site rehabilitation
- capacity increases
- facility expansions for existing facilities

A complete list of CNSC's ongoing EAs, along with a comprehensive description of each project and next steps in the regulatory process, can be found on our website at www.nuclearsafety.gc.ca.

Impact of an EA on a project

EAs can give proponents a better idea of a proposed project's potential impacts and the available mitigate measures to minimize or eliminate any adverse environmental effects. An EA can help determine

- alternative actions, methods, or locations;
- innovative technologies to mitigation, minimize, or eliminate adverse effects; or
- other means of carrying out the project.

Following an EA, a project can be modified to eliminate or minimize its potential adverse environmental effects in a cost-effective and environmentally responsible manner.

Important – If a project were deemed to have potentially significant adverse environmental effects that could not be mitigated, it would not receive a positive EA and the project would not proceed to licensing by the CNSC's Commission Tribunal.

Résumé

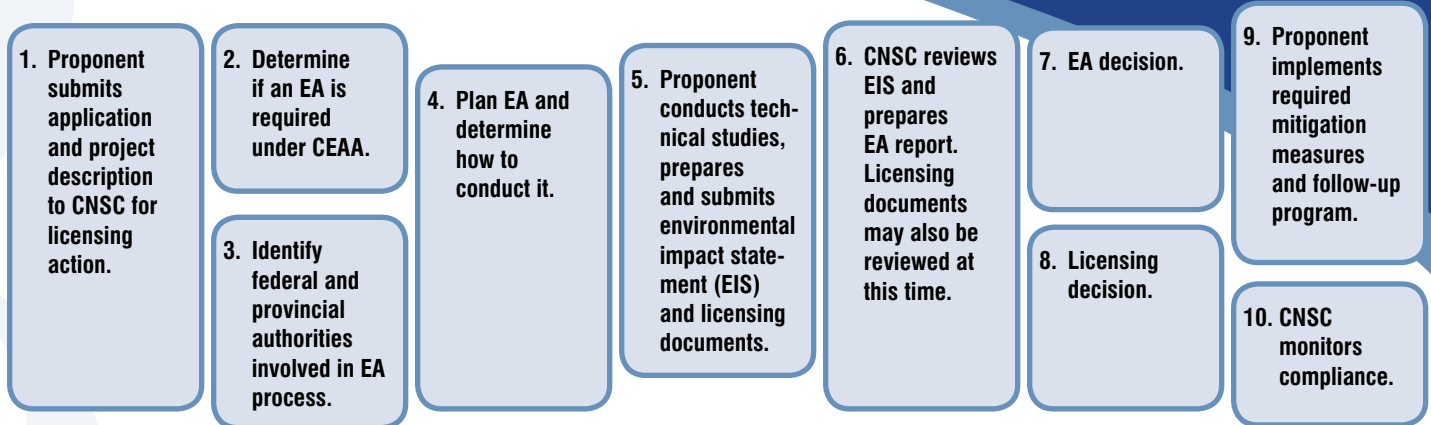
Une évaluation environnementale (EE) est un outil de planification qui peut aider à anticiper, à évaluer, à limiter, à surveiller et à gérer les répercussions environnementales d'un projet avant sa réalisation. En ce qui concerne les projets et installations (nouveaux ou d'importance) pour lesquels des mesures d'attribution de licences de la Commission canadienne de sûreté nucléaire (CCSN) sont nécessaires, la commission procède à des EE en vertu de la Loi canadienne sur l'évaluation environnementale (LCEE) et de sa réglementation.

Dans l'article qui suit, une représentante de la CCSN, Nathalie Skov, discute des répercussions d'une EE sur un projet, du processus de réglementation de la CCSN, de ce qu'évalue une EE et de ce qui survient après une évaluation. Elle indique également avec qui communiquer si l'on a des questions au sujet des EE ou d'un projet précis.

La majorité des renseignements fournis dans l'article ci-dessous se trouvent également en français sur le site web de la CCSN à l'adresse www.nuclearsafety.gc.ca/fr.



Fundamental steps in the CNSC's regulatory process



The process begins when a proponent submits a project description and an application for licensing action for CNSC consideration. For all new licence applications and for most amendments to an existing licence under the *Nuclear Safety and Control Act* (NSCA), a determination is made whether to conduct an EA.

When an EA is required, the commission must make the EA decision before considering if the project can proceed to licensing. CNSC conducts three types of EAs under the CEAA:

- **Screening** – CNSC Commission Tribunal or designated officer makes the EA decision
- **Comprehensive Study** – Minister of the Environment makes the EA decision
- **Review Panel** – Federal Cabinet considers the EA before it proceeds to licensing

What is assessed in an EA?

At the beginning of an EA, CNSC staff review the proposed project description and determine what must be assessed. EA guidelines are drafted and submitted to the proponent, who conducts technical studies and develops an environmental impact statement (EIS).

The EA guidelines contain a list of project-environment interactions based on two sets of data – project work and activities and valued ecosystem components – measured against each other.

Project Work and Activities – The proposed project is broken down into its various phases, such as site preparation, construction and modification, operations and maintenance, and decommissioning. Activities associated with each phase are detailed as fully as possible. For example, in the site preparation phase, activities may include excavation, grading, and soil handling during excavation.

Valued Ecosystem Components (VECs) – VECs are developed with input from community members or interested parties to identify important ecosystem elements that could be affected by project activities. These include air quality, noise, aquatic habitat, wildlife communities and species, soil quality, land use, and traditional land and resource use. VECs are identified under several categories, including atmospheric environment, geology and hydrogeology, radiation and radioactivity, socioeconomics, health, and Aboriginal interests.

Project activities and VECs are arranged in a table to identify how a proposed project would interact with the environment. Activities are evaluated

against the VECs, and potential interactions are indicated in the table.

Once project-environment interactions are identified, the proponent conducts technical studies to assess potential impacts, including any possible cumulative effects. Measures are proposed to mitigate or eliminate adverse effects, and likely residual effects are identified and assessed by proponents.

The CNSC analyzes the results of the proponent's technical studies and the EIS. The CNSC occasionally requests further studies or clarifications and often coordinates input from other federal government departments that may be involved in the EA as technical expert reviewers or as other responsible authorities.

After the assessment of the proponent's project is completed, the CNSC produces an EA report and submits it to the responsible authority (the commission, the Minister of Environment, or the review panel, depending on the type of EA) for an EA decision.

The CNSC typically considers up to 12 categories of over 30 VECs in an EA, and all possible project activities are listed under each phase of the project.

continued on page 12 . . .



The following example shows how potential interactions are identified.

Example of a partial project-environment interaction table

Project work & activities	Atmospheric environment		Geology & hydrogeology			Radiation & radioactivity				Aboriginal interests	
	Air quality	Noise	Soil quality	Groundwater quality	Groundwater quantity	Terrestrial environment	Surface water quality & aquatic environment	Members of the public	Project workers	Traditional land & resource use	Cultural & heritage resources
Site preparation phase											
Excavation & grading	•	•	•	•	•	•			•		
Handling of soil during excavation	•							•	•		•
Construction & modification phase											
Construction of ventilation system	•	•				•	•	•	•		
Connection of pipe to active drain system	•	•	•	•	•				•		

How many EAs are performed each year?

Every year, the CNSC is asked to determine if various projects will require an EA. Depending on the proposed projects, new EAs may be initiated, while ongoing EAs continue to their completion.

As of February 2010, the CNSC had 24 ongoing EAs:

- 16 screenings
- 4 comprehensive studies
- 2 review panels
- 2 EAs conducted under non-CEAA legislation, in areas governed by Canadian land claim agreements

An EA can take anywhere from eight months to a couple of years to complete, depending on the type of EA required, the complexity of the proposed project, the ability of proponents to conduct their technical studies, the public participation requirements, and the level of technical review needed to complete the EA report. 🇨🇦

Canadian Nuclear Safety Commission



For more information

about our regulatory responsibilities, visit the CNSC's website at www.nuclearsafety.gc.ca.

To contact someone about EAs in general or for more information on a specific project, email EA@cnsccsn.gc.ca.

Le programme de mentorat et vous

Nous avons besoin de votre rétroaction!

par Leah Shuparski et Donata Chaulk,
au nom du comité des affaires étudiantes de l'ACRP

Les membres de l'ACRP sont moins nombreux que ceux de la *Health Physics Society* ou de l'*American Association of Physicists in Medicine* aux États-Unis, et il est peu probable que son bassin de membres s'accroisse autant que ces deux dernières. Toutefois, notre organisme attire en fait un nombre important de professionnels de la radioprotection provenant de partout au Canada. Ces professionnels œuvrent dans une variété de domaines relatifs à la radioprotection, pour des institutions ministérielles et non-ministérielles ou pour des entreprises, et en faisant partie de l'ACRP, ils ont la capacité de se réseauter et de s'entraider pour solutionner des problèmes. Nos congrès sont riches en renseignements portant sur de nouvelles études ou sur des solutions en radioprotection fonctionnant à l'intérieur du système législatif canadien. Mais pour élargir la portée de l'ACRP, épanouir davantage ses connaissances collectives et miser sur l'avenir de la profession, l'association a besoin d'étudiants prêts à apprendre et à miser sur les connaissances courantes.

Cette culture de collaboration est à la base d'une idée intéressante sur laquelle s'est penché le comité des affaires étudiantes (CAÉ) de l'ACRP pour répondre aux enjeux de croissance et d'épanouissement de nos connaissances collectives : un programme de mentorat qui serait offert aux étudiants pendant les congrès annuels. Pourquoi un programme de mentorat? Le mentorat nous distinguerait des autres organismes professionnels du domaine, engendrerait très peu de coûts, et contribuerait à attirer des étudiants vers notre association.

Bien sûr un programme de mentorat nécessiterait aussi la participation de nos ressources les plus précieuses : nos membres! En effet, peut-être avez-vous profité des connaissances d'un grand mentor lorsque vous avez commencé dans le domaine et que vous désirez également faire votre part. Ainsi, non seulement le fait d'être mentor vous donnera-t-il la satisfaction d'aider quelqu'un mais cela vous aidera aussi à élargir votre réseau.

Le CAÉ demande actuellement votre rétroaction à savoir si vous, les membres de l'ACRP, seriez prêts à participer à un programme de mentorat en agissant à titre de mentors. Vous pouvez soit donner votre opinion sur le forum du site Web de l'ACRP sous le thème désigné ou encore envoyer vos commentaires par courriel à leahshuparski@gmail.com.

Votre opinion nous est importante !

A Mentorship Program & You

We Need Your Feedback!

by Leah Shuparski and Donata Chaulk,
on behalf of the CRPA Student Affairs Committee



In terms of numbers, CRPA is smaller than the Health Physics Society or the American Association of Physicists in Medicine, and likely will not reach the size of either. However, our organization does attract a considerable number of radiation protection professionals from across Canada. These professionals work in various RP fields in governmental and non-governmental institutions or

in companies, and by joining the CRPA, they can network and help each other solve problems. Our conferences are a wealth of information on new studies or RP solutions that work in the Canadian legislative system. But if the CRPA is to grow and further expand its collective knowledge, the organization needs students who are both eager to learn and willing to build on the currently available knowledge for the future of the profession.

This culture of collaboration was the spark for an interesting idea that the CRPA Student Affairs Committee (SAC) has been discussing to address the issues of growth and the expansion of our collective knowledge: a mentorship program that would be offered to students during the annual conferences. Why a mentorship program? Mentoring would differentiate us from other professional organizations in the field, it would require very little overhead, and it would help attract students to our association.

Of course, a mentorship program would also require the participation of our most precious resource: our members! Why be a mentor? Maybe you had a great mentor when you were starting out and want to pay it forward. Being a mentor not only gives you the satisfaction of helping someone but also lets you expand your network.

SAC is currently soliciting feedback to see if you, the members of CRPA, would be willing to participate in a mentorship program by acting as a mentor. You can either provide your opinion on the CRPA website's forum under the designated topic or email your comments to leahshuparski@gmail.com

Your opinion is important to us!

Nuclear Energy

Climate Change or Changes in Perception?

Une version française de cet article est disponible sur le site Web à www.crpa-acrp.ca ou en contactant l'auteur (stephane_jeanfrancois@merck.com).

The CRPA conference held in Saskatoon in 2008 was rich in nuclear-industry scientific presentations, not to mention the testimony of Greenpeace co-founder Patrick Moore, who said he was tired of “being against something” and wanted to defend nuclear energy as a solution to the world’s energy woes. If Mr. Moore can do it, why don’t other environmental organizations follow suit? Is it solely out of intellectual dishonesty? The debate continued to rage in 2009 on the methods to be adopted to fight climate change and the increase in atmospheric greenhouse gases (GHGs). The year ended with a meeting in Copenhagen, a meeting that confirmed the timidity of political bodies for any solution aimed at reducing GHGs to the detriment of the global economy. Who is right?

To try to understand the situation, we must understand the new context in which nuclear-derived electrical power operates.

Kyoto and the Generational Impact

The alarmist tone on climate change stems, rightly or wrongly, from the famous Kyoto Protocol of 1997, which arose from the Rio Summit held in 1992, where the concept of sustainable development was born. Sustainable development is one that allows current generations to benefit from growth without compromising the interests of future generations. It involves a principle as important as the stalwart “As Low As Reasonably Achievable” (ALARA) principle in radiation safety: the principle of generational equity, a concept that is supported by members of generations X and Y and weakly supported by most baby boomers.

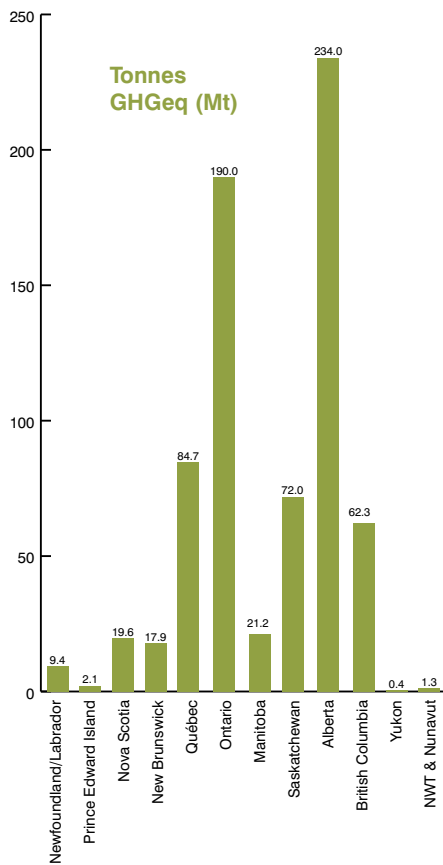
To summarize, the Rio Summit said we need to do something for future generations; this “something” was defined by the Kyoto Protocol in 1997, after a fashion, and supported by the Intergovernmental Panel on Climate Change (IPCC). Today, the protocol and the United Nations form the political-action wing on climate change, backed by the scientific wing, the IPCC. Kyoto is the face of the unanimous finding that greenhouse gases such as CO₂, CH₄, N₂O, and CFCs cause

global warming. What is less unanimous is the proof of this warming and the relationship between GHGs and industrial activities. To the great displeasure of certain manufacturers, it has been decided that man-made GHG sources result in global warming and that countries must do their part to reduce GHG levels. This means bringing the quantities of the six GHGs in the atmosphere down to 5% below 1990 levels. And, to persuade economists and free-economy supporters, the Stern Report of 2007 also drew a sombre picture of the economic havoc wreaked by global warming and called on large economies to act now to reduce the economic burden resulting from the impacts of climate change. But like all grandiose scientific theories, global warming has its share of detractors, especially when the warming of the planet is accompanied by visions deemed alarmist and sensational by many. The ecology and the environment are criticized and elevated to the ranks of a “new religion,” with its own version of right and wrong and a vision of the end of the world in the 21st century. The benefit of this cataclysmic vision is that nuclear energy appears almost benign in comparison. So why are we not adopting this energy source in North America?

Energy: The Crux of the Matter

The need for energy lies at the heart of the debate. How can we produce more of it? All the pieces are in place. Canada, as one of the 100 or so countries that ratified the Kyoto Protocol in 2002, is committed to fighting climate change. Canada is an energy-consuming country that has nothing to envy about its neighbour to the south, the United States, although at least the United States was clear in its actions by not ratifying Kyoto in 2001. The debate is now focused on energy production. Nuclear energy is a godsend for some and a Pandora’s box for others. Some say that energy is not optional, that we need to produce it, while others say that the less we depend on it, the more its production is optional. All the experts agree that energy-conservation activities are the most effective and cost efficient in terms of energy management.

Who is right? In Quebec, Hydro-Québec has discreetly decided to go ahead with the renovation of Gently II, while



GHG emissions by province, 1990–2006 (Source: Environment Canada)

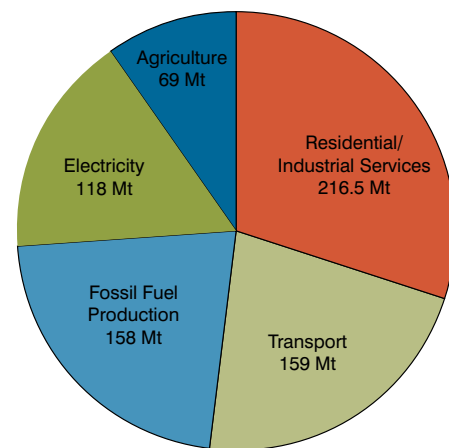
officially counting on wind and geothermal energy to meet its energy requirements. People have a lot of fun dismissing wind power as the energy source of “romantics.” It is qualified as a pipe dream, since, according to its detractors, a wind turbine does not measure up to a nuclear reactor. In Quebec, though, it must be admitted that wind energy is hydroelectricity’s best ally; the electrical potential of dams is stored in reservoirs and used as required—akin to big batteries to be used when the wind is not blowing or when the province wants to sell power to its neighbours. Could the same be done with a hydro power and nuclear energy combination? Asking the question means answering it. Can a thermal reactor (nuclear or coal powered) be shut down as quickly as a hydroelectric dam? The real question, though, is what to do when there are no rivers to dam, as in Quebec. What are emerging countries—which covet ever-abundant coal as a cheap energy source—to do? What can other Canadian provinces do?

Return to the Generational Conflict

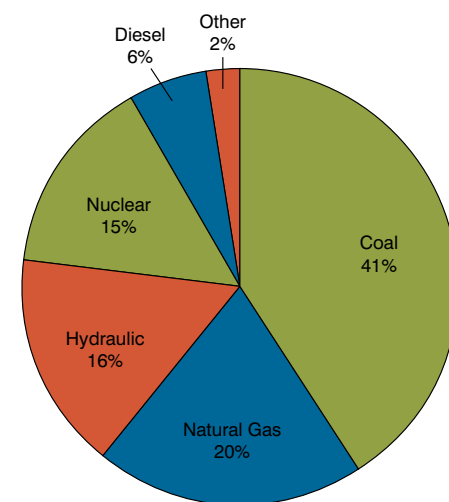
So we are back at square one. Despite what hard-core environmentalists say, nuclear energy is wonderful in terms of its energy density, GHG emissions (zero), and reliability. It is also difficult for them to use the hazardousness of the process as an argument, since CANDU reactors have proven their reliability without any major incidents over the past 30 years. On top of this, nuclear energy production is very tightly regulated. The issue lies in how to dispose of spent fuel rods. Given that one of the tenets of sustainable development is intergenerational equity, the question is, is the disposal of spent fuel rods in permanent storage equitable? The development mechanisms stemming from the Marrakesh Agreement in 2001 and adopted in 2005 do not refer to nuclear energy as a solution for this very reason. Should these mechanisms be reviewed? According to the Stern Report, the concentration of atmospheric CO₂e (CO₂ equivalent) should not exceed a maximum of 550 ppm, as this would cause an average increase of more than 2 degrees Celsius (based on a probability of between 77% and 99%). Shouldn’t we therefore use all the means at our disposal to limit the CO₂ contribution of our energy production? Not all of them, will say certain analysts.

No Consensus

This is what happened in Copenhagen in December 2009—nary a mention of nuclear energy! Regardless, where is nuclear energy in 2010? Have we failed in our role as radiation safety specialists to communicate the risk? Can we justify using nuclear power to produce energy in industrialized countries? Where are the new North American nuclear power plant projects? In the same place as the world consensus to reduce GHGs. Copenhagen demonstrated the political emergence of BRIC (Brazil, Russia, India, and China) countries, countries that are determined to have their share of the world economic pie. The post-Copenhagen targets of 2020 are now set out in terms of temperature increases—the



GHG emissions in Canada in 2006 (Source: Environment Canada)



Worldwide proportion of energy sources (Source: OECD/IEA)

increase is limited to 2 degrees—but there are no longer any specific targets for CO₂e values. Canada has aligned itself with the United States, which, in struggling to fix a sick economy, has disappointed many environmentalists. And nuclear energy is always the elephant in the room, never even mentioned in the negotiations; the perception continues to be that it is simply not a solution. Can we change directions by reusing our spent fuel? Can we at least prove that we have moved forward in our environmental performance in the management of spent fuel? Or can we only show that we are not simply shifting the burden to future generations?

continued on page 21 . . .



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President's Message / Message du Président



. . . continued from page 7 / suite de la page 7

nous devrions viser à tenir une élection saine et concurrentielle chaque année. D'ailleurs, j'encourage vivement les membres intéressés à soumettre leurs candidatures à l'un de ces postes à se présenter aux élections de l'année prochaine. Ayant moi-même vécu la chose, je peux vous dire qu'il s'agit d'une expérience positive et enrichissante, et que, Dieu merci, vous obtiendrez beaucoup d'aide!

Un exemple pertinent de l'aide disponible est le groupe de travail composé d'anciens présidents et dirigé par le Dr Richard Osborne, dont le mandat est de mettre au point un document de position sur les modifications proposées à la norme portant sur le tritium dans l'eau potable en Ontario. Le conseil a examiné cette question importante de politique publique sur laquelle l'association devait prendre position. Le groupe de travail a élaboré un excellent document de prise de position qui a été remis au représentant du gouvernement approprié et qui va bientôt paraître sur notre site Web ainsi que dans un prochain numéro du *Bulletin*. Merci beaucoup à Dr Osborne et aux membres du groupe de travail qui se penchent sur ce dossier à la fois difficile et important.

Sous la direction de Pauline Jones, le comité des congrès a été très actif au cours de la dernière année. En plus de soutenir activement la planification du congrès d'Edmonton et des congrès à venir (Ottawa 2011 et Halifax 2012, actuellement en préparation), le comité a apporté des améliorations significatives au processus de planification et au manuel documentant ce processus. Il a, en outre, créé un processus officiel de proposition de congrès, qui a été d'une grande utilité pour le conseil dans son processus décisionnel. Le congrès annuel est une partie très importante des activités de l'association et le comité a fait un superbe travail pour viser la réussite au cours des années à venir.

Sur le plan administratif, je suis heureux d'annoncer qu'un litige a été réglé avec succès. En effet, lors de l'assemblée générale annuelle de 2009, à Montréal, nous faisons l'objet d'une poursuite de la part d'un hôtel et nous en avons discuté alors. Il est bon de pouvoir mettre cette distraction derrière nous alors que le nouveau conseil d'administration entreprend son mandat.

En terminant, je tiens à dire encore une fois que cela a été un privilège et un honneur pour moi de représenter l'ACRP au cours de l'année écoulée.

David Tucker
Président, ACRP

filled by acclamation. Although we are fortunate that strong individuals have been persuaded to stand for these positions in the past, a healthy, competitive election each year should be our goal. When the call comes out next year, I urge interested members to consider standing for election to one of these posts. From personal experience, I can tell you it is a positive and rewarding experience and you get lots of help!

One timely example of the depth of available support is the working group of past presidents that was struck, with Dr. Richard Osborne as chair, to put together a position paper on the proposed changes to Ontario's drinking-water standard for tritium. The Board considered this to be an important public-policy issue for the association to take a position on. The excellent paper assembled by the working group has since been delivered to the appropriate government official and will soon appear both on our website and in a future *Bulletin*. I extend many thanks to Dr. Osborne and the members of the working group for their challenging and important work.

The Conference Committee, under Pauline Jones's leadership, has also been very active over the past year. In addition to supporting the planning for our upcoming conferences (Ottawa 2011 and Halifax 2012 currently in the works), the members of this committee have made significant improvements in the planning process and the manual documenting the process, including the introduction of a formal conference proposal process that has been particularly useful to the Board in its decision making. The annual conference is a critical part of the association's activities, and the committee has done an excellent job of ensuring its continued success in the years ahead.

One administrative note must be mentioned here. As discussed at the last AGM in Montreal, a lawsuit was filed against the organization by a hotel, but I am pleased to report that the lawsuit has been successfully settled. This distraction can now be put behind us as the new Board members begin their term.

In closing, I want to say again what a privilege and an honour it has been to represent the CRPA for the past year.

David Tucker
President, CRPA

Editor's Note / Message du rédacteur en chef



... continued from page 9 / suite de la page 9

urable y est pour beaucoup. Vous remarquerez d'ailleurs que le mot « climat » devient suspect, comme le disait Thomas Friedman, lauréat du prix Pulitzer, et que l'on préfère plutôt parler de lutte contre les GES, chose qui devrait, en principe, aider l'option nucléaire. Nous avons également demandé à la CCSN de nous parler de son processus d'étude environnementale lors de projets nucléaires. Certains auront en tête les séances houleuses du Bureau d'audiences publiques sur l'environnement (BAPE), au Québec. J'ai d'ailleurs travaillé sur un projet portant sur le sujet et j'avais alors été surpris de constater que la population, bien qu'inquiète du projet, ait décliné en grand nombre l'invitation d'Hydro-Québec à visiter le Gentilly II site! Enfin, notre dossier vert se termine sur un article original portant sur les radiations et notre environnement de tous les jours. Souvent, nous devons défendre les sources de radiations artificielles et convaincre le public de notre contrôle sur l'élément, mais ce même public doit aussi comprendre qu'il se fait naturellement envahir dans son propre milieu environnemental. Et contrairement à ce qu'en dit une certaine mouvance, les radiations naturelles ne sont pas nécessairement plus inoffensives....

Nous sommes heureux de vous proposer le premier d'une série d'articles portant sur l'exécutif de l'ACRP. Nous pensons que cette initiative pourrait aider les membres à mieux comprendre le travail important qu'effectuent les membres élus du CA et pourrait encourager de nouvelles vocations chez nos lecteurs. En effet, le faible taux de représentation aux élections et le petit nombre de votes m'inquiètent. J'espère de tout cœur que cette série contribuera à raviver la flamme pour servir l'ACRP.

Bien sûr, vous retrouverez nos précieux collaborateurs qui, je l'admets, ont dû subir une certaine pression cette fois-ci, car, à l'avenir, j'aimerais pouvoir publier deux *Bulletins* avant la tenue du congrès annuel, afin de mieux expliquer nos objectifs de communication autour de cette activité d'envergure pour notre association. C'est ce qui explique pourquoi la présente édition du *Bulletin* a été devancée.

Stéphane
Rédacteur en chef, *Bulletin* de l'ACRP.

look at the vision of those who oppose the use of nuclear energy to fight climate change. You will notice two things in particular in this article: that the concept of sustainable development plays a huge part in the debate and that because, as Pulitzer Prize-winner Thomas Friedman used to say, the word "climate" causes some suspicion, my discussion centres on "the fight against GHGs," which should provide support for the nuclear option. In my discussion, I also ask the CNSC to explain its environmental study process during nuclear projects. This issue may remind you of the tumultuous sessions held by the Bureau d'audiences publiques sur l'environnement (BAPE) on a hydro project in Quebec; while studying that process, I was surprised to see that, although concerned by the project, many people turned down Hydro-Québec's invitation to visit the site! This *Bulletin's* green file ends with an interesting article on radiation in people's everyday environment. Often, as radiation protection professionals, we are called upon to defend sources of artificial radiation and convince the public that we are in control of those elements. However, at the same time, members of the public should realize that they are being invaded by radiation sources in their own environment—in a completely natural way—and that, contrary to a certain sphere of influence, natural radiation is not necessarily harmless.

This issue also presents the first of a series of articles on the CRPA executive. The series is aimed at helping members better understand the important work done by their association's elected members and at encouraging more members to become involved with the association. The low representation rate and low number of votes cast at the association's elections are of concern. I hope this series will help revive the flame of serving the CRPA.

Of course, our outstanding regular contributors are still here. They were under considerable pressure this time, since in the future I would like to present two *Bulletins* before the annual conference to better explain our communication goals for that important event. To achieve that goal, the production of this issue of the *Bulletin* had to be moved up.

Stéphane
Chief Editor, CRPA *Bulletin*

How Radioactive Is Your Home?

by Eva Sailerova, PhD, CRPA(R)
University of Manitoba

Unfortunately, I read the scary articles about radioactive granite *after* we renovated our kitchen. The now-infamous Jupurana Crema Bordeaux, which is a granite-emitting 2 mSv/year, has more purple than my granite countertops, but still . . . After all, my favourite spot to sit is at the granite peninsula in the kitchen. Other thoughts were also going through my mind. What about the LCD TV? What about the fridge or the quartzite tiles? What if I live in a house that is surrounded by a huge radioactive field? That is, except for the background and the radon in the basement.

As a radiation safety professional, I felt a little ashamed of my ignorance and decided to do something about it. I took home my Ludlum 3, along with both the 44-3 and 44-9 probes, and measured different materials and items in my house, as well as the differently coloured parts of the granite slabs on my kitchen counters. The results are summarized in Table 1.

As you can see from Table 1, the results are not only quite comforting but also quite interesting. The second most-radioactive item in my house was the toilet water-tank cover—about twice background. The hottest spot was the grey amorphous-looking part of the Lennon granite. In comparison, the Venetian Gold granite, specifically the brown (and most abundant) part, was almost background. What I did not expect were the high counts on the quartzite tiles. They were even hotter than the brown granite! I tried to google information about the amount of uranium in the tiles, but nothing was available.

The measurements of the radiation field coming from the TV, the fridge, the hardwood floor, and the fish tank were background, which was far more comforting. The decorative items—a fossil and a huge rock found on the shore of an island in the Lake of the Woods—were also background. (Before this experiment, my husband swore that the rock was a meteorite.) Not surprisingly, the lowest reading was from the surface of the thick iron table in our foyer, about half of the background reading.

If you have not yet done so, I would encourage you to monitor your own home. Doing so might assure you that, indeed, the potential major source of radon gas is still your basement and not the granite countertops in your kitchen. It is also fun, and if guests should ever ask you about the safest place to sit in your house in terms of radiation hazards, you'll be able to tell them. I know my answer now. I will tell them to sit or, even better, to lie down on the iron table in the foyer. 🍁

Quel est le taux de radiation à votre domicile?

Il peut être amusant et éducatif de déterminer les sources de rayonnements d'un domicile. Cet article présente les résultats de tests sur le niveau relatif de rayonnements émanant de substances communément retrouvées à domicile, comme par exemple des comptoirs de granite, d'aggloméré de quartz, des toilettes, des télévisions et des aquariums. Chez l'auteure, le niveau de rayonnement le plus élevé provient d'un type de granite tandis que le rayonnement du couvercle du réservoir de la toilette occupe le deuxième rang.

Table 1: Materials and items in my house measured with the 44-3 and 44-9 probes. (All interior measurements are on contact.)

		44-3	44-9
Background (10 metres from house)		140 cpm	50 cpm
Granite Venetian Gold	beige spots	150	70
	brown spots	180	80
	grey spots	180	80
Granite Lennon (B & W)	black spots	260	90
	white spots	230	80
	grey spots	320	120
Rock from Lake of the Woods		160	60
Fossil from Morocco		150	50
Hardwood floor		140	50
LCD TV (turned on)		160	50
Fridge, stainless steel		130	40
Fish tank, with fish		150	40
Iron table, 0.5-inch thick		80	30
Quartzite tiles		210	80
Porcelain toilet water-tank cover		260	90



Bulletin

Canadian Radiation Protection Association
Association canadienne de radioprotection

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Le Coin des lecteurs vous permet de partager vos idées, d'émettre votre opinion ou encore de donner votre commentaire au sujet d'une publication antérieure du *Bulletin*. Prière d'envoyer vos lettres au Secrétariat de l'ACRP à secretariat2007@crpa-acrp.ca. Nous sommes impatients de vous lire.

Nuclear Energy: Climate Change or Changes in Perception?

... continued from page 15

Colleagues, if you think you can turn back this movement, please do so because clearly the nuclear industry seems to be missing the boat. Recently, we learned that Ontario's green subvention policy has attracted Samsung, a company that is ready to invest \$7 billion in order to develop 2500 megawatts of power from windmills and solar panels. We need to make clear that Ontario is also providing a financial advantage of about \$470 million by offering 13.5 cents/kWh for terrestrial windmill electricity and 19 cents/kWh for ocean windmill energy. If the negative perception of nuclear power, which is cheaper than this scheme, doesn't have to do with this phenomenon, I would like to know. Specialists, heed this call—I want to hear what you have to say. 🍁

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Quelle serait l'activité spécifique d'un kilogramme de combustible d'uranium enrichi à 5 % ?

par **Emélie Lamothe**, spécialiste en radioprotection

Bonjour et bienvenue à nouveau. Lorsque vous lirez cet article, j'aurai défait ma dernière boîte de déménagement, tandis que mes amis auront emballé toutes leurs possessions avant de commencer à construire leur nouvelle maison. La préparation du site de construction commencera dès qu'ils auront décidé du type de chauffage qu'ils adopteront : chaleur géothermique, gaz ou électricité. Puisque j'ai la radioprotection à cœur, leur situation m'a fait penser aux combustibles nucléaires.

Answer

Quelques données :

Nombre d'Avogadro (NA) = $6,022 \times 10^{23}$

Isotope	Masse atomique	Période radioactive (y)	Teneur en masse (%)	Constante de désintégration (s ⁻¹)	Activité par 1 g U _{nat}
U-238	238,050783	4,468E+09	99,2746 %	4,915E-18	12,356 Bq
U-235	235,043923	7,038E+08	0,7201 %	3,120E-17	568 Bq
U-234	234,040946	2,455E+05	0,0053 %	8,945E-14	12,356 Bq

L'activité spécifique (AS) est définie comme étant le nombre d'atomes désintégrés par seconde par échantillon de matière. La formule mathématique s'exprime comme ceci :

$$AS = \lambda N_0 = \lambda \frac{NA}{AW} \quad (1)$$

- où - λ représente la constante de désintégration
- N_0 représente le nombre d'atomes à $t = 0$
- NA est le nombre d'Avogadro
- AW représente la masse atomique de l'isotope en question.

Lorsqu'il y a un mélange, l'équation 1 peut être reformulée comme suit :

$$AS = \sum_i AS_i \quad (2)$$

L'uranium enrichi est de l'uranium dont le pourcentage de composition d'U-235 a été augmenté par le processus de séparation d'isotopes. Dans le cas de l'uranium faiblement enrichi, le pourcentage de composition de U-235 a été augmenté à moins de 20 %, normalement entre 2 % et 5 %. L'uranium faiblement enrichi (UFE) s'appelle aussi uranium légèrement enrichi.

Les deux erreurs les plus communes dans le calcul de l'activité spécifique de l'UFE sont (a) d'oublier complètement l'U-234 ou (b) d'oublier que l'U-234 est plus léger, et donc que son facteur d'enrichissement est encore plus élevé que celui

de l'U-235. Nous tenons pour acquis que l'enrichissement est linéairement proportionnel à la différence de masse de l'U-238.

Le facteur d'enrichissement pour l'UFE à 5 % peut être formulé comme suit :

$$\begin{aligned} \text{Facteur d'enrichissement pour U-235} \\ = \frac{\% UFE}{\% U_{nat}} = \frac{5\%}{0,7201} = 6,943 \quad (3) \end{aligned}$$

Isotope	Teneur en masse d'U-nat	Facteur d'enrichissement	Teneur en masse d'UFE	AS (Bq/g d'isotope)
U-238	99,2746 %		94,9504 %	1,243E+04
U-235	0,7201 %	6,943	5,0000 %	7,995E+04
U-234	0,0054 %	9,258	0,0496 %	2,302E+08

Nous disposons maintenant de tous les renseignements nécessaires pour calculer l'activité spécifique du combustible enrichi à 5 %.

$$\begin{aligned} SA_{UFE} &= \% SA_{238} + \% SA_{235} + \% SA_{234} \\ &= (94,9504 * 1,243E + 04) + (5,0000 * 7,995E + 04) + (0,0496 * 2,302E + 08) \\ &= 1,5E + 05 \text{ Bq/g} \cdot UFE \end{aligned}$$

Comme nous pouvons le constater dans le Tableau 3, l'U-234 est maintenant responsable d'environ 87,8 % de l'activité dans l'UFE.

Isotope	Teneur en masse d'U-nat	Facteur d'enrichissement	Teneur en masse d'UFE	AS (Bq/g d'isotope)	AS (Bq/g d'isotope)	Teneur en activité
U-238	99,2746 %		94,9504 %	1,243E+04	1,181E+04	9,0802
U-235	0,7201 %	6,943	5,0000 %	7,995E+04	3,997E+03	3,0744
U-234	0,0054 %	9,258	0,0496 %	2,302E+08	1,142E+05	87,8454

suite à la page 25 . . .

Question du dernier numéro

Aujourd'hui, les spéculations vont bon train au sujet du type de réacteur qui sera construit au site Darlington de l'OPG. Les arguments abondent, qu'ils soient en faveur des trois designs potentiels ou qu'ils s'y opposent. Tous ces designs ont cependant un élément commun : l'utilisation de combustible d'uranium légèrement enrichi. Par conséquent, quelle serait l'activité spécifique d'un kilogramme de combustible d'uranium enrichi à 5 % (aussi connu sous l'appellation « combustible légèrement enrichi ») ?

Pour l'U-234, l'enrichissement sera légèrement plus élevé que celui de l'U-235. Nous pouvons raisonnablement tenir pour acquis une proportion de U-234 à U-235 d'environ 1,3, ce qui donne un facteur d'enrichissement d'environ 9,258. La teneur en masse est résumée dans le Tableau 2.

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4. Submission of a manuscript implies that it is not being considered for publication elsewhere. Once accepted for publication in the *Bulletin*, consent from the editor must be obtained before a manuscript, or any part of it, may be published elsewhere in the same form.
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Editor (c/o CRPA Secretariat)

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email: secretariat2007@crpa-acrp.ca

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Materials must be received by the editor no later than the following dates:

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- Number 3 July 15
- Number 4 October 15

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What is the specific activity of 1 kg of 5% enriched uranium fuel?

by **Emélie Lamothe**, Health Physics Specialist

Hi and welcome back. By the time you read this article, I will have unpacked my last moving box, and friends will be packing up their belongings to start building their new house. Site preparation will begin as soon as they decide how they want to heat their home—geothermal, gas, or electric. Given my little health-physicist heart, this makes me think about reactor fuels.

Last Issue's Question

These days, there is a great deal of speculation about which type of reactor will be built at OPG's Darlington site. Arguments abound as to the pros and cons of the three potential designs. The one element these designs have in common, however, is the use of slightly enriched fuel. What then is the specific activity of 1 kg of 5% enriched uranium fuel (commonly referred to as slightly enriched fuel)?

Answer

Some data:

Avogadro's number (NA) = 6.022 x 10²³

Isotope	Atomic Weight	Half-life (y)	Abundance by Mass (%)	Decay Constant (s ⁻¹)	Activity per 1 g U _{nat}
U-238	238.050783	4.468E+09	99.2746%	4.915E-18	12,356 Bq
U-235	235.043923	7.038E+08	0.7201%	3.120E-17	568 Bq
U-234	234.040946	2.455E+05	0.0053%	8.945E-14	12,356 Bq

Specific activity (SA) is defined as the number of decays per second per amount of substance. Mathematically, it is expressed as:

$$SA = \lambda N_0 = \lambda \frac{NA}{AW} \quad (1)$$

- where - λ is the decay constant
 - N_0 is the number of atoms at $t = 0$
 - NA is Avogadro's number
 - AW is the atomic weight of the isotope in question.

Where there is a mix, equation 1 can be rewritten as:

$$SA = \sum_i SA_i \quad (2)$$

Enriched uranium is uranium in which the percent composition of uranium-235 has been increased through the process of isotope separation. In the case of slightly enriched uranium, the percent composition of U-235 has been increased to less than 20%, usually between 2% and 5%.

Slightly enriched uranium is also known as low enriched uranium (LEU).

The two most common errors in calculating the specific activity of LEU are (a) forgetting about U-234 all together or (b) forgetting that U-234 is lighter so it will enrich by even more than U-235. Enrichment is assumed to be linearly proportional to the mass difference from U-238.

The enrichment factor for 5% LEU can be expressed as:

$$\text{Enrichment Factor for U-235} = \frac{\% \text{ LEU}}{\% U_{\text{nat}}} = \frac{5\%}{0.7201} = 6.943 \quad (3)$$

For U-234, the enrichment will be slightly more than that of U-235. We can reasonably assume a ratio of U-234 to U-235 of about 1.3, giving a U-234 enrichment factor of about 9.258. The resulting abundance by mass is summarized in Table 2.

Table 2: Low Enriched Uranium (LEU)

Isotope	Nat-U Abundance by Mass	Enrichment Factor	LEU Abundance by Mass	SA (Bq/g isotope)
U-238	99.2746%		94.9504%	1.243E+04
U-235	0.7201%	6.943	5.0000%	7.995E+04
U-234	0.0054%	9.258	0.0496%	2.302E+08

We now have all the pieces to calculate the specific activity for 5% enriched fuel.

$$\begin{aligned}
 SA_{LEU} &= \%SA_{238} + \%SA_{235} + \%SA_{234} \\
 &= (94.9504 * 1.243E + 04) + (5.0000 * 7.995E + 04) + (0.0496 * 2.302E + 08) \\
 &= 1.5E + 05 \text{ Bq/g LEU}
 \end{aligned}
 \tag{4}$$

As we can see in Table 3, U-234 now accounts for about 87.8% of the activity in LEU.

Table 3: Low Enriched Uranium (LEU)

Isotope	Nat-U Abundance by Mass	Enrichment Factor	LEU Abundance by Mass	SA (Bq/g isotope)	SA (Bq/g isotope)	Abundance by Activity
U-238	99.2746%		94.9504%	1.243E+04	1.181E+04	9.0802
U-235	0.7201%	6.943	5.0000%	7.995E+04	3.997E+03	3.0744
U-234	0.0054%	9.258	0.0496%	2.302E+08	1.142E+05	87.8454

Question du présent numéro

... suite de la page 23

En examinant les résultats d'un échantillon d'essai biologique sur un employé, vous arrivez à un résultat de 2,9E+06 MBq/L, ce qui dépasse le niveau d'investigation interne dans vos installations. Que pouvez-vous dire au sujet de la période radioactive biologique du tritium pour cet employé ?

Quelques données :

Jour	Résultat de l'essai biologique (MBq/L)
0	2,9E+06
1	2,3E+06
2	1,8E+06
3	1,4E+06
4	1,1E+06
5	9,1E+05
6	7,2E+05
7	5,7E+05
10	2,9E+05
14	1,1E+05
16	7,2E+04
20	2,8E+04
30	2,8E+03

Amusez-vous! Souvenez-vous que cette rubrique s'adresse à vous! Envoyez vos réponses et vos suggestions pour les prochains numéros au secrétariat de l'ACRP ou encore faites-les-moi parvenir par courriel à l'adresse eslamothe@hotmail.com.

This issue's question

While reviewing bioassay sample results, you find a 2.9E+06 MBq/L result, which is above the internal investigation level at your facility. What can you say about the tritium biological half-life for this worker?

Some data:

Day	Bioassay Result (MBq/L)
0	2.9E+06
1	2.3E+06
2	1.8E+06
3	1.4E+06
4	1.1E+06
5	9.1E+05
6	7.2E+05
7	5.7E+05
10	2.9E+05
14	1.1E+05
16	7.2E+04
20	2.8E+04
30	2.8E+03

Have fun! Remember, this column's for you. Send your answers and suggestions for future issues to the CRPA Secretariat or eslamothe@hotmail.com.

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Gary Wilson

on Being CRPA President



I have been asked to give a brief insight into the time I spent as president of CRPA. Even though you are only president for one year, it really is a three-year term. The first year is spent learning the ropes and taking on the role of liaison for the next conference. I found it much easier to assume the role of president after having been on the board as a director. That experience gave me the opportunity to get to know some of the board members I would be working with in the upcoming year and to get a better feel for the CRPA operations.

Attending these meetings did not take up too much of my time throughout the year. The six planned board meetings are generally held once every two months and alternate between teleconferences and face-to-face meetings. Other than the face-to-face meeting at the annual conference, the other two meetings are generally in the city that offers the least travel for the majority of the board members. During my time, these meetings took place in Toronto. The three teleconferences, which were held in April, September, and January, kept us on track with association business. The few extra meetings that were needed to discuss urgent business were always teleconferences. The time required away from my job was three Fridays a year

for travel to Board meetings and three 2-hour teleconferences a year, starting at 2:00 p.m. Eastern time. Being an east coaster, the time difference meant only one hour on the office clock and one on my own time.

My year as president was the busiest of my three-year term. I had a wealth of support from board members and the various CRPA committees working on behalf of the membership. Things got even easier once I learned I didn't have to do everything myself! Yes, I did get to wield some power choosing the Board-Committee liaisons, but I also had to deal with the correspondence and questions that arose during the year. For me, the most valuable resource was the assistance I received from the CRPA Secretariat. Liz Krivosov certainly kept me on track.

The final year is perhaps the easiest. You are out of the hot seat and can take some time to determine where you want to continue to contribute to the association. You also provide continuity for new board members and the incoming president.

One of the best things about being president is all the people you meet. The radiation protection community is small but it is also very diverse. The contacts I made definitely helped me in my "real" job, and, given the few times I was away, I believe my employer benefited greatly.

Usually, my employer is hard pressed to support my attendance at annual conferences and continuing education sessions. However, because the board has a face-to-face meeting just before every conference, my transportation cost was covered, which was a major cost saving to my employer. As a result, I was able to attend every conference during my time on the board. The association benefited by getting my time and involvement, my employer benefited by saving some travel costs, and I benefited from the continuing education I added to my work skills.

Although it is difficult to describe in this short space all that I experienced, I feel that no one should hesitate to serve on the board. 🍁

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Poison in the Well

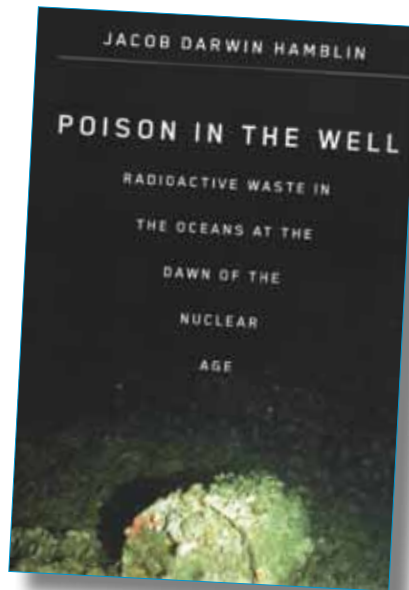
Radioactive Waste in the Oceans at the Dawn of the Nuclear Age

Jacob D. Hamblin (Piscataway, NJ: Rutgers University Press, 2009)

review by Michael Grey
Candesco Corporation,
Burlington, ON

Jacob Hamblin is an assistant professor of History at Oregon State University who specializes in the scientific and technical history of the Cold War. His first book, *Oceanographers and the Cold War*, was a study of the political, economic, and military motivations for international cooperation in the marine sciences in the years following World War II. *Poison in the Well* is his second book.

Poison in the Well is a history of radioactive waste disposal at sea, focusing on activities in the United Kingdom, the United States, and western European countries during the period between the end of World War II and the signing of the London Convention (Convention on the Prevention of Marine Pollution by



Dumping of Wastes and Other Matter) in 1972. Although the book concentrates on the dumping of packaged wastes in international waters, it does occasionally deal with the routine discharge of liquid wastes into coastal waters.

The first two chapters review activities in the United States and the United

Kingdom in the years immediately after World War II (1945–1955). The third chapter looks at the policy-development activities of the Atomic Energy Commission (AEC) and the National Council on Radiological Protection (NCRP) in the United States in the mid-1950s and the role of oceanographers in those activities. Chapters 4 and 5 concentrate on activities related to the International Geophysical Year, in 1957, and those leading to the 1960 decision by the AEC to stop issuing licences for the disposal of radioactive wastes at sea. Chapter 6 moves the story into the early 1960s and looks at developments at the newly created International Atomic Energy Agency (IAEA) and French efforts to dispose of radioactive wastes in the Mediterranean. Chapter 7 discusses British and western European disposals in the Atlantic during the 1960s and the creation of the European Nuclear Energy Agency (now the NEA) to facilitate those disposals. The final chapter, entitled “Confronting Environmentalism,” looks at the movement toward prohibiting disposals of radioactive and hazardous wastes at sea that culminated in the London Convention.

Given the author’s background, it is not surprising that a major focus of this book is the struggle by oceanographers for a place at the policy-setting table and the resistance they encountered from the health physics community. Other major

Résumé

L’auteur de ce livre, Jacob Hamblin, est professeur adjoint spécialisé dans l’histoire scientifique et technique de la guerre froide à l’Université de l’Orégon. Il a aussi écrit un premier livre, *Oceanographers and the Cold War*.

Son deuxième livre, *Poison in the Well* présente de façon plus ou moins chronologique, l’histoire de l’évacuation des déchets radioactifs dans l’océan par le Royaume-Uni, les États-Unis et les pays de l’Europe de l’Ouest lors de la période suivant la fin de la seconde Guerre Mondiale et la signature de la Convention de Londres de 1972, qui portait sur la prévention de la pollution des mers

résultant de l’immersion de déchets et d’autres substances. Quoique le livre touche surtout les colis de déchets évacués en eaux internationales, il aborde occasionnellement l’émission d’effluents liquides dans les eaux côtières.

Si l’on tient compte du profil de l’auteur, il est peu surprenant de trouver dans l’ouvrage quelques chapitres portant sur la lutte des océanographes pour faire entendre leurs voix lorsqu’il est question d’établir des politiques quant à la disposition des déchets dans l’océan et sur la résistance de la communauté de la radioprotection devant l’intervention des océanographes dans l’élaboration de telles politiques.

Les quelques erreurs techniques mineures du livre de huit chapitres, dont le dernier s’intitule « Confronter l’environnementalisme », ne nous détournent pas de l’essence de la discussion sur la divergence entre les océanographes et les spécialistes en radioprotection, qui sont rarement les héros de cette histoire. La lecture de ce livre m’a ramené en mémoire certaines discussions lors de l’atelier sur les recommandations du CIPR en 2006, au Maryland. Je le recommande donc en guise de précaution et de rappel à la communauté de la radioprotection qui doit, encore aujourd’hui, assumer pleinement son rôle en matière de protection de l’environnement.

themes are the role of public opinion and of international diplomacy, including the Cold War rivalry between the Soviet Union (which criticized western activities while secretly carrying out even larger dumping campaigns) and the West and the objections of non-nuclear countries such as Ireland and Portugal to the dumping conducted off their coasts.

There are a few minor technical errors in the text, such as describing strontium-90 as an alpha emitter and reporting the level of surface contamination on the deck of a ship as “600 curies per second,” but these do not significantly detract from the discussion. A more significant problem is the poor structure of the index, which aggravates the problems created by the lack of a chronology and a list of acronyms.

The resistance of the health physics community of the day to the participation of oceanographers in radioactive waste disposal policy is discussed several times throughout the text, and the health physicists are seldom the “heroes” of the story. It is easy to dismiss the health physicists’ objections as relics of a previous era, but while reading these sections, I was frequently reminded of some of the discussions that occurred during a workshop on the latest International Commission on Radiological Protection (ICRP) recommendations held in Bethesda, Maryland, in the summer of 2006. I would recommend this book as both a cautionary tale and as a reminder to the health physics community that it has yet to fully address its role in environmental protection. 🍁

Election results / Résultats des élections

On behalf of the Board of Directors, CRPA is pleased to announce the results for the 2010 Elections:

President-Elect	Lois Sowden-Plunkett
Treasurer	Christine Dehm
Director	Raymond Ilson, CRPA(R)
Director	Leona Page, CRPA(R)

We thank all the candidates who choose to participate in the election process. The Board would particularly thank the members of the Nomination Committee for their hard work.

Au nom du conseil d'administration, l'ACRP est heureuse d'annoncer les résultats des élections de 2010 :

Président désignée	Lois Sowden-Plunkett
Trésorière	Christine Dehm
Directeur	Raymond Ilson, ACRP(A)
Directrice	Leona Page, ACRP(A)

Nous remercions tous les candidats qui ont choisi de participer aux élections. Le conseil veut remercier particulièrement les membres du comité de nomination pour leur travail.

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Coming Events / Réunions à venir

- Health Physics Society, 55th Annual Meeting**
 June 27–July 2, 2010, Salt Lake City, UT
 For more information, visit the HPS website at www.hps.org/meetings.
- 21st World Energy Congress: Responding Now to Global Challenges**
 Sept 12–16, 2010, Montreal, Quebec
 For more information, visit www.wecmontreal2010.ca.
- Third African IRPA Regional congress (AFRIRPA2010)**
 Sept 13–17, 2010, Nairobi, Kenya
 The theme of AFRIRPA2010 is “Strengthening Radiation Protection Infrastructures in Africa: Towards Establishing Effective and Sustainable Co-operations and Networks.” For more information, visit the website at www.earp.or.ke/afrirpa2010.



What's Up? SPEAK OUT

Do you know of an upcoming event that might be of interest to your fellow CRPA members? Send the event information to secretariat2007@crpa-acrp.ca and we can include it in the next issue of the *Bulletin*.

Quoi de neuf?

Connaissez-vous une activité qui pourrait intéresser vos collègues de l'ACRP? Faites-en parvenir les renseignements relatifs à l'adresse courriel secretariat2007@crpa-acrp.ca et nous pourrions en faire la promotion dans la section "Réunions à venir" du *Bulletin*.

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Contributors

Michael Grey is a senior analyst with Candesco Corporation in Toronto, Ontario, and past president of CRPA.



Michael Grey est analyste principal chez Candesco Corporation de Toronto, Ontario, et ancien président de l'ACRP.

Emélie Lamothe is a health physicist and member of CRPA. In her professional life, she has worked in the fields of research and development, dosimetry, QA, health and safety, and emergency preparedness.



Emélie Lamothe est spécialiste de radioprotection et membre de l'ACRP. Au cours de sa carrière, elle a travaillé dans les domaines de la recherche et du développement, de la dosimétrie, de l'assurance qualité, de la santé et sécurité en milieu de travail et de la protection civile.

Eva Sailerova is the assistant Radiation Safety Coordinator at the University of Manitoba. She received her PhD from Charles

University in Prague and did post-doctoral studies at the University of Alberta. For four years, she worked in the Radiopharmacy department at the Health Sciences Centre in Winnipeg on a scientific project involving Re-188, optimization of its generation, and labelling techniques. Her initiation into the field of radiation safety occurred when she worked as an assistant RSO at the Winnipeg Regional Health Authority. In 2001, she joined the Radiation Safety Program at the University of Manitoba.

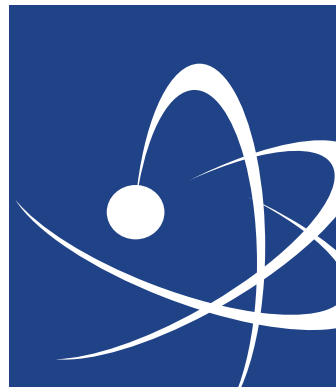


Eva Sailerova occupe le poste de coordonnatrice adjointe en radioprotection à l'Université du Manitoba. Elle a obtenu son doctorat de la Charles University à Prague et a fait ses études post-doctorales à l'Université de l'Alberta. Pendant quatre ans, elle a travaillé au département de radiopharmacie du Centre des sciences de la santé à Winnipeg sur un projet scientifique portant sur le Re-188, l'optimisation de sa génération, et les techniques de son marquage. L'initiation d'Eva Sailerova au domaine de la radioprotection a eu lieu lorsqu'elle travaillait comme responsable adjointe de la radioprotection auprès de l'Office régional de la santé de Winnipeg. En 2001, elle s'est jointe au programme de radioprotection de l'Université du Manitoba.

Leah Shuparski is a medical health physicist with the Ottawa Hospital and acting head of the CRPA Student Affairs Committee.



Leah Shuparski travaille actuellement à l'hôpital d'Ottawa comme physicienne en services de santé et est chef intérimaire du comité des affaires étudiantes de l'ACRP.



The Canadian Nuclear Safety Commission's (CNSC's) Environmental Assessment Division (EAD) is responsible for developing, implementing, and monitoring the CNSC's Environmental Assessment Program pursuant to the *Canadian Environmental Assessment Act* (CEAA) and other jurisdictions. EAD acts as the primary point of contact with staff from the Canadian Environmental Assessment Agency and other federal, provincial, and territorial departments involved in EAs for which CNSC is a responsible authority. For EA matters, EAD is also the lead federal coordinator in engaging Aboriginal groups.

La division des évaluations environnementales (DÉA) de la Commission canadienne de sûreté nucléaire (CCSN) est responsable du développement, de la mise en œuvre et de la surveillance du

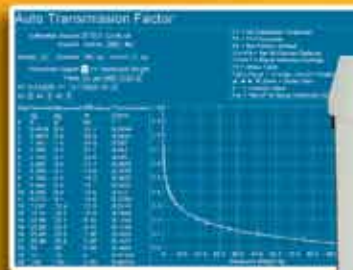
programme d'évaluation environnementale de la CCSN, en vertu de la Loi canadienne sur l'évaluation environnementale (LCEE) et d'autres autorités. La DÉA constitue le premier point de contact avec le personnel de l'Agence canadienne d'évaluation environnementale (ACEE) et des autres ministères fédéraux, provinciaux et territoriaux qui sont impliqués dans les EE dont la CCSN est responsable. La DÉA est également le principal coordonnateur fédéral s'occupant de groupes autochtones pour les questions relatives aux EE.

Gary Wilson is the Radiation Safety Officer at Capital Health in Halifax, Nova Scotia, where he manages a district-wide program for the diagnostic and therapeutic use of nuclear substances, Class II devices, and over 100 other radiation-emitting devices. As well as serving on various CRPA committees, he has completed two terms on the Board of Directors and one term as president.



Gary Wilson est responsable de la radioprotection chez Capital Health à Halifax, en Nouvelle-Écosse, où il mène présentement un programme à l'échelle du district pour l'utilisation thérapeutique et diagnostique de substances nucléaires, d'appareils de classe II et de plus de 100 autres appareils à émission de rayonnements. En plus d'avoir fait partie de divers comités de l'ACRP, il a complété deux mandats au conseil d'administration et un mandat en tant que président.

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