The National Academies of
SCIENCES • ENGINEERING • MEDICINE

Radioactive Sources: Applications and Alternative Technologies

Virtual Meeting

PUBLIC AGENDA

October 13, 2020, Eastern Time (ET)

Link: https://nas-sec.webex.com/nas-sec/j.php?MTID=m870bffe0d474fa8e0261b94fef06aa0d
Meeting ID: 199 630 0955
Password: gPiFhe6MG62 (47434366 from phones and video systems)
Telephone: +1-415-527-5035 or +1-929-251-9612
Access code: 199 630 0955

PUBLIC SESSION: Industry Perspectives on Radioactive Sources and Alternative Technologies

10:00 am – 10:05 am	**Call Open PUBLIC SESSION to Order and Welcome** Bonnie Jenkins, Committee Chair and Charles Ferguson, Study Director
10:05 am – 10:25 am	**Nordion's Views on Radioactive Sources and Alternative Technologies** Ian Downie, Vice President of Business Development and Strategic Supply, Nordion
10:25 am – 10:40 am	**Q+A and Discussion**
10:40 am – 11:00 am	**Sotera Health Views on Radioactive Sources and Alternative Technologies** Kathleen Hoffman, Senior Vice President - Global Environmental, Health & Safety, Sotera Health
11:00 am – 11:15 am	**Q+A and Discussion**
11:15 am – 11:35 am	**Radioisotopes and Alternatives – an Industry Perspective** Mike Fuller, Director, Regulatory Affairs and Quality Assurance, QSA Global, Inc.
11:35 am – 11:50 pm	**Q+A and Discussion**
11:50 pm – 12:10 pm	**Well Logging – an Industry Perspective** Mark Shilton, Vice President, New Technology and Global Business Innovation, QSA Global, Inc.
12:10 pm – 12:25 pm	**Q+A and Discussion**
12:25 pm – 12:45 pm	**Well Logging Market Overview Specific to Independent Well Logging Companies** Kenny Jordan, Executive Director, Association of Energy Service Companies
12:45 pm – 1:00 pm	**Q+A and Discussion**

List of Sample Questions Sent to the Presenters

Nordion

- Please provide an overview of your company and its market.
- Please describe the production process of cobalt-60 for radiation therapy versus sterilization or other applications.
- What were the trends in cobalt-60 supply and demand over the past 10-15 years for different applications? What are the future projections, and will supply be able to meet demand for the foreseeable future? If supply is expected not to meet demand, what are various ways to address a potential shortfall in supply; for example, can new production reactors be brought online and how long would that take?
    - What are, in your view, the factors that led/will lead to those trends?
- To the extent possible please discuss price-trends of cobalt-60 over the past 10-15 years and reasons for these trends.
- What is your company's involvement, if any, in recycling and/or disposal of cobalt-60 sources? Please describe a typical contractual arrangement.
    - do you accept decayed sources on exchange only?
    - What about if a facility closes and there will be no exchange?
    - What about a facility or former customer where your relationship has expired?
- Please provide any additional information or advice that you think is relevant to this committee's work.

Sterigenics and QSA Global

- Please provide an overview of your company and its market.
- Please provide an overview of your company's products that utilize radiation sources or alternative technologies and their applications.
- What are some pros and cons in performance of the source versus alternative technologies for the different applications?
    - What efforts, if any, are currently in progress to solve equivalency issues?
- What trends has your company seen over the past 10-15 years in terms of demand for radiation sources versus alternative technologies in developed versus developing countries?
    - What are, in your view, the factors that led to those trends?
- What are your views about the future of radiation sources and alternative technologies over the next 10 years?
- Please provide any information on new/emerging non-source technologies that your company is developing and may be deployed over the next 10 years.
- Please provide any additional information or advice that you think is relevant to this committee's work.

BIOS

Ian Downie is Nordion's Vice President of Business Development and Strategic Supply. In this capacity he has overall responsibility for Nordion's relationships with nuclear utilities around the world for the supply of cobalt-60 to Nordion. Ian began strengthening Nordion's cobalt supply chain in 1998 and has worked with nuclear utilities and governments around the world, including China, India, Korea, Argentina, Canada, Russia and the United States. Based out of Belgium from 2007 to 2013, Ian led Nordion's European isotope businesses including NDT (non-destructive testing), radio-pharmaceutical, radio-chemical and medical device products. Since his return from Europe to Canada in 2013 he has assumed responsibility for Nordion's global cobalt-60 business which includes industrial sources for panoramic irradiators and high specific activity sources for cancer treatment and scientific applications. Early in his career, he also had responsibility for the design and manufacture of teletherapy and blood irradiation devices. Ian holds a diploma in Electrical Engineering Technology and an MBA.

Michael Fuller has been involved in the nuclear field for over 30 years, beginning as a reactor operator in the U.S. Navy's Submarine program. He joined the QSA Global, Inc. regulatory group in 2007, and was promoted to the position of Director in 2013. He is responsible for the company's radiation safety, regulatory compliance, trade compliance, and 10 CFR Part 71 quality assurance implementation. He and his team manage the radiation safety program of one of the largest industrial radioactive materials licensees in Massachusetts. As a security manager for QSA Global, he is also responsible for execution of the Agreement State equivalent to 10 CFR Part 37 at all QSA Global facilities. He holds a BS in Computer Science.

Kathy Hoffman is the Sr. Vice President of Global Environmental, Health & Safety for Sotera Health, which includes Sterigenics, Nordion and Nelson Labs. She is responsible for the global environmental, health, and safety program across all companies. Kathy is an industry-recognized expert in sterilization regulatory requirements and environmental, health and safety programs. She is currently a board member of the International Irradiation Association (iiA) organization and member of the executive team of Ethylene Oxide Sterilization Association.

Kenny Jordan has worked for 43 years in the oil and gas industry, originally starting work as a roustabout for Texaco during the summers while going to school. He holds a Bachelor of Science Degree, Ocean Engineering, from Texas A&M University. He has served in the wireline/well logging industry since 1979, first as a field engineer responsible for operation of a logging unit in the areas of offshore Louisiana, southeast Texas and in the Ft. Worth area. He worked various aspects of the industry, including logging instructor, sales, district manager and regional manager for a major wireline company in the U.S. He has had experience all over the world with aspects of the logging business in numerous countries including China, India, Vietnam, Middle East, Europe, South America and SE Asia, having been involved with the selling of well logging equipment. He is currently the executive director of the Association of Energy Service Companies (AESC), a national trade association representing companies involved in the upstream oil and gas well servicing business, which includes well logging companies as part of their membership. Mr. Jordan has been involved with the AESC for 24 years, serving as its President from 2003 – 2004 then becoming the Executive Director in January 2005. He also serves on the IPAA Safety and Environmental Committee, co-chair on the NIOSH Oil and Gas Extraction Council, advisor at National STEPS, member of the Board of Directors at DEPA, works on numerous committees involving API and their Recommended Practices/Standards updates, and member of the API Drilling and Production Committee.

Mark Shilton is Vice President of Technology at QSA-Global Inc, Burlington, Massachusetts, USA. He has been with QSA-Global Inc or its predecessor organizations for over 40 years, originally based in the UK from 1979 and subsequently in Burlington Massachusetts since 2002. Dr. Shilton graduated in Chemical Physics in 1972 at the University of Kent at Canterbury UK, and he received his Doctorate in solid state chemistry from De Montfort University in Leicester UK in 1976. He is a Chartered Chemist and a member of the UK's Royal Society of Chemistry. He has served on several national and international committees, which promote safe, secure and beneficial uses of radioisotopes. His career and responsibilities span manufacturing, sales and development of several important radioisotope source products and technologies that are used throughout the world in industrial, medical, research and analytical applications.

Reading Material

IIA, 2017, A Comparison of Gamma, E-beam, X-ray and Ethylene Oxide Technologies for the Industrial Sterilization of Medical Devices and Healthcare Products http://iiaglobal.com/wp-content/uploads/2018/01/White-Paper-Comparison-Gamma-Eb-Xray-and-EO-for-Sterilisation.pdf

Shilton et al., 2002, Palladium Isotone Enrichment: https://patents.google.com/patent/GB2374977A/en

Shilton, 1999, Gamma Radiation Source: https://patents.google.com/patent/WO2000065608A1/en

Shilton et al., 2015, Device and method for enhanced iridium gamma radiation sources: https://patents.google.com/patent/WO2015175326A1/en

Vose et al., 2016, Strontium sealed source: https://patents.google.com/patent/WO2016178746A1/en

Menuhr et al., 2001, Capsule seed: https://patents.google.com/patent/US20020156338/en

Miles et al., 1998, Spray gun with common control of fluid and air valve: https://patents.google.com/patent/EP0934776A1/it

Shilton, 2002, Radioactive sources: https://patents.google.com/patent/US20040164255

Shilton, 1998, Method of and apparatus for generating random numbers: https://patents.google.com/patent/US6697829

Howe and Shilton, 1979, UK Patent Application for Uranyl Periodate Materials arid Method of Ionic Conduction: https://inis.iaea.org/collection/NCLCollectionStore/_Public/12/612/12612615.pdf

Howe and Shilton, 1978, Electrical device with separator as conductor for hydrogen cations: https://patents.google.com/patent/US4179491

Shilton and Miles, 1997, Surface static reduction device: https://patents.google.com/patent/CA2271722A1

Shilton et al., Advanced Radioisotope Sources - Design for Safety and Performance: https://www.slideshare.net/MarkVose1/qsard1301-arps-finala4-keynote-mark-shilton-editor-vers4

Shilton, Advanced, Second Generation Selenium-75 Gamma Radiography Sources: https://www.ndt.net/article/wcndt00/papers/idn655/idn655.htm

Kelly and Shilton, 2001, Safety and Performance by Design: https://www.eu-alara.net/images/stories/pdf/program5/session%202/poster%20S2/shilton.pdf

Howe A. and Shilton M. Hydrogen-bond ordering in the proton conductors hydrogen uranyl phosphate and arsenate tetrahydrates. Journal of the Chemical Society, Chemical Communications, Issue 5, Pages 194-196, 1979 https://pubs.rsc.org/en/Content/ArticleLanding/1979/C3/C39790000194#!divAbstract

Shilton M, Vose M. Enhanced ^{75}Se Sources for Optimum Safety and Performance. 2017: https://www.ndt.net/events/APCNDT2017/app/content/Paper/283_Idin_Rev1.pdf

Shilton M, Vose M, Idin F. Enhanced ^{75}Se Sources for Optimum Safety and Performance. Available at: https://www.ndt.net/events/APCNDT2017/app/content/Slides/283_Idin_Rev2.pdf

Shilton M. Safety Performance of Se-75 Radiography Sources. ECNDT Gothenberg Sweden, 2018: https://www.ndt.net/article/ecndt2018/papers/ecndt-0120-2018.pdf