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nwmo news

Nuclear Waste Management Organization

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NWMO-Supported Researcher Wins Prestigious Prize

Dr. Barbara Sherwood Lollar, an internationally renowned isotope geochemist whose work has been supported by the NWMO, is the winner of the 2016 John C. Polanyi Prize.

The prize, created in honour of the Nobel Prize winning chemist, is awarded by the Natural Sciences and Engineering Research Council of Canada (NSERC) to an individual or team whose work has led to a recent outstanding advance in the natural sciences or engineering. The research leading to the advance must have been funded at least partially by a grant from the NSERC.

A professor in the University of Toronto's Department of Earth Sciences, Dr. Sherwood Lollar was singled out for her research on the geochemistry of ancient waters found deep below the Earth's surface. This work is of particular interest to geoscientists who study conditions in deep geological repositories because it shows that water deep within the Earth can be isolated for millions to billions of years. But it also has implications for other areas of science. For example, the findings could be useful for a future Mars expedition, where NASA has already found rocks of comparable age and geology to those studied by Dr. Sherwood Lollar.



Dr. Barbara Sherwood Lollar (second from right) at the awards ceremony on Parliament Hill. Also pictured (from left to right) are the Honourable Kristy Duncan, MP; Prof. Victoria Kaspi, winner of this year's Gerhard Herzberg Canada Gold Medal; Prime Minister Justin Trudeau; Dr. B. Mario Pinto, President of the Natural Sciences and Engineering Research Council of Canada (NSERC); and the Honourable Geoff Regan, Speaker of the House of Commons. Photo courtesy of NSERC.

Two of Dr. Sherwood Lollar's former PhD students, Drs. Jennifer McKelvie and Sarah Hirschorn, are now geoscientists at the NWMO. "I am so very excited that the excellence of Dr. Sherwood Lollar's research has been recognized by the NSERC's Polanyi Prize," explains Dr. McKelvie. "And as a NWMO employee, I am delighted that the research we are helping fund is not only making a direct contribution to repository safety, but that it is also helping to advance Canadian science in general."

The work Dr. Sherwood Lollar conducts on behalf of the NWMO is jointly funded by the NSERC. Started in 2009, it consists of analyzing underground rock and groundwater samples from the Grimsel Underground Research Laboratory in Switzerland. The goal is to characterize the microorganisms they contain. This characterization helps enhance safety by allowing geoscientists to determine whether a site has microorganisms that might adversely affect the performance of a repository over time.

Carleton Researchers Complete Transportation Study for the NWMO

Working with researchers at Carleton University, the NWMO recently completed a detailed assessment of potential radiological exposure resulting from the transportation of used fuel in a reinforced and shielded Used Fuel Transportation Package. The assessment covered both members of the public along potential transportation routes and transportation workers, and was based on data collected along Canadian roads.

In each case, the assessment found annual doses to be significantly below the regulatory public dose limit of 1 millisievert per year.

"One way to look at the results is to compare them to how long you would have to fly in a jet airplane to get the same level of exposure to radiation," explains Ulf Stahmer, Senior Transportation Engineer at the NWMO. "Let us say you are a hitchhiker along a highway and are exposed to six passing shipments. That is equivalent to one second of flying time. Or let us say that you are controlling traffic for a road construction crew and are exposed to 260 passing shipments. That is equivalent to eight minutes of flying time."

Previous estimates were based on generic, internationally available exposure time, distance and frequency assumptions. The Carleton researchers considered a wide variety of possible exposure scenarios, from people living along transportation routes, pedestrians, hitchhikers, the crew in the truck transporting used nuclear fuel, and drivers and passengers in the truck's vicinity.

The full report (*APM 2016 Lifecycle Cost Estimate Update Summary Report*) may be read online at www.nwmo.ca/reports.

Measuring Radiation Exposure

Radiation exposure is measured in sieverts. A sievert is a unit of radiation "dose" to human tissue that accounts for health effect. Radiation doses are commonly measured in thousandths of a sievert, or millisieverts (mSv).

In Canada, the average effective whole body dose from natural background radiation is approximately 1.8 mSv per year. The Canadian Nuclear Safety Commission's radiation dose limit for a member of the public is 1 mSv per year (above and beyond natural background radiation). For nuclear energy workers, the limit is 50 mSv per year, with the total not to exceed 100 mSv during any five-year period.

The NWMO Updates Cost Estimate

In June, the NWMO published its latest lifecycle cost estimate for implementing Adaptive Phased Management (APM), Canada's plan for the long-term management of the country's used nuclear fuel.

The *Nuclear Fuel Waste Act* requires the NWMO to keep an up-to-date estimate of the total cost of APM. Full cost estimates are completed every five years. The estimate is used to establish annual contributions waste owners make to trust funds. Under the legislation, these funds are to be used to cover the cost of the APM Project once a construction licence is issued. In the years before a construction licence is obtained, the NWMO's operating cost is provided by the waste owner organizations.

The eventual cost of the project is impacted by many factors, including the volume of used nuclear fuel to be managed. Based on this updated estimate, the project is expected to cost about $22.8 billion (2015 $) to manage an inventory of 5.2 million fuel bundles.

The estimate also factors in the significant advances the NWMO has made over the past five years, most notably in its engineering program and in the site selection process.

"Unlike the previous cost estimate, which was based on international design concepts, we now have a conceptual design that is optimized for the safe, long-term management of used CANDU fuel," explained Derek Wilson, the NWMO's Vice-President of Design and Construction.

These same advances have allowed the NWMO to update its planning assumptions, and with them, the timelines for implementing the project. For the purpose of the latest cost estimate, it is assumed that a preferred site could be identified as early as 2023, at which point the host area would see a significant ramp-up in local activity, including the construction of a Centre of Expertise. Based on our latest understanding of the time and work required to implement the plan, for planning purposes we are assuming operations could begin between 2040 and 2045.

Mr. Wilson cautioned that timelines associated with the cost estimate are neither deadlines nor targets. "They are simply reference assumptions to support planning," he explained. "The NWMO is committed to taking the time needed to complete the project properly."

As the project advances and more data is gathered, the NWMO will continue to update its planning assumptions.

To learn more about how Canada's plan is funded, please go to www.nwmo.ca/funding.

NWMO Staff Hit the Road

Chilly spring weather may have kept some people indoors, but not the NWMO's engagement team. Over the past three months, they have been working closely with community liaison committees (CLCs) to organize open houses in all the areas involved in the site selection process. They have also participated in a wide range of local and regional events.

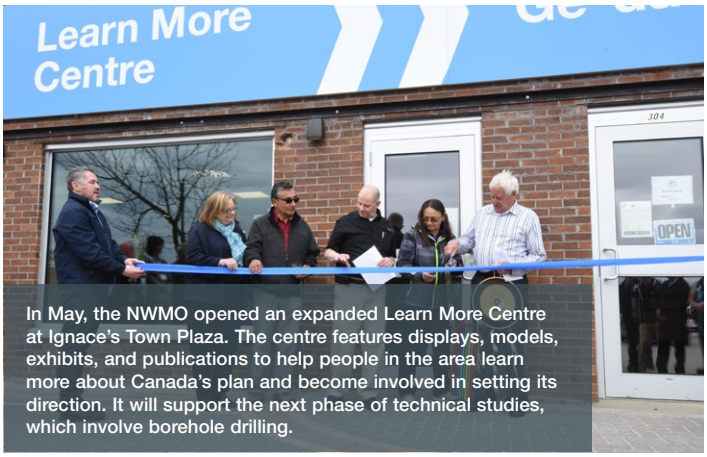
"Dialogue and collaboration, and working with communities, are key to identifying a site where Canada's plan for used nuclear fuel can be implemented," said Jo-Ann Facella, Director of Social Research and Dialogue. "We appreciate the opportunity to work with communities to develop and implement engagement activities that help people learn about the project, have their questions and concerns addressed, and plan NWMO activities in the area."

NWMO subject matter experts have also been invited to CLCs to share information about the project and help answer questions. For example:

- Derek Wilson, the NWMO's Vice-President of Design and Construction, briefed CLCs in Blind River, Elliot Lake, Huron-Kinloss, Ignace, and South Bruce on the latest plans for facilities to be built as part of the project. He will visit CLCs in other communities later this year.
- Michelle Dassinger, the NWMO's Digital Communications Program Lead, has visited all nine CLCs to introduce the NWMO's new website.
- Jo-Ann Facella, the NWMO's Director of Social Research and Dialogue, is one of several staff members who have been engaging communities in discussing their expectations about how the project might be implemented in their area.

NWMO staff have also actively participated in several recent municipal association conferences, including those of the Federation of Northern Ontario Municipalities, Rural Ontario Municipal Association, Northwestern Ontario Municipal Association, and Ontario Small Urban Municipalities.

"These conferences are great opportunities to engage with municipal representatives from potential siting areas, regional hubs, and other communities with questions about the project," explains Jessica Gosbee, the NWMO's Senior Advisor for Stakeholder Research. "As the NWMO broadens its engagement, these conferences are going to become even more important to our work."



In May, the NWMO opened an expanded Learn More Centre at Ignace's Town Plaza. The centre features displays, models, exhibits, and publications to help people in the area learn more about Canada's plan and become involved in setting its direction. It will support the next phase of technical studies, which involve borehole drilling.

Communities That Requested Preliminary Assessments and That Are Currently in the Site Selection Process

- Blind River
- Central Huron
- Elliot Lake
- Hornepayne
- Huron-Kinloss
- Ignace
- Manitouwadge
- South Bruce
- White River

Engagement and outreach are now broadening to include First Nation and Métis communities, and neighbouring municipalities in learning more about the project and becoming involved in decision-making.

The NWMO's Latest Annual Report and Implementation Plan Are Now Available

In March, the NWMO submitted its annual report for 2015, *Progress Through Collaboration*, to the Honourable James Gordon Carr, Minister of Natural Resources Canada. At the same time, the NWMO published its strategic plan for the next five years: *Implementing Adaptive Phased Management 2016 to 2020*.

A draft of the newest implementation plan was released for public comment in October 2015. The final plan was then revised to reflect the input the NWMO received. The plan has also been updated to reflect the results of the NWMO's ongoing work with communities, advances in technology and science, and evolving public policy.

"Offering guidance on our implementation plans is just one of the ways the public can get involved in setting the direction for our work," says Kathryn Shaver, Vice-President of APM Engagement and Site Selection. "We encourage people to come to our open houses, meet with our staff, and check back frequently at our website for the latest news on the site selection progress and the innovative work of our technical program."

Both reports can be viewed online at www.nwmo.ca. To order a hard copy, please email us at contactus@nwmo.ca.

Two NWMO-Funded Graduate Students Complete Their Degrees

The NWMO has a long tradition of not only supporting leading researchers in nuclear waste management, but also helping promising graduate students launch their own careers in the field. Two of those students, Ms. Roshanak Pashang and Dr. Wendy Stone, recently completed their degrees in April. Dr. Stone earned her PhD; Ms. Pashang, her MSc.

Both studied in Ryerson University's Department of Chemistry and Biology under Prof. Gideon Wolfaardt. Their studies were jointly funded by the Natural Sciences and Engineering Research Council of Canada and the NWMO.

Dr. Jennifer McKelvie, a geoscientist at the NWMO and an adjunct professor at Ryerson University, was on the committee supervising the two students' theses. "We are really excited by their work because each addresses the sorts of microbial processes we need to be aware of and plan for in a deep geological repository," she notes.

She adds, "It is also an investment in our future. With a long-term project like ours, it is incredibly important to encourage talented young scientists to enter the field. It is the innovative work of scientists like Dr. Stone and Ms. Pashang that will help ensure that Canada's used nuclear fuel will continue to be managed according to the highest scientific standards in the decades to come."

The NWMO Co-Hosts International Conference on Corrosion



Conference attendees visit the NWMO's proof testing facility.

In May, the NWMO, Ontario Power Generation and Canadian Nuclear Laboratories sponsored the sixth International Workshop on Long-Term Prediction of Corrosion Damage in Nuclear Waste Systems. The four-day conference, which was also supported by the European Federation of Corrosion, was held in Toronto.

The conference brought together some 70 researchers and industry professionals from more than a dozen countries. Attendees included representatives from the national waste management organizations of Canada, the Czech Republic, France, Japan, Sweden, Switzerland, and the United Kingdom.

"Minimizing corrosion plays a huge role in safely managing used nuclear fuel over the long term," explains Peter Keech, the NWMO's Manager of Engineered-Barrier Science.

"That is because the containers in which the fuel is stored use pressure vessel grade steel to keep their contents from being crushed in the event of a future glaciation. On their own, these steels have a level of corrosion resistance and will provide containment for many thousands of years.

"However, to provide an extra level of protection, many container designs also include an outer layer of copper. Copper is ideal because it is known to be especially durable under deep rock conditions where there is no oxygen to cause corrosion."

"It is really exciting to see how much international co-operation there is in this crucial aspect of container design," adds David Hall, Corrosion Scientist at the NWMO. "It is also highly gratifying to see how much international interest the NWMO's design is attracting. Unlike other designs, in which the copper exterior forms a separate layer, we directly apply the copper to the steel container, thus eliminating any gap between the two metals."

In addition to nearly 40 presentations, there were 30 poster presentations highlighting the work of students and other researchers in the field. Five of the students, Daniel Guo, Taylor Martino, Ryan Morco, Thalia Standish, and Joseph Turnbull, are studying under professors whose research the NWMO jointly funds with the Natural Sciences and Engineering Research Council of Canada.

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NUCLEAR WASTE MANAGEMENT ORGANIZATION
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