



OPERATIONAL RESILIENCE DURING THE COVID-19 PANDEMIC



Nuclear Forensics



AS COVID-19 pandemic travel bans were imposed in March 2020, the U.S. Department of Energy's (DOE's) National Nuclear Security Administration's (NNSA's) Global Material Security (GMS) Program, which works overseas to provide partners with the capacity to secure nuclear and other radioactive materials and deter smuggling efforts, faced a serious challenge. "When the pandemic started, the stakes were already high. We had to come up with solutions—and fast," says GMS Program Leader for Lawrence Livermore Melinda Lane. "GMS was a 'boots-on-the-ground' program in every sense of the word. We relied heavily on our most important asset—the physical presence of our subject matter experts (SMEs)—leading nuclear forensics technical workshops, research, and training; building relationships and growing networks; and supporting the security and protection of nuclear materials around the world. In March and April of 2020 alone, we cancelled dozens of in-person engagements."

Initially, travel restrictions severely impacted GMS activities. By creatively using virtual communication platforms and adopting a new, more flexible approach to program implementation and execution, GMS cultivated an innovative operational resilience that supported mission fulfillment. Despite the absence or restriction of in-person engagements, this approach continues to enhance the program's mission delivery.

One of several DOE national laboratories supporting GMS efforts, Lawrence Livermore provides leadership and expertise in nuclear forensics, support for the International Atomic Energy Agency's (IAEA's) Information Circular/908 (INFCIRC/908) "Joint Statement on Mitigating Insider Threats" and its International Working Group, and good practices for the protection and security of nuclear and radioactive materials. The Laboratory also works collaboratively with its NNSA sponsor, NA-21, and other national laboratory SMEs to advance capacity building across all aspects of the nuclear security regime and state-of-the-practice in nuclear nonproliferation.

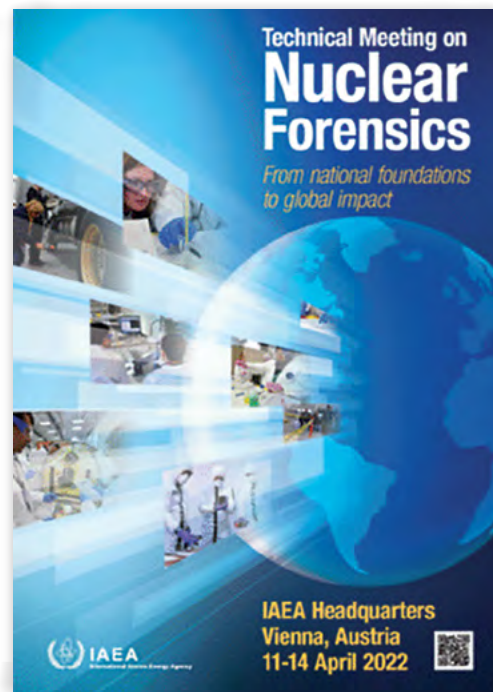
Virtual Nuclear Forensics

Nuclear forensics—the science of analyzing and identifying the origins of illicitly trafficked nuclear or other radioactive materials—plays a critical role in keeping the nation safe. GMS assists partners in developing their own nuclear forensics capabilities by conducting technical workshops, trainings, and benchmark studies. "If there ever was an example of necessity driving invention, this transition to virtual nuclear forensics training and workshops applies," says Ruth Kips, deputy associate program leader for Nuclear Smuggling Detection and Deterrence at the Laboratory. "We had to identify virtual communication tools to teach and perform joint science, something we had never done before.

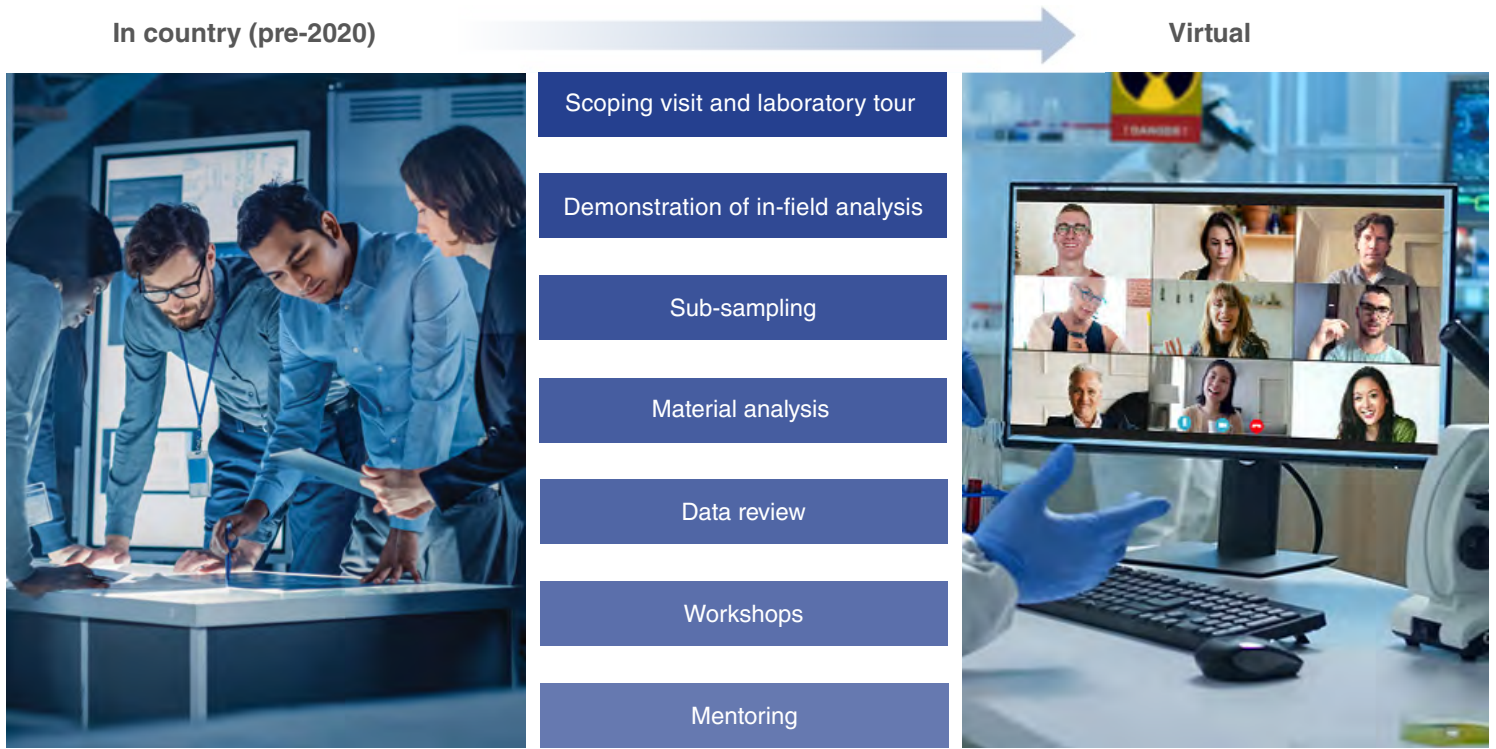
We learned so much during this process, and our program is stronger because of it."

To accommodate the new virtual learning environment, course content was streamlined and complemented by pre-recorded presentations. Course instructors also encouraged virtual participation by crafting polls and quizzes. "We realized that some of the work we perform in person could be done virtually. From initial introductions with our international partners and overviews of laboratory capabilities to technical demonstrations, data review, and mentoring, we used virtual video conferencing platforms for the first time."

For joint sample analyses, part of international nuclear forensic capacity building efforts, all participating laboratories measure a small part of the same nuclear material and compare results and methods. Prior to the pandemic, at the start of a joint sample analysis, Kips and her team would typically meet in person at a partner laboratory and discuss what sample would be analyzed, how to organize the sample shipment process, and what techniques each laboratory would apply to evaluate the material. "Our first joint sample analysis with Romania on a set of highly enriched uranium (HEU) samples started early in the pandemic,



The International Atomic Energy Agency (IAEA) held its first hybrid Technical Meeting in April 2022. The event was co-chaired by Lawrence Livermore and INTERPOL and attended by more than 118 in-person and 79 virtual participants, 64 member states, and four international organizations.



The COVID-19 pandemic curtailed nearly all travel, requiring the Global Material Security (GMS) Program to shift from exclusively in-person to virtual engagements. Using virtual tools and platforms, GMS successfully collaborated with its partners around the world to continue to build capacity across all nuclear security domains including support for nuclear forensics training and collaborative research.

and we were not able to travel to the laboratory in Bucharest for those initial discussions and laboratory visits. So, we observed the subsampling process of a set of HEU metal samples through prerecorded demonstrations and virtual meetings performed by our partners in Romania, which resulted in a well-documented record of the material sampling in preparation for shipment to Los Alamos and Lawrence Livermore national laboratories,” says Kips.

More Engagements, More Participants

As with in-person workshops and hands-on research performed prior to the pandemic, GMS team members have maintained a presence at international conferences and nuclear security summits for decades. SMEs from Lawrence Livermore and Pacific Northwest National Laboratory provide technical leadership and support for the IAEA’s INFCIRC/908 and its International Working Group to mitigate insider threats for nuclear security. “After the initial travel hiatus, we realized we can conduct more engagements with more participants,” says Livermore nuclear engineer and former policy director Frank Wong. “In June 2021, we launched a webinar for INFCIRC/908 subscribers so they could receive updates on the International Working Group’s

efforts since the last IAEA International Conference on Nuclear Security in 2020. We were thrilled because there was so much pent-up demand. INFCIRC/908 subscribers are passionate and engaged. We now have INTERPOL and 32 country subscribers including Slovenia and Switzerland, which subscribed during the pandemic. That’s huge. Travel costs can limit in-person attendance, but virtual attendance can be almost limitless.”

Wong and other GMS team members coordinated and executed virtual sessions and side events at several IAEA conferences and meetings, including transforming Argentina’s in-person-only event, “Leadership in Nuclear Security: Women Supporting the Amendment to the Convention on the Physical Protection of Nuclear Material,” into a hybrid format featuring Mirela Gavrilas, director of the Office of Nuclear Security and Incident Response for the U.S. Nuclear Regulatory Commission. The event hosted 50 in-person attendees as well as 40 virtual attendees from around the world.

GMS teams also supported the Nuclear Forensics International Technical Working Group’s (ITWG’s) Annual Meeting in June 2021. This first, virtual annual meeting included more than 100 nuclear forensics practitioners from 30 countries

and highlighted the working group's notable contributions to international nuclear security. The 25th anniversary meeting of the ITWG, originally planned for June 2020, took place in June 2022—the first time the ITWG Annual Meeting has convened in the United States since its first meeting at Lawrence Livermore in 1995. Lawrence Livermore hosted the meeting as a hybrid event combining virtual and in-person engagements.

Securing Nuclear and Radiological Materials

Pre-pandemic support for the GMS mission included site assessments, progress reviews, and assurance visits to identify and improve nuclear material security systems and practices at nuclear or radiological facilities. Before the pandemic, SMEs conducted in-person walk-throughs to evaluate security systems, touring site perimeters and access control points and examining cameras, sensors, barriers, and material storage containers. “Gaining a complete understanding of how a site operates and maximizing security system effectiveness without seeing the location firsthand presented a major obstacle,” says Adam Houlihan, international security specialist and portfolio leader at Lawrence Livermore. After the pandemic curtailed travel, GMS stakeholders determined how to conduct virtual walk-throughs using facility diagrams, photos, and videos filmed by partners and submitted via secure digital portals. “These virtual visits allowed GMS to support the design and implementation of crucial security upgrades at nuclear and radiological facilities around the world despite the absence of travel.”

Continuously engaging partners on security improvements and operations throughout the pandemic ensured continuity of the GMS mission and presented an opportunity to understand the challenges partner facilities and organizations face in maintaining secure operations under pandemic conditions. In response, Lawrence Livermore SMEs documented their feedback and developed a comprehensive report assessing the lessons learned to better inform security planning and foster resilience during disruptive, large-scale events.

The Best of Both Worlds

Crafting creative, virtual solutions led to more frequent communication among GMS partners. Lane says, “Our relationships are stronger because now we interact with partners on a much more frequent basis.” While beneficial to existing relationships, virtual engagements still present limitations when forging new partnerships. Wong adds, “Many of the successful international engagements continued through the pandemic due to the solid foundation of our established networks and relationships.” By developing operational resilience during the COVID-19 pandemic, GMS team members determined that they can successfully execute trainings, joint research, and workshops



GMS Program team members coordinated and executed virtual sessions and side events for several International Atomic Energy Agency conferences and meetings.

remotely; increase SME and senior leader participation in engagements due to fewer travel commitments; and improve opportunities for mentoring and coaching by including junior staff at limited cost.

In a post-pandemic world, Lane and her team anticipate an optimum hybrid of virtual and in-person engagements. The success GMS achieved during the pandemic is based on everyone's willingness to be flexible and think creatively. “The hybrid model is here to stay. Our engagements are more interactive and inclusive because we're using the robust communication tools we developed during the pandemic. Going forward, GMS will benefit from the best of both worlds.”

– Sheridan Hyland and Genevieve Sexton

Key Words: Department of Energy (DOE), Global Material Security (GMS) Program, Information Circular/908 (INFCIRC/908), International Atomic Energy Agency (IAEA), International Technical Working Group (ITWG), National Nuclear Security Administration (NNSA), nuclear forensics.

For further information contact Melinda Lane (925) 422-0658 (lane14@lnl.gov).