



A YEAR OF UNPARALLELED URGENCY

2022 Annual Report





As we reach the end of the first year of the war in Ukraine, NTI sends hope for a better future to the victims of Russia’s invasion. We also salute the bravery of the workforce at the Zaporizhzhia Nuclear Power Plant and all of Ukraine’s nuclear facilities who are working night and day to prevent catastrophe. NTI honors inspectors from the International Atomic Energy Agency (IAEA) who have risked their lives to ensure safety and security at those plants. Today, as we stand at the precipice of a more dangerous nuclear era, NTI remains steadfast in our commitment to work to reduce catastrophic threats and build a safer world.

Contents

Letter from the NTI Co-Chairs	4
Reinforcing Red Lines in Ukraine	6
Sounding the Alarm on Biological Threats	8
Preventing Nuclear Catastrophe	10
Upholding Nuclear Security Rules of the Road	16
Building Public Support for a World Without Nuclear Weapons	22
Spotlighting Emerging Biotech Risks	26
Driving Progress to Prevent and Respond to Biological Events	30
Celebrating Two Decades of Impact	34
Our Leadership	40
NTI Staff	42
Saying Farewell	43

LETTER FROM THE NTI CO-CHAIRS

Ernest J. Moniz, Sam Nunn, and Ted Turner



“ We must...do all we can to prevent nuclear use now and in the future.”

Just three days into 2022, the leaders of China, France, Russia, the United Kingdom, and the United States jointly and publicly declared that “a nuclear war cannot be won and must never be fought” and committed to work toward disarmament and reducing nuclear risks. It was a reaffirmation of the historic Cold War joint statement issued by Ronald Reagan and Mikhail Gorbachev, and it set an important foundation for reinvigorated efforts to reduce the risk of nuclear conflict.

Less than two months later, Vladimir Putin launched his attack on Ukraine—an assault unlike anything seen in Europe since World War II. Just four days in, Putin issued the first of what would be a series of thinly veiled nuclear threats when he ordered his generals to put Russian’s nuclear weapons on a higher state of alert.

As we write this letter, the war has now raged on for a year, and the dangers have compounded. Amid horrifying footage of apartment buildings, schools, and churches reduced to rubble, the world has watched Putin’s military endanger Ukraine’s main nuclear power plant, putting much of Europe—including Russia’s own citizens—at risk of a catastrophic radiological release. The Kremlin’s reckless nuclear threats keep coming.

The Ukraine crisis has challenged fundamental assumptions about the efficacy of nuclear deterrence and raised important questions about the best way to prevent nuclear use, both in the immediate and the long term.

The bottom line: the world has changed.

From the start of the war, NTI has been at the forefront of efforts to reduce nuclear dangers and strategic risks associated with the war, to bring an end to Russia’s reckless attacks on Ukraine’s Zaporizhzhia Nuclear Power Plant, and to reestablish pathways toward nuclear risk reduction and disarmament. We’ve worked privately, convening some of the world’s leading experts and officials to define what the crisis in Ukraine will mean for the future of the global nuclear order, and we’ve worked publicly, spreading our messages in testimony before Congress, in *Washington Post* op-eds, and even on *The Late Show with Stephen Colbert*.

A significant, related lane of work for NTI is reducing cyber and other threats to nuclear weapons and command-and-control systems that could result in nuclear use by accident or terrible miscalculation. As a direct result of our efforts over two years with Congress and the Biden administration, the Pentagon in late 2022 initiated a “fail-safe” review to identify policies and procedures to protect against a catastrophic blunder. We are now working to convince all nuclear-armed countries to conduct similar reviews.

We also engaged national security expert and former White House counterterrorism advisor Richard A. Clarke to narrate a compelling video on cyber-nuclear threats, which has been viewed more than one million times so far. The video is just one element of our broadening scope of work to reach new audiences and build the political will to address today’s evolving and escalating threats.

Meanwhile, our biosecurity work continues to address a critical global priority: preventing the next pandemic, which could be even worse than COVID-19. Our NTI | bio team has worked globally to help mitigate those risks by plugging gaps in the global bio and health security architecture. A key goal is to create a new mechanism to rapidly identify the origins of high-consequence biological events, critical to stopping the spread of devastating pathogens.

We also are thrilled to report that over the summer, the World Bank announced the establishment of a transformative new fund to support global pandemic preparedness and prevention—a fund we helped shape and an idea we have advocated since the development of our first Global Health Security (GHS) Index in 2019.

NTI | bio also has been laying the foundation for the official launch in 2023 of a new, independent organization: the International Biosecurity and Biosafety Initiative for Science (IBBIS). We all appreciate that bioscience and biotechnology advances are vital for fighting disease, protecting the environment, and promoting economic development—but innovations in this area also can pose unique challenges, increasing the risks of accidental misuse or deliberate abuse with potentially catastrophic consequences. IBBIS will help ensure bioscience and biotechnology can flourish safely and responsibly.

These are just a few highlights from our work in 2022.


We were grateful in 2022 to have marked NTI’s 20th anniversary (a celebration delayed by COVID-19). We were honored that our longtime supporter and advisor Warren Buffett made a wonderful video for the event in which he called Sam one of his personal heroes who “should be a hero really to every citizen of the world” for his decades of work on nuclear risk reduction. We also were moved by PBS’ Judy Woodruff, who shared a wonderful tribute to Ted, a man she hailed for being “driven by the simple goal of making the planet safe for humanity.”

We also are extraordinarily grateful to the foundations, families, and individuals who put their trust in NTI by providing financial support. In particular, we thank new funders and longtime supporters: Warren Buffett, Carnegie Corporation of New York, Effective Giving, John D. and Catherine T. MacArthur Foundation, Open Philanthropy, Peter G. Peterson Foundation, and David and Lucile Packard Foundation. Without them, we would not be able to do this important work.

As we look ahead and pray for peace for the people of Ukraine and the region, we face some serious headwinds on nuclear risk reduction—but we also know we must seize this opportunity to do all we can to prevent nuclear use now and in the future. Over more than two decades, on both nuclear and biosecurity, NTI has proved that progress is possible.

We hope you will join us in this important work.


Ernest J. Moniz


Sam Nunn


Ted Turner

Reinforcing Red Lines in Ukraine

On February 24, Russia invaded Ukraine, setting off a series of nuclear threats and provocations that have brought the world closer to the brink of nuclear weapons use than at any time since the Cuban Missile Crisis. As Vladimir Putin waged an increasingly risky campaign—putting nuclear power plants in the line of fire, making unfounded accusations about biological weapons programs, and breaking a long-held taboo against threatening to use nuclear weapons—NTI’s experts led the way on explaining the stakes and promoting safe and peaceful outcomes for Ukraine and the world.

- When the Russian military turned the Zaporizhzhia Nuclear Power Plant into a battleground, **Scott Roecker** and **Nickolas Roth** fanned out across the news media to explain the safety and security risks associated with the deteriorating situation on the ground. In interviews with **ABC’s *World News Tonight***, **CBS**, the **BBC**, and more, they called on Russia to declare a cease-fire and provide access to IAEA experts.
- In a September *Washington Post* op-ed, NTI Board members **Mike Mullen**, **Sam Nunn**, and **Ernie Moniz** called on President Xi Jinping of China to tell Russian President Vladimir Putin that nuclear weapon use is a line he must not cross.
- “What we’re worried about is blunder,” said **Ernie Moniz** on *The Late Show with Stephen Colbert*. “We have to keep lowering the number of nuclear weapons, eventually eliminate them, and satisfy our nonproliferation goals.”
- IAEA Director General Rafael Mariano Grossi met with **NTI’s Board of Directors** in Washington in October. He said “We need to work together at this point of great urgency.”
- **Joan Rohlfing** broke down the Russia-Ukraine conflict and associated nuclear risks for Hollywood writers, producers, directors, and executives in an event hosted by **University of Southern California’s Lear Center** and on the *Scriptnotes* podcast.
- **Hayley Severance** explained to *Time* magazine the harm caused by Russia’s false claims that Ukraine was developing bioweapons. NTI also hosted a seminar to help combat Russia’s bioweapons disinformation campaign.



Scott Roecker on CBS News.



Ernie Moniz on The Late Show with Stephen Colbert.



IAEA Director General Rafael Grossi addresses NTI's Board of Directors.

Photo credit: (Photo by Miguel Medina/AFP via Getty Images)

Sounding the Alarm on Biological Threats

In May, as the Omicron variant of COVID-19 continued infecting people across the globe, cases of Monkeypox appeared in the United Kingdom, and rapidly, the number of infections grew to tens of thousands worldwide. NTI experts called for greater investments in prevention, preparedness, and response, warning that the next biological event—whether from a naturally occurring virus, a deliberate act, or a lab accident—could be even more severe.

- NTI Board members **Peggy Hamburg** and **Ernie Moniz** issued a **statement on the Monkeypox outbreak**: “The lack of urgency and political will by the United States and other governments to proactively invest sufficient attention and resources in pandemic preparedness is alarming and inexcusable.”
- A **2021 NTI | bio tabletop exercise** involved a fictional outbreak of an engineered version of Monkeypox. When the 2022 outbreak emerged, coincidentally mirroring details from our exercise, NTI became the target of harassment and accusations. NTI experts worked to dispel disinformation about our work—and Reuters, Newsweek, and other outlets set the record straight.
- NTI celebrated the launch of the **World Bank’s Pandemic Fund**, the first financing tool focused on strengthening pandemic prevention, preparedness, and response capacities. NTI’s 2019 **Global Health Security Index** recommended creating such a fund, and NTI | bio played an instrumental role in the fund’s conception, development, and launch.
- “Though new tools for engineering biology offer tremendous potential benefits, stronger guardrails are needed to prevent misuse as they become more broadly accessible,” wrote **Jaime Yassif** in a December op-ed for **The Economist**.
- NTI briefed G7 leaders, delegates at the ninth Biological Weapons Convention (BWC) Review Conference, and senior officials at Carnegie India’s Global Technology Summit on progress toward establishing the **International Biosecurity and Biosafety Initiative for Science (IBBIS)**, a new organization NTI is incubating to address emerging biological risks.



Jaime Yassif (left) and Piers Millett (on screen) at Carnegie India’s Global Technology Summit.



Angela Kane at an IBBIS briefing hosted by NTI.



Gabrielle Essix at the ninth BWC Review Conference.

Preventing Nuclear Catastrophe



Lynn Rusten (center) and participants at an NTI-hosted workshop in Jakarta, Indonesia.

The year started on a positive note with a **joint statement by the leaders of China, France, Russia, the United Kingdom, and the United States** on “Preventing Nuclear War and Avoiding Arms Races.” The January 3 statement—the first of its kind made by this group—included the affirmation that a “nuclear war cannot be won and must never be fought.” This declaration followed years of advocacy from NTI and our Euro-Atlantic Security Leadership Group (EASLG) calling for the five recognized nuclear weapons states to echo the famous 1986 statement by Ronald Reagan and Mikhail Gorbachev.

Less than two months later, on February 24, Russia invaded Ukraine, upending the Euro-Atlantic and global security order. EASLG co-conveners—Des Browne, Wolfgang Ischinger, Igor Ivanov, Ernie Moniz, and Sam Nunn—immediately highlighted the nuclear risks associated with the war and called for dialogue and diplomacy.

Throughout 2022, Russia’s repeated nuclear threats ran roughshod over the taboo against threatening to use nuclear weapons and raised the specter that a nuclear weapon might be used for the first time in 77 years. Over the course of the year, NTI leaders and staff condemned dangerous Russian rhetoric, called for dialogue and restraint, and promoted ways to bring about an end to the conflict. In a September *Washington Post* op-ed, NTI Board Member Michael Mullen and NTI Co-Chairs Sam Nunn and Ernie Moniz called on Chinese President Xi Jinping to “make clear to Putin that nuclear use is a line he must not cross and that nuclear saber-rattling itself threatens the global nuclear order.” Moniz reiterated the importance of China’s warning to Putin on *The Late Show with Stephen Colbert*. In early November, Xi stated publicly that the international community should “reject the threat of nuclear weapons,” a statement that was widely interpreted by media and experts as an admonition to Putin.



Page Stoutland (in red) and participants in NTI's fifth Cyber-Nuclear Forum on a nuclear reactor site visit in southern France.

Throughout the year, the EASLG convened meetings of former senior-level officials from across the Euro-Atlantic region, including Russia and Ukraine, for dialogue about ending the war, mitigating its humanitarian consequences, and reducing nuclear risks. NTI also held meetings with outside experts to consider the implications of the war for the future of the global nuclear order, Euro-Atlantic security, and global security more broadly. These discussions are providing a baseline for ongoing work at NTI to reduce nuclear and strategic risks and reestablish pathways to nuclear disarmament.

Understanding the importance of building trust among future Russian, European, and U.S. leaders and experts, NTI continued to support the **Younger Generation Leaders Network (YGLN) on Euro-Atlantic Security**, a unique initiative to develop and foster a new generation of leaders equipped to tackle global challenges fueled by historical animosities and fresh divisions caused by the war in Ukraine. The network underscores the need to communicate with one another to avoid the mistakes that have plagued previous generations in addressing the region's security issues. Today, the YGLN has more than 90 young professionals from Europe, Russia, Ukraine, and the United States. In 2022, NTI provided a grant to the network through NTI's Robert E. Berls, Jr. Next Generation Fund, established in honor of NTI's top Russia expert who was instrumental to the YGLN's founding and who passed away in 2021.

Reducing cyber risks to nuclear weapons systems and nuclear facilities in the digital age continues to be at the forefront of NTI's risk-reduction agenda, and NTI's **Cyber-Nuclear Forum** is breaking new ground in this area. Established in 2019, the Forum works to mitigate the risks of cyberattacks on nuclear facilities globally by fostering a network of cyber-nuclear security practitioners and providing nuclear operators with a venue to exchange and develop new ideas and cybersecurity best practices. In April, NTI convened the sixth meeting of the Forum with nearly 40 leaders and experts in the field from 14 countries.

“ I welcome the administration's ... plan to commission an independent nuclear 'fail-safe' review to strengthen safeguards against false warnings, blunders, mistakes, or unintentional use of nuclear weapons.

Sam Nunn
NTI Co-Chair



Win for Global Security: Fail-Safe Review

NTI achieved a major policy win in 2022 that will help ensure that a failure in our nuclear weapons systems won't result in a civilization-disrupting catastrophe. The Biden administration initiated a nuclear “fail-safe” review—a study of U.S. nuclear weapons and command, control, and communications systems and processes aimed at identifying policy and procedural steps to reduce the risk of nuclear use by accident or miscalculation, including as a result of a cyberattack.

This initiative—the first comprehensive review since the 1990s—is the direct result of more than two years of advocacy. Sam Nunn, Ernie Moniz, and NTI experts promoted the idea privately with members of Congress and senior administration officials and publicly, including through a 2021 *Washington Post*

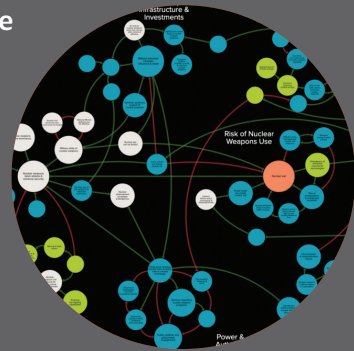
op-ed penned by Nunn and Moniz, “Biden should do more to prevent the accidental launch of nuclear weapons. Here's how.”

Thanks to NTI, Congress mandated the review in the National Defense Authorization Act, and the Biden administration embraced it in its Nuclear Posture Review.

Now, with the review underway, NTI has been asked to help shape the process and will continue working to ensure the review is thorough and yields actionable recommendations to reduce the risk of nuclear use by accident or miscalculation. NTI also is working to encourage other nuclear weapons states, including Russia, to undertake similar reviews.

Mapping a Global Security System without Nuclear Weapons

Imagine a day when the world is free from the grip nuclear weapons have on our imaginations, our policies, and our future. That's the impetus behind Horizon 2045, an innovative project that seeks to identify and apply new strategies, perspectives, and disciplines to chart a path to global security free from the existential threat of nuclear weapons by 2045—100 years after the nuclear bomb was invented. Founded in 2019 by NTI, N Square, and the Rhode Island School of Design's Center for Complexity, the project brings together some of the world's most creative thinkers to explore how to envision a future where nuclear weapons are no longer the linchpin to international security. In 2022, the Horizon 2045 team applied systems thinking, strategic foresight, and an exploration of the entanglement of nuclear weapons with other existential threats to address this challenge.



As a contribution to Horizon 2045, NTI is developing a **blueprint for a safer, more effective nuclear system**—one that is not based on the threat of nuclear annihilation to prevent nuclear use. Our team is exploring the tools, institutions, and capabilities required for a future world with peaceful nuclear technologies but without nuclear weapons. As NTI's President Joan Rohlfing explains, "One of the criticisms we frequently hear is that 'A world without nuclear weapons simply is not possible. We could never verify that others are not cheating.' I think that suffers from a complete failure of imagination." This work seeks to demonstrate that an alternative security paradigm is both plausible and achievable.

NTI also is working to **raise awareness and advance understanding of the global effects of a nuclear war**. Although the immediate devastating impact of a nuclear explosion is well understood, the long-term effects of a nuclear exchange on global climate, food systems, infrastructure, economies, and society are underexplored and unappreciated by both publics and policymakers. In June, NTI convened a hybrid international conference with more than 40 scientists and policy experts to present and discuss new research on nuclear effects and the implications for nuclear policy and decisionmaking. "Heat, blast, radiation, and mushroom clouds are all in the popular lore," Ernie Moniz told the group. "But we think the estimates of the consequences of a nuclear conflict are outdated and underestimated." A better understanding of the potential effects of using a nuclear weapon will serve to accelerate nuclear threat-reduction efforts globally.

In August, countries from around the world gathered in New York for the 10th Review Conference of the Treaty on the Non-Proliferation of Nuclear Weapons (NPT). The event—delayed two years by the COVID-19 pandemic—was an opportunity for states parties to assess implementation of the treaty and set a course for progress on its core objectives to prevent the spread of nuclear weapons and ultimately eliminate them entirely, while guaranteeing peaceful uses of nuclear technology. To substantively contribute to a successful Review Conference, NTI convened officials and experts from more than 20 countries through the **Global Enterprise to Strengthen Non-Proliferation and Disarmament**. Launched in 2018, the Global Enterprise helps identify practical steps that countries can take to strengthen the treaty, considered the centerpiece of the global nuclear nonproliferation and disarmament regime. In 2022, NTI hosted discussions about the implications of the war in Ukraine and published practical recommendations that were included in the Review Conference's draft final document, which never achieved consensus.

Through the Global Enterprise, NTI also worked to **integrate diverse perspectives into the 2022 NPT debate**. In June, NTI partnered with the Asia-Pacific Leadership Network to convene an in-person workshop in Jakarta, Indonesia. The regional meeting—which followed workshops in Brazil

“One of the criticisms we frequently hear is that ‘A world without nuclear weapons simply is not possible. We could never verify that others are not cheating.’ I think that suffers from a complete failure of imagination.

Joan Rohlfing
NTI President



in 2019 and Ghana in 2020—brought together more than 30 participants from 15 countries across the Asia-Pacific region to discuss regional perspectives on nuclear disarmament and nonproliferation. NTI amplified this work by bringing a representative from each regional workshop to New York to participate in an official Review Conference side event co-sponsored by NTI and Norway. Review Conference President Ambassador Gustavo Zlauvinen of Argentina participated in the event, “**Regional Perspectives on Strengthening the NPT**,” and cited the Global Enterprise's important role in helping “keep the momentum during the postponement of the Review Conference,” noting that the effort “pushed...officials and capitals and civil society to stay focused on the issues.”





Upholding Nuclear Security Rules of the Road

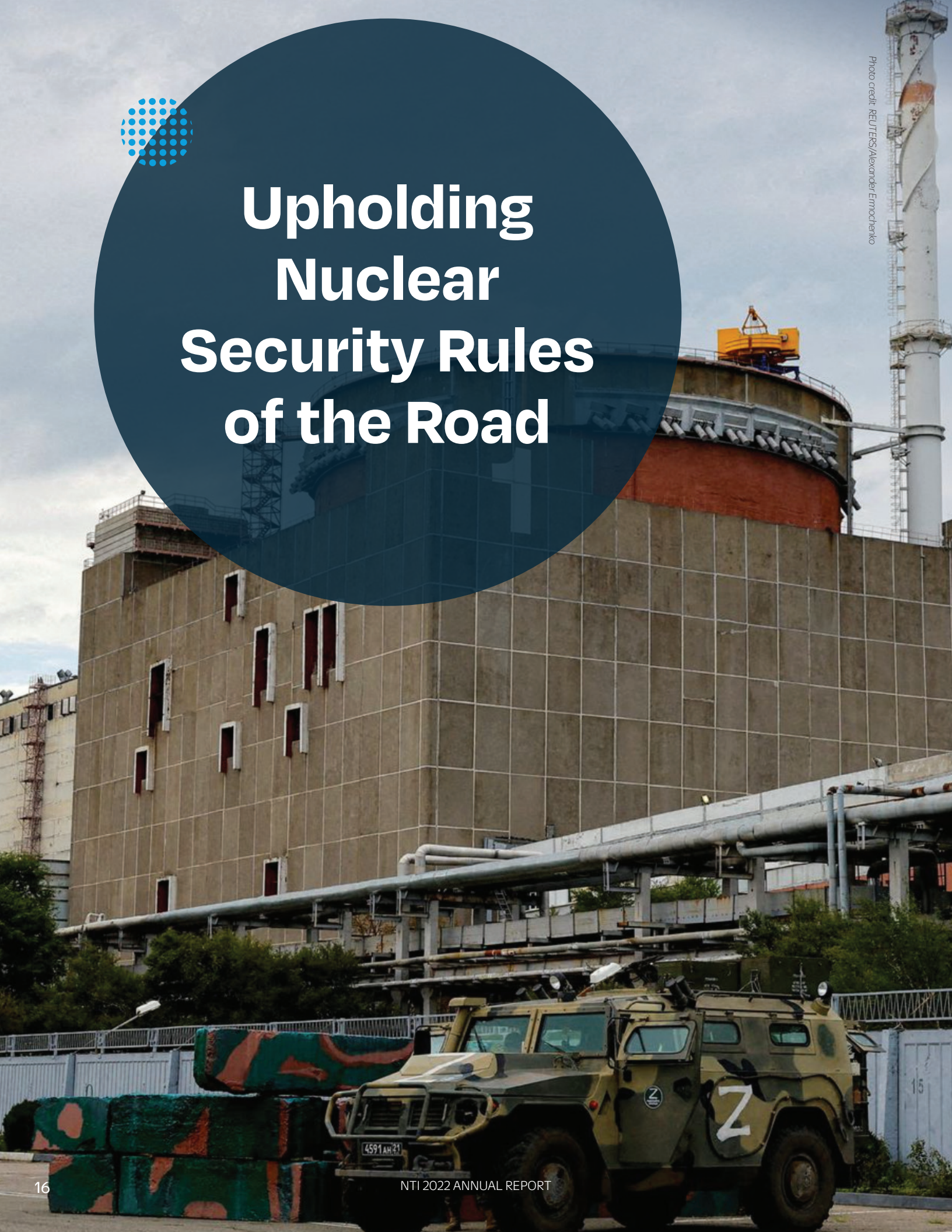


Photo credit: REUTERS/Alexander Esmachenko



Scott Roecker (center) with NTI colleagues and participants at 10th anniversary meeting of the Global Dialogue in Hiroshima, Japan.

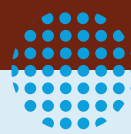
The world witnessed a stunning, flagrant disregard for nuclear security when Russian forces recklessly attacked and occupied Ukraine's Zaporizhzhia and Chernobyl nuclear plants. Vladimir Putin's decision to risk large-scale radiological contamination and jeopardize the health of the people and the environment around these civilian nuclear reactors is a new and deeply disturbing type of brinksmanship.

Amid these unprecedented challenges, many governments took advantage of important opportunities to strengthen international norms, laws, and institutions, and NTI played a critical role in driving this progress.



NTI experts present on nuclear security at the United Nations in New York.

NTI experts first **helped guide public understanding of the Zaporizhzhia crisis** through the news media and gave decisionmakers detailed analyses of new developments and specific recommendations to reduce the risk and mitigate the effects of a radiological release. In August, when the crisis reached a tipping point, NTI issued a statement calling on Russia and Ukraine to prevent a catastrophic radiological release by providing the Zaporizhzhia Nuclear Power Plant with the supplies



Win for Nuclear Nonproliferation: A New Agreement on Responsible Fuel Cycle Practices in the Middle East

NTI has long prioritized developing and promoting approaches to the nuclear fuel cycle—the processes that prepare uranium for use in nuclear reactors and then manage the disposal of radioactive spent fuel—that also enhance safety, security, and nonproliferation. The Middle East is crucially important for this work, given the ongoing and planned expansion of nuclear energy in the region.

In November, Ernie Moniz and Emirates Nuclear Energy Corporation (ENEC) Managing Director and CEO His Excellency Mohamed Al Hammadi signed a new agreement for a three-year joint nuclear security project. NTI and ENEC will examine existing standards in nuclear energy development and identify new cooperative fuel cycle strategies that support the global expansion of nuclear energy in a responsible, sustainable, secure, and transparent manner.

“We’re embarking on a collaboration that is focused on an important problem: nuclear energy at a time of climate change and heightened sensitivity in energy security,” Moniz said.



Ernie Moniz and His Excellency Mohamed Al Hammadi shake hands after signing agreement.

“[The United Arab Emirates] has ‘walked the walk’ by setting the highest nonproliferation standards, which is generating tailwinds for even more development.”

The agreement follows two workshops with United Arab Emirates and U.S. experts—one in December 2019 which focused on the back end of the nuclear fuel cycle and a second in September 2022 which explored the front end of the fuel cycle, including practices that uphold countries’ commitments not to develop nuclear weapons.

needed to avoid a meltdown and allowing inspectors from the IAEA inside to “assess what safety and security issues need to be addressed at the site.” In September, IAEA Director General Rafael Mariano Grossi led his team of inspectors into the plant. The following month, during a trip to Washington to brief senior U.S. government officials, Grossi met with NTI’s Board of Directors and thanked NTI for our support and influential voice in the nuclear nonproliferation and nuclear safety and security fields.



IAEA Director General Rafael Mariano Grossi meets with NTI’s Board of Directors.

NTI also played an important role in bolstering the international nuclear security architecture as a civil society leader at the first review of the only legally binding treaty on nuclear security: the Amendment to the Convention on the Physical Protection of Nuclear Material, which covers the physical protection of nuclear facilities and materials and criminalizes offenses related to illicit trafficking and sabotage. NTI **contributed to the success of the treaty’s review conference** by helping governments prepare for the meeting, leading a conference session, and hosting an event featuring civil society and NTI experts who presented policy recommendations for advancing the treaty.

With U.S.-Russia relations at their lowest point in decades and U.S.-China relations in tumult, NTI saw the urgent need to preserve expert-level communication on nuclear security issues among the three countries with the largest quantities of nuclear weapons and weapons-useable materials. Throughout 2022, NTI **held informal, bilateral dialogues and virtual workshops** with Russian and Chinese nuclear experts focused on sensitive nuclear security issues through a technical lens. Despite tensions between the United States and Russia and China, both dialogues were constructive, substantive, and resulted in actionable proposals to advance nuclear risk reduction.





NTI, U.S. Department of State, and IPNDV Partners meeting in Sydney, Australia.

“The Partnership has produced an impressive and valuable toolkit that can strengthen future arms control regimes by exploring realistic and effective verification mechanisms to help address complex verification challenges associated with nuclear disarmament.

Ambassador Bonnie Jenkins

U.S. Under Secretary of State for Arms Control and International Security

LOOKING AHEAD

Innovating for the Future with the IPNDV



Jessica Bufford addresses a meeting of the IPNDV.

When the world generates the political will to eliminate and dismantle nuclear weapons, what tools will countries need to do so verifiably? Since 2014, NTI and the U.S. Department of State have led a group of 25+ countries in imagining, devising, and formalizing the methods and technologies to facilitate future multilateral efforts to verify the elimination of nuclear weapons. This initiative, the **International Partnership for Nuclear Disarmament Verification (IPNDV)**, has developed a detailed and innovative framework for the verifiable dismantlement of nuclear weapons. IPNDV is now field-testing technologies that improve the reliability of this complex process.

In 2022, IPNDV Partners met in Germany for a simulation to test nuclear disarmament verification procedures under realistic conditions, in Brussels for a tabletop exercise on verifying the transport and long-term storage of nuclear warheads, and in Sydney for a high-level meeting to set the agenda for 2023.

U.S. Under Secretary of State for Arms Control and International Security Ambassador Bonnie Jenkins attended the Sydney meeting and said, “The Partnership has produced an impressive and valuable toolkit that can strengthen future arms control regimes by exploring realistic and effective verification mechanisms to help address complex verification challenges associated with nuclear disarmament.”

In June, 10 years after creating a high-level forum to address the world's most pressing nuclear security issues, NTI convened the 15th meeting of the **Global Dialogue on Nuclear Security Priorities** in Hiroshima, Japan. Nuclear security leaders from government, industry, intergovernmental, and nongovernmental organizations developed recommendations to advance nuclear security, as they reflected on opportunities to strengthen ties between the nuclear security and nuclear disarmament communities. Participants toured the Peace Memorial Park and met with a survivor of the Hiroshima bombing, who spoke about the immediate aftermath and long-term destructive power of nuclear weapons.

In August, NTI held an event at the NPT Review Conference on “**Nuclear Security: A Foundational Element of the Non-Proliferation Regime**” to explore the important role of nuclear security in advancing the three pillars of the NPT: making progress toward disarmament, promoting nonproliferation, and expanding peaceful uses of nuclear technology.

In December, NTI senior leadership reaffirmed our commitment to maintaining U.S.-Russia dialogue on nuclear issues even in challenging times. Ernie Moniz delivered a virtual keynote address to dozens of global experts at the **2022 Moscow Non-Proliferation Conference**, offering sharp criticism of Russia's actions in Ukraine and calling for risk-reduction measures, diplomacy, and vigilance to avoid global nuclear catastrophe.



An image from NTI's 2022 Cranes for Our Future campaign toolkit.

In 2022, amid ongoing nuclear threats from Vladimir Putin, President Biden warned we were closer to “nuclear Armageddon” than we had been in 60 years—since the Cuban Missile Crisis. The specter of nuclear use topped news cycles and sank into public consciousness more than at any time in recent history, making NTI's work to build and engage a movement of advocates for a safer future more important than ever.

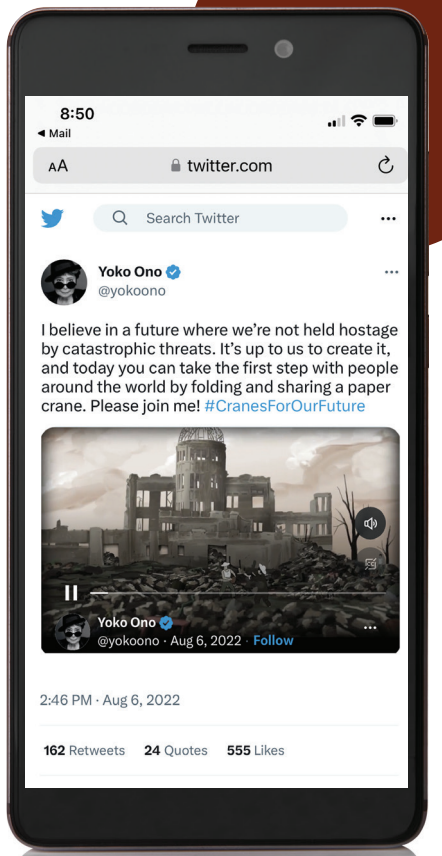
To help guide efforts by NTI and the U.S. nuclear policy community to build public support for a world without nuclear weapons, NTI conducted a new phase of **audience and narrative research**, examining storylines

that already exist in various media. Nuclear weapons show up everywhere and are almost always depicted as world-ending tools of unhinged leaders—but rarely in narratives demonstrating a thriving future without nuclear weapons. How can we engage creators with messages of hope, showing that progress is possible?

The research provided a roadmap: individuals most likely to be persuaded to work toward a safer world spend their time on social media channels, such as YouTube, not on cable news or traditional media. NTI followed this path to reach new audiences in a series of 2022 campaigns.

To engage new voices and give people a shared moment to express their support for a future without nuclear weapons, NTI again partnered with the Hiroshima and Nagasaki Prefectures for the second annual **Cranes for Our Future** campaign. Between August 5 and 9—commemorating the anniversaries of the atomic bombings and as the 10th NPT Review Conference was getting underway in New York—organizations, individuals, and families around the world folded and shared origami cranes on social media with a message about what a world without nuclear weapons means to them.

The 2022 campaign was a resounding success. Cultural influencers like George Takei and Yoko Ono joined the campaign, along with the Indigo Girls, who urged their Twitter followers to join because “we believe in a future where we’re not held hostage by catastrophic threats.” Our 2022 coalition included activists, authors, and artists; more than 70 organizations, from The Elders and Union of Concerned Scientists to WiN Ukraine; global security leaders, including UN Secretary-General António Guterres and NPT Review Conference President Ambassador Gustavo Zlauvinen; and members of Congress.





Win for Pop Culture: Influencing Hollywood Storylines Post-Ukraine Invasion

Amid heightened interest in nuclear threats related to Ukraine and knowing that Hollywood plays an outsized role in public perception, NTI partnered with the University of Southern California's Norman Lear Center to educate writers and producers interested in incorporating nuclear weapons themes into fictional storylines.

In April, Joan Rohlfing and journalist David Hoffman of *The Washington Post* participated in a virtual panel event moderated by David Grae, executive producer and writer of CBS' *Madam Secretary*. Dozens of high-profile writers, producers, directors, and executives from Participant Media, NBC Universal, *NCIS: Los Angeles* (CBS), *SEAL Team* (CBS), *Last Week Tonight with John Oliver* (HBO), *Limitless* (CBS), *Queen Sugar* (OWN), *Boomerang* (BET), and *Brockmire* (IFC) joined.



In a post-event survey, more than 80 percent of attendees reported thinking differently about the nuclear threat, and half said they planned to use the information in a future project. Rohlfing then joined the podcast *Scriptnotes*, an influential source for film and TV writers co-hosted by screenwriters Craig Mazin (*Chernobyl*) and David August. The episode has had more than 24,000 downloads across 127 countries.



The Cranes campaign also featured paper artist Jeff Nishinaka, who created a widely shared image of a beautiful paper sculpture. He discussed his family connection to Hiroshima with NTI's *Atomic Pulse* blog. A diverse set of TikTokkers joined us, including a Latina mom, a Black history educator, and a member of the Navajo Nation. We produced an animated video with a story of hope that was shared by Yoko Ono and the UN, along with many others.

Our second annual campaign exposed more than 20 million people around the world to messages about a safer world, without nuclear weapons.

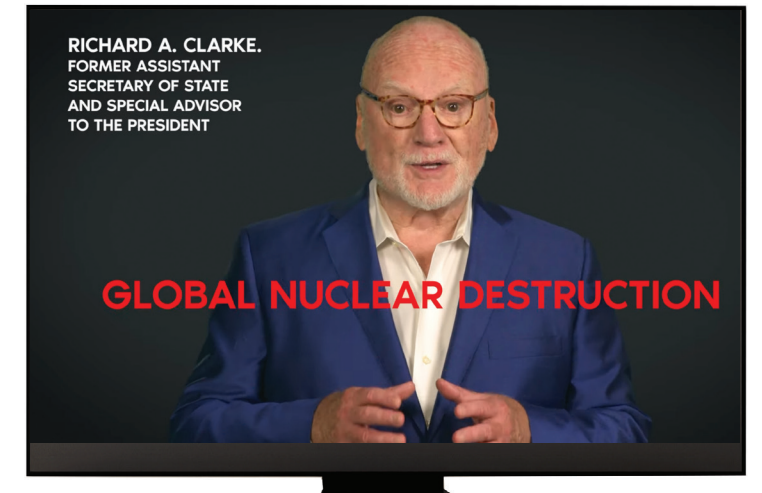
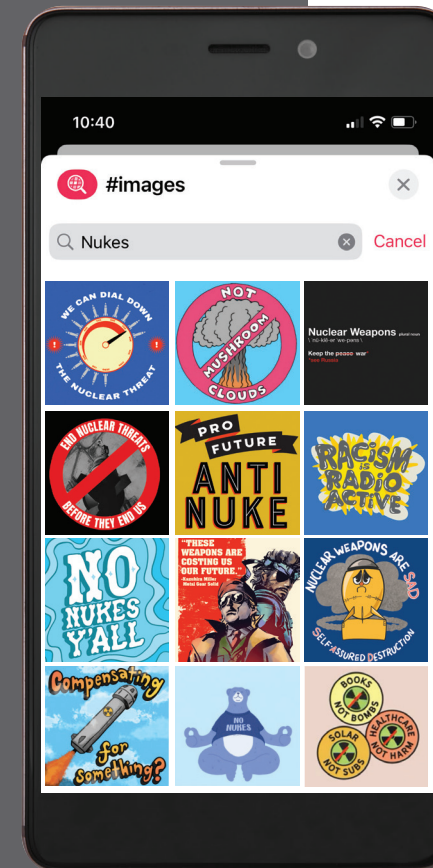
LOOKING AHEAD

Meeting New, Younger Audiences Where They Are

To build a coalition that can help make nuclear weapons a thing of the past, NTI is focused on reaching younger and more diverse audiences. In 2022, NTI worked with a firm to seed new content on GIPHY, the internet's second largest search engine and the largest public repository of short, animated digital graphics commonly called GIFs. We ran a small pilot, creating and posting 27 pro-nuclear-disarmament GIFs.

People texting or sharing on social media can find these GIFs by using search words like "nukes" or "nuclear weapons." NTI's GIFs have been viewed or shared 40 million times. Importantly, positive messages like "We are the generation that will end the nuclear threat" and "No nukes y'all" are bumping mushroom clouds out of view.

NTI also worked with creators on TikTok and YouTube—engaging a diverse cadre of micro-influencers to develop content highlighting modern nuclear risks, share stories about inspiring figures who have helped reduce nuclear dangers, and call on their followers to do their part to build a safer future without nuclear weapons. The TikToks, focused on #CranesForOurFuture and our cyber-nuclear work, have been viewed nearly 2.5 million times by people in our target audience.



NTI also focused on cyber and nuclear threats, releasing a powerful **five-minute explainer video** narrated by cyber-security expert and former White House advisor Richard A. Clarke. The YouTube video highlighted how close the world has come to nuclear catastrophe, how cyber risks might cause our luck to run out, and what we can do about it.

The video was shared widely across social channels and featured in *Politico* and *The Washington Post*, inspiring five TikTok creators to educate more than a million people about "mission-critical cyber vulnerabilities" in nuclear weapons systems. Audience testing showed that the video moved viewers eight percentage points toward NTI's position that nuclear weapons are a liability to our security—among the largest swings ever seen by the testing firm, which conducts impact measurements for hundreds of issue-advocacy clients every month.

A large, dark brown circular graphic with a dotted pattern in the top left corner, containing the title text.

Spotlighting Emerging Biotech Risks



Jaime Yassif addresses a meeting of NTI's Biosecurity Innovation and Risk Reduction Initiative.

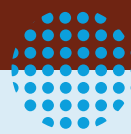
Bioscience and biotechnology offer tremendous potential benefits—from improving human health to fostering economic development to combating climate change—but these innovations also can increase the risks of accidents or deliberate misuse with potentially catastrophic, global consequences. National governments have the lead in providing oversight but have struggled to keep pace with rapid advances. The international community—with governments, industry, and the research community working in tandem—must take bold steps now to safeguard bioscience so the world can benefit from its promise and prevent its perils.

To close global biosecurity gaps and develop practical solutions to safeguard bioscience, NTI | bio announced in a January article for *Science and Diplomacy* our plans to incubate and launch the **International Biosecurity and Biosafety Initiative for Science (IBBIS)**, an independent, international organization with the singular mission of reducing emerging biological risks associated with technology advances. IBBIS will work with all stakeholders on the front lines of biosecurity to reduce risks throughout the research and development lifecycle so bioscience and biotechnology can advance safely and responsibly.



Jaime Yassif and Hayley Severance briefing on IBBIS in Berlin, Germany.

NTI | bio introduced IBBIS to key audiences at international meetings throughout the year, including at the Global Health Security Conference in Singapore in June, the G7 Global Partnership meeting in Berlin in October, and the ninth BWC Review Conference in Geneva in December. NTI leaders shared the long-term vision for IBBIS and briefed global audiences on IBBIS' initial focus on developing biosecurity tools and best practices for DNA providers to prevent the misuse of DNA synthesis technology.



Win for a New Biosecurity Organization: Introducing IBBIS' Inaugural Executive Director

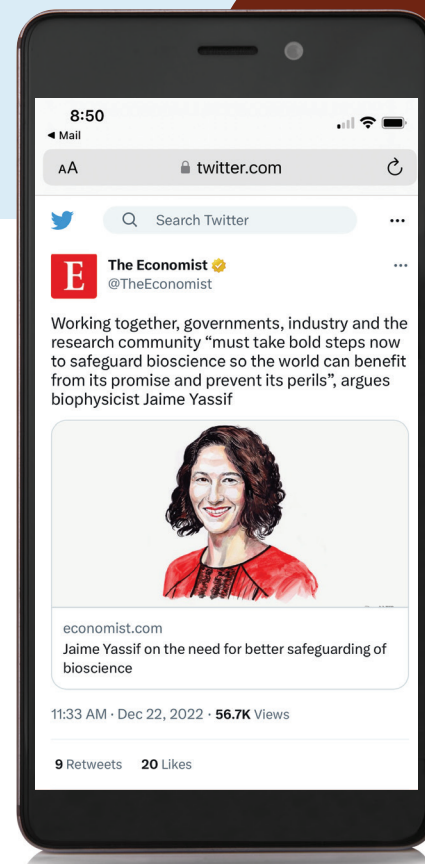
Dr. Piers Millett, an internationally recognized expert in global biological risk reduction with nearly 25 years of science policy experience, was appointed in October as the founding executive director of the International Biosecurity and Biosafety Initiative for Science (IBBIS)—a new organization NTI | bio is establishing to work with global partners to strengthen biosecurity norms and develop practical, innovative tools to uphold them.

“I am thrilled to lead IBBIS and look forward to working collaboratively with industry and governments to develop tools and solutions that can fill critical biosecurity gaps so we can address emerging biological risks as they arise,” Millett said. “My hope is that IBBIS can be a resource and partner for stakeholders across the globe working to advance the life sciences and grow the bioeconomy, so we move the field forward together, safely and responsibly.”



Millett has deep experience from his work in the synthetic biology community; within the United Nations system, at the BWC, and with the World Health Organization; and from his role as an advisor to the Government of the United Kingdom.

In recent years, DNA synthesis technology has become more widely accessible, making the potential building blocks of a dangerous pathogen just an online order away. Although many suppliers have self-imposed screening requirements, an estimated one in five orders go un-screened. To close this gap, **NTI and the World Economic Forum convened an international Technical Consortium** of experts from across industry, academia, government, and civil society to help develop the **Common Mechanism for DNA Synthesis Screening**, software that DNA providers can use to screen DNA synthesis orders and customers, to help ensure their product is not misused or involved in a catastrophic accident.



In 2022, NTI and our partners made progress on developing key components of the software package, including a set of reference databases, a screening algorithm, and a novel database of “benign” and “biorisk” sequences. Beta testing and peer review of the system is the last step before the Common Mechanism will be available for use. “This is something that’s never been done before outside of a DNA synthesis company, and it will dramatically improve global biosecurity,” said James Diggans, head of biosecurity at Twist Bioscience, an industry leader in DNA synthesis technology.

In June, NTI | bio convened a meeting of the **Biosecurity Innovation and Risk Reduction Initiative (BIRRI)** in London with more than 30 international leaders from the academic research community, biotechnology industry, governments, international organizations, and philanthropy. They discussed how IBBIS can work alongside the World Health Organization and the BWC to strengthen biosecurity norms and develop innovative tools to uphold them. Attendees also discussed ways to work with national governments to create stronger oversight systems.

BIRRI meeting participants also discussed three new pilot projects aimed at incentivizing stronger biosecurity practices. The **Seal of Approval Project** aims to change current incentive structures within research institutions and among providers of key materials and services to encourage them to take steps to guard against biosecurity risks; a **Biotechnology Funders Compact** seeks public commitments by organizations that fund research to incorporate biosecurity reviews into their decisionmaking processes; and a **Cyber-Data-Biosecurity Intersection Project** explores innovative risk-mitigation approaches at the intersection of cybersecurity, data security, artificial intelligence, and biosecurity.

To round out the year, NTI | bio partnered with Carnegie India as one of four official knowledge partners for the **seventh annual Global Technology Summit** in New Delhi, an event co-hosted by India’s Ministry of External Affairs. NTI | bio experts took the main stage for a plenary session titled, “Architecture for Global Biosafety and Biosecurity,” on the same day that India assumed the G20 presidency and highlighted India’s opportunity—as a nation with one of the fastest growing bioeconomies—to make biosecurity, biosafety, and biotechnology governance a priority on its G20 agenda.

Strengthening Biosecurity in an Era of Benchtop DNA Synthesis



A graphic from NTI's explainer video on DNA synthesis screening.

Modern bioscience relies on synthetic DNA for everything from studies of biological systems to vaccine development to agricultural production. For decades, researchers have ordered high-quality, low-cost synthetic DNA from companies that customize DNA to match customer needs. This system has allowed for a reasonable level of oversight, with most major traditional DNA providers screening orders to flag requests for pathogen or toxin DNA.

But new benchtop DNA synthesis devices will enable researchers to obtain synthetic DNA more rapidly by printing it in their own laboratories. This on-demand, decentralized production of synthetic DNA allows for faster and easier access, but it also could enable a user to create pathogen or toxin DNA without detection.

NTI's forthcoming report, **Benchtop DNA Synthesis Devices: Capabilities, Biosecurity Implications, and Governance**, addresses key questions critical to understanding the status of benchtop DNA synthesis device capabilities and the broader implications for biosafety and biosecurity. The report will include recommendations to address the risks posed by this rapidly evolving industry and draws on the perspectives of more than 30 experts from benchtop synthesis companies, the broader biotechnology industry, as well as the biosecurity and bioscience research communities.



Driving Progress to Prevent and Respond to Biological Events

The year started fresh on the heels of the December 2021 release of NTI's **Global Health Security (GHS) Index** and its key finding that, despite the devastation wrought by COVID-19, no country is fully prepared to address future pandemics or other catastrophic biological events. Our work in 2022 was driven by the recognition that without significant progress, the next pandemic could be even worse.

In February, Ernie Moniz and Munich Security Conference (MSC) Chairman Ambassador Wolfgang Ischinger virtually convened 19 global leaders and experts for a **high-level tabletop exercise on reducing high-consequence biological threats**. This was the fourth year that NTI partnered with MSC to bring high-level attention to biothreats by convening senior leaders from across government, industry, and civil society to explore gaps in the global biosecurity and pandemic preparedness architecture and to identify concrete actions to address them.

In 2022, the fictional scenario for NTI's tabletop exercise involved a bioweapon attack against cattle with a genetically engineered strain of the Akhmeta virus. Although the attack was intended to cause economic damage by targeting agriculture, the virus quickly spilled over into humans and continued to spread, rapidly evolving into a global pandemic. The exercise revealed that the global response was complicated by challenges attributing the source of the pandemic, by a lack of coordination across sectors at national and international levels, and by cyber intrusions affecting disease detection systems. Over 20 months, the fictional Akhmeta outbreak caused 2.2 billion cases and more than 120 million deaths.

Discussions and recommendations from the exercise focused on the need to coordinate an effective international response to high-consequence biological events that have cascading effects on critical infrastructure, supply chains, and public services; the impact of cybersecurity risks on prevention and response to biological events; opportunities to strengthen biothreat intelligence; and effective approaches for assessing biological events of unknown origin.



A fictional news video from NTI | bio's tabletop exercise.



Win for Global Health Security: GHS Index Impact

In September, NTI celebrated a major step forward for global health security with the establishment of the World Bank's Pandemic Preparedness Fund, the first global financing mechanism focused primarily on building pandemic prevention, detection, and response capacity in low- and middle-income countries.

Creating new funding streams to fill preparedness gaps was a key recommendation of the inaugural **GHS Index** in 2019, and NTI | bio, working in partnership with the Pandemic Action Network, played an instrumental role in the fund's conception, development, and launch. Now that the fund is operational, the **GHS Index** can help Pandemic Fund decisionmakers prioritize investments and allocate resources

based on data about the most important capacity gaps. Data from the **GHS Index** also can help countries build strong funding proposals and measure the impact of investments.

In the United States, the 2023 National Defense Authorization Act approved by Congress recognized the **GHS Index** as a valuable resource to guide U.S. global health security investments and suggested that the U.S. government use the **GHS Index** to inform prioritization and funding decisions for the Pandemic Fund.

The continued uncertainty and debate about the genesis of COVID-19 underscores the need for a **mechanism to rapidly identify the source of emerging pandemics**. The ability to rapidly discern outbreak origins will allow global decision-makers to mitigate risks in real-time and more effectively prevent crises in the future. Current international investigative mechanisms are critically important but have significant gaps. The World Health Organization has robust outbreak investigation capabilities and a strong comparative advantage in assessing naturally emerging infectious disease outbreaks, and the UN Secretary-General's Mechanism has the authority to investigate allegations of deliberate use of chemical and biological weapons. However, there is no process for assessing events of unknown origin that fall between the reach of these two mechanisms—for example, if it looks like an outbreak may not have emerged from natural origins but is not clearly from an accident or a deliberate attack.



NTI | bio hosts the Global Biosecurity Dialogue in Cape Town, South Africa.

To address this gap, NTI is working with international partners to develop a new **Joint Assessment Mechanism (JAM)**. Housed within the UN Secretary-General's office, the JAM would be used to rapidly establish the facts regarding the origin of an unusual outbreak, and its approach would be transparent and evidence-based to foster legitimacy in the eyes of the international community. The JAM would use new tools, methods, and technologies—such as bioinformatics, data science, and artificial intelligence—to build a capability suited to today's risk environment.

NTI | bio introduced and built support for the concept at the G7 Global Partnership meeting in Berlin and the ninth BWC Review Conference in Geneva. NTI is continuing to build support within the UN and among member states to encourage the Secretary-General to establish this new mechanism.

Raising international awareness about emerging biological risks is crucial for driving action to close biosecurity gaps. To this end, NTI hosted a meeting of our **Global Biosecurity Dialogue** in Cape Town in November. The dialogue included an in-depth discussion about the emerging biological risks posed by rapid technology advances, highlighting the need for stronger collaboration between the public and private sectors to incentivize actions to improve safety and security.

The nearly 50 high-level biosecurity experts and policymakers from across governments, international organizations, the private sector, and civil society also developed creative solutions that protect against human-caused pandemics. Participants resolved to launch a biosecurity advocacy agenda, improve biosecurity collaboration at the regional level, create transparent biosecurity systems with clear performance indicators, incentivize actions that reduce emerging biological risks associated with technology advances, and work to foster the next generation of biosecurity leaders.

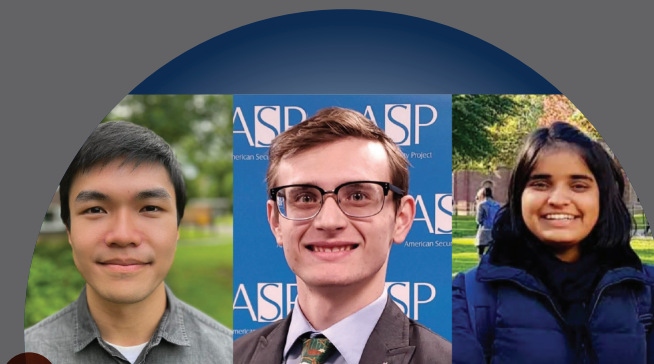
LOOKING
AHEAD

Empowering Next-Generation Leaders

Fostering the next generation of experts is crucial to the future of biosecurity and global public health. That's why NTI | bio prioritizes elevating emerging expert voices and creating opportunities for young people to share their ideas with policymakers. In advance of the ninth BWC Review Conference at the end of 2022, NTI | bio invited young leaders to submit papers for our annual Next Generation for Biosecurity Competition, which solicited proposals for an effective and politically viable BWC verification protocol, which makes use of modern science and technology.

The competition attracted applicants from the fields of public health, biosecurity, mathematics, and synthetic biology who hailed from 11 countries across five continents. The winning team presented their work at the June Global Health Security Conference in Singapore and at the August BWC meeting of experts.

NTI | bio also arranged for the winners and runners-up to meet with the U.S. Department of State in October and to attend the BWC Review Conference, where one of this year's competition winners spoke on a panel with UN High Representative for Disarmament Affairs Izumi Nakamitsu and U.S. Undersecretary of State for Arms Control and International Security Bonnie Jenkins.



2022 winners Ryan Teo, Nicholas Cropper, and Shrestha Rath.



Celebrating Two Decades of Impact

“ Sam Nunn is a hero of mine. I don’t have many heroes, but Sam is a hero, should be a hero to really every citizen of the world because Sam has worked tirelessly, effectively ... for decades to try to prevent the world from essentially destroying itself.

Warren Buffett, in a video toast to Sam Nunn



NTI celebrated 20 years of progress and achievement at our annual Board of Directors dinner in April. The anniversary event, postponed by a year due to the COVID-19 pandemic, featured inspiring toasts and tributes as well as a future-focused panel discussion on the importance of innovation in building a safer world.

In a moving video toast to NTI Co-Founder and Co-Chair Sam Nunn, long-time NTI supporter and advisor Warren Buffett said, “Sam Nunn is a hero of mine. I don’t have many heroes, but Sam is a hero, should be a hero to really every citizen of the world because Sam has worked tirelessly, effectively...for decades to try to prevent the world from essentially destroying itself.”



Carmen MacDougall welcomes guests to NTI’s 20th anniversary dinner.

The event was held at a challenging time for global security, just months after Russia invaded Ukraine. As she honored NTI Co-Chair Ted Turner as “one of the most consequential figures of our time,” PBS’ Judy Woodruff reminded the audience of the work ahead: “As we have been painfully reminded these past two months, the work of NTI to reduce the threats posed by nuclear, biological, and chemical weapons is today more important than ever.”

20th Anniversary Giving Circle

We are deeply grateful to the following donors who made a major or planned gift to NTI to commemorate our 20th anniversary and honor the visionary leadership of Sam Nunn and Ted Turner.

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- David Bernstein
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- Dick and Loretta Heiser
- Marshall and Yuko Hung
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- John Lichter
- Harry Lindmark
- Walter and Karen Loewenstern
- Michael A. Peterson
- Ray and Meredith Rothrock
- Val and Min-Myn Schaffner
- Alexa Wesner
- Blaine Wesner



“As we have been painfully reminded...the work of NTI to reduce the threats posed by nuclear, biological, and chemical weapons is today more important than ever.

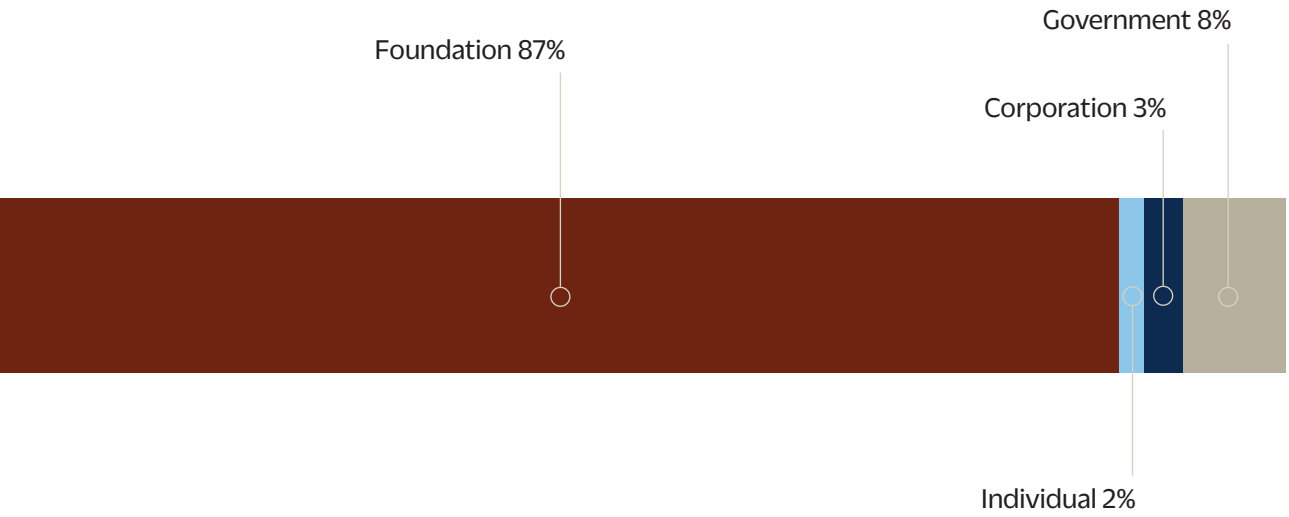
Judy Woodruff of PBS, in a video toast to Ted Turner

NTI founding president Charlie Curtis at NTI's 20th anniversary dinner.

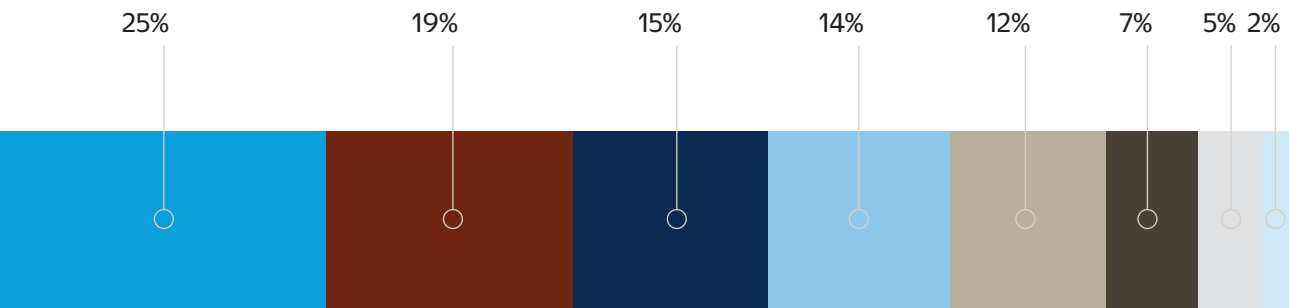


2022 FINANCIALS

Where the Funds Came From | Revenue Sources



Where the Funds Were Spent | Expenditures



2022 Expenditures	
Description	Amount
Global Biological Policy and Programs	\$ 4,803,453
Management and General	\$ 3,722,626
Communications and Public Education	\$ 2,928,962
Nuclear Materials Security	\$ 2,747,598
Global Nuclear Policy Program	\$ 2,328,560
Fundraising	\$ 1,381,099
Other Program Services	\$ 1,046,298
Scientific and Technical Affairs	\$ 481,828
Total	\$ 19,440,424

NTI is a tax-exempt, public charity under Section 501(c)(3) of the U.S. Internal Revenue Code.

THANK YOU!

We gratefully acknowledge all our 2022 funders, including the following institutions and individuals who gave \$500 or more. Thank you for supporting NTI’s nuclear and biological threat-reduction mission during this critical time. Your generosity builds a safer world now and for future generations.

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“ We believe that humans, with all their foibles, are interested in and capable of tremendous good, and that includes fixing the problems they create. We firmly believe that by supporting NTI we are creating a world with more happiness.

Amber Walker
Co-founder of Happy Human, LLC, which donates 5% of its profits to NTI

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As of December 2022

SAYING FAREWELL

NTI mourned the passage in 2022 of several exemplary leaders, devoted public servants, and champions for peace and global security—all cherished friends and partners in our work to build a safer world. We are grateful for their service on NTI's Board of Directors.



Charles A. Bowshe, a leader in the world of finance and accounting who spent 15 years as the Comptroller General of the United States and head of the General Accounting Office, was a distinguished public servant who believed in the power of speaking the truth. He made significant contributions to U.S. fiscal and budgetary policy, as well as U.S. and international accounting and auditing policies, and he played an invaluable role at NTI on fiscal matters and was deeply dedicated to our mission. We benefited greatly from his wisdom, his integrity, his expertise, and his friendship.



General Eugene Habiger, an extraordinary leader with deep expertise in national security and nuclear operations, worked tirelessly to reduce global nuclear threats around the globe and brought invaluable judgment and counsel to NTI over more than two decades. As commander in chief of the U.S. Strategic Command, Habiger was responsible for all U.S. Air Force and U.S. Navy strategic nuclear forces. It was in this position that he established an unprecedented military-to-military relationship with Russia to reduce nuclear risks. In 2000, the then-recently retired four-star general and his Russian counterpart were interviewed by CBS' *60 Minutes*. They said there were too many nuclear weapons in the world and advocated for lowering the numbers. It was that interview that inspired Ted Turner to co-found NTI with Sam Nunn in 2001.



Dr. Nafis Sadik, a trailblazer who was deeply committed to global health and security over her long career, was the first woman to lead a major, voluntarily funded agency within the United Nations. Since beginning her career as a physician in 1954, she consistently called attention to the importance of addressing gender, population, and development issues across the globe and took on a number of increasingly challenging leadership roles—from special advisor to the UN Secretary-General and special envoy for HIV/AIDS in Asia and the Pacific to executive director of the United Nations Population Fund, with the rank of Under-Secretary-General. She was an early member of NTI's Board, and she served for decades with a deep commitment to NTI's mission.



Fujia Yang, an internationally renowned nuclear physicist and educator, was dedicated to improving relations between China and the United States. An academician of the Chinese Academy of Sciences, Yang was a professor whose work took him around the world from Fudan University, where he served as president from 1993–1999, to visiting professorships in Denmark, the United States, and Japan. Most recently, he served as the sixth Chancellor of the University of Nottingham, one of the United Kingdom's leading research universities. He also served as the founding president of the University of Nottingham Ningbo China. Yang was a generous colleague, and NTI benefited enormously from his wisdom and deep expertise.



ON TO 2023 ...

The sixth edition of the **NTI Nuclear Security Index**—recognized globally as the premier resource and tool for tracking and assessing countries' progress on nuclear security—will be released this summer. Visit www.ntiindex.org

The **International Biosecurity and Biosafety Initiative for Science (IBBIS)**—an independent, international organization incubated by NTI—is launching to address emerging biological risks posed by advances in bioscience and biotechnology. Learn more at www.ibbis.bio

The third annual **#CranesForOurFuture** campaign takes flight August 4–9. Fold and share a paper crane on social media with your message of hope for a future without nuclear weapons. For more information, visit www.cranesforourfuture.org



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