MEETING SUMMARY:

Workshop on Radiological Security

London / 6 April 2017

POOL RE
REINSURING TERRORISM RISK

NTI
BUILDING A SAFER WORLD

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Letter from Des Browne and Julian Enoizi

Des Browne

Julian Enoizi

Imagine lunchtime in Trafalgar Square on a breezy summer day. Tourists are taking pictures; schoolchildren are heading to the National Portrait Gallery; office workers are enjoying a break in the sun. Suddenly, there is a small explosion next to the statue of Charles I. Several people are killed and a few others are badly hurt, but the damage is contained to the immediate vicinity of the statue.

Or so it seems.

As police and other first responders rush in to clear the area and tend to the injured, they have no idea that the bomb has dispersed a radioactive powder called cesium-137. It is already wafting down Whitehall and over Downing Street, Scotland Yard, the Houses of Parliament, and across the Thames to St. Thomas' Hospital and into the neighbourhoods of South London.

London has been hit with a "dirty bomb."

It is a horrifying scenario and one with long-term implications. Unlike a nuclear weapon, a radioactive bomb would not cause catastrophic levels of death and injury—but depending on its chemistry, form, and location, a radioactive bomb could cause tens of billions of pounds in damage owing to the costs of evacuation, relocation, and clean-up.

In addition to causing mass panic, a single radioactive bomb could render an area as large as several square kilometres uninhabitable for years.

Our organisations, Pool Reinsurance Company Ltd. (Pool Re) and the U.S.–based Nuclear Threat Initiative (NTI), have been working together to address the risks posed by radiological sources in the United Kingdom and globally. In April 2017, we held a joint conference in London with more than 50 representatives from the government, academia, medical community, and insurance and reinsurance sectors.

We examined the threat posed by terrorist organisations looking to acquire and use radioactive material in a bomb. We gained insights into the vulnerability of radioactive sources used in research and medical equipment, such as hospital blood irradiators. Finally, we explored the potential consequences of a dirty bomb attack and the implications for the insurance and reinsurance industries.

This paper summarises the NTI/Pool Re Workshop on Radiological Security and highlights ways to mitigate—and even eliminate—the risks of a dirty bomb. Important steps can be taken to do just that, and other countries have begun to take them.

Pool Re and NTI have a common interest in reducing and mitigating risks. Both organisations believe it is incumbent on us all—governments, academia, and private sector—to take action to protect public health and safety from the growing threat of radiological terrorism.

Des Browne
Member of the House of Lords, former UK Secretary of State for Defence, Vice Chairman of NTI

Julian Enoizi
Chief Executive Officer of Pool Re

Summary

Terrorist threat: According to Pool Re's Terrorism Threat & Mitigation Report: August–December 2016, the threat level in the United Kingdom remains severe and persistent in nature, and the main driver continues to be Islamist extremism, in particular Al Qaeda, Daesh, and their respective global affiliates.

Nature of the threat: Terrorist organisations have expressed interest in weapons of mass destruction and disruption, including nuclear, chemical, and radiological. Because there are radiological sources located at thousands of sites worldwide, experts believe the probability of a terrorist successfully detonating a radiological bomb is much higher than that of an improvised nuclear weapon.

Radiological isotopes: There are four commonly used radiological isotopes. The most dangerous isotope is cesium-137 because it is widely used in open medical and research facilities and thus vulnerable to theft and because it is highly dispersible given its powder form.

Consequences of a dirty bomb: Using the modelling scenarios prepared for the workshop, the economic impact of a cesium-137 bomb explosion in London could be on the order of tens of billions of pounds, depending on the required clean-up level and the location of the event.

Financial and psychological impact: A dirty bomb attack would incur significant costs in property damage, denial of access, relocation, loss of attraction, and business interruptions, not to mention economic loss. In addition, there would be considerable public loss of confidence in the ability of the government to protect its citizens.

Mitigating and eliminating the threat: Security around vulnerable radiological sources, as well as their supply chains, can and should be increased. But the only way to completely eliminate the threat is to replace cesium-137 sources with safe, effective alternative technologies. Such alternative X-ray technologies are on the market and offer equivalent medical outcomes.

Several countries are making progress: Alternative technologies are already being used in France, Norway, and Japan. In the United States, New York City is working to replace all of its 30 cesium-137 blood and research irradiators within the next two years. In Atlanta, Emory University Hospital has replaced its cesium-137 blood irradiator. NTI also is working with officials in California, which has more cesium-137 sources than any other state.

Threat Overview

The ingredients for a radiological dirty bomb—which are the very same isotopes that can make life-saving blood transfusions and cancer treatments possible—are located at thousands of sites in more than 150 countries, many of which are poorly secured and thus vulnerable to theft. As a result, experts believe the probability of a terrorist successfully detonating a dirty bomb is much higher than that of an improvised nuclear weapon.

The vulnerability of those radiological sources, particularly cesium-137, which is used in blood irradiators in hospitals and other open environments, has caused concern for years—but today the risk is growing. Radical terrorist organizations, such as Daesh, have said they are looking to acquire and use radioactive material in a dirty bomb. In 2016, Belgian investigators discovered terrorists monitoring an employee at a highly enriched uranium research reactor that also produces medical isotopes for a large part of Europe. In addition, recent media reports from Iraq and Syria indicate that Daesh extremists may have already stolen enough material to build a radiological bomb.

Although radioactive isotopes also are used for various purposes at universities and research centres, in agriculture, in the oil and gas industry, and by governments, the isotopes are considered most vulnerable in busy, often unguarded, medical settings where staff turnover can be high and many people have access to the machines housing the isotopes.

There are several radiological isotopes of concern, but a bomb that spreads cesium-137 would have the most devastating consequences. Some of the other potentially dangerous isotopes are hard metals that likely would be dispersed as fragments and could be picked up from the ground or extracted from buildings after a detonation. Cesium-137, however, is a highly dispersible powder, so exposed buildings might need to be demolished and the debris removed, with access to the contaminated area denied for years while the site is cleaned well enough to meet minimal environmental guidelines for protecting the public.

PRESENTATIONS

Pictured left to right: Steve Coates, Andrew Bieniawski, Deborah Rosenblum, Julian Enoizi and Ed Butler

Presentations

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Presentation Highlights

Introduction: The Cesium-137 Threat, the Consequences of a Dirty Bomb, and Risk Reduction Measures

The Rt. Hon. the Lord Browne of Ladyton

The Rt. Hon. the Lord Browne of Ladyton (Des Browne), Vice Chairman, NTI

The former U.K. Defence Secretary emphasised that radiological terrorism is a more urgent threat than nuclear terrorism and that additional global efforts are needed to raise awareness and to reduce the risk.

He explained that regulations and guidelines for protecting radiological materials have traditionally focused on safe handling of the materials—not on securing the materials from theft. As a result, radioactive sources, which often are located in so-called soft target settings open to the public, can be easily and quickly removed from the equipment that houses them, such as hospital blood irradiators. He also noted that it does not require technical expertise to build a radiological dirty bomb.

Cesium-137, in particular, has been a concern for years, he said, and could be a weapon of choice for terrorists because a dirty bomb would

- Terrify citizens in the area where it was detonated and, indeed, around the world
- Exacerbate public mistrust in governments' ability to protect against devastating attacks
- Generate tremendous news media attention for the terrorist organisation behind it, which would help with recruitment and financial support
- Have massive economic repercussions—some estimates say in the tens of billions of pounds—as thousands of people and businesses were relocated, buildings were demolished, and debris were removed
- Render large sections of a city uninhabitable for years

Browne underscored that today it is possible not only to reduce the risk posed by cesium-137 but also to eliminate it. Technological advances have allowed hospital blood irradiators that use cesium-137 to be replaced with alternative devices that are safe and effective and that produce equivalent medical outcomes.

The Threat of CBRN Weapons to the United Kingdom

Ed Butler

Ed Butler, CBE, DSO, Head of Risk Analysis, Pool Re

Ed Butler explained that a terrorist event in the United Kingdom that involves chemical, biological, radiological, or nuclear (CBRN) material is currently considered to be a high-impact, low-probability event. In the categories of CBRN, chemical weapons present the biggest threat and are thought to be the most likely, with radiological weapons ranked second, biological weapons third, and nuclear weapons last. He said that governments need to "think the unthinkable" regarding a radiological weapon being used by a terrorist group in a major city. Conceptualising these possibilities will allow better understanding of the risk, impact, and consequences of such an attack, as well as permit consideration and design of contingency plans and appropriate insurance coverage to mitigate the impact, thereby improving everyone's collective resilience to a catastrophic event.

The March 2016 terrorist bombings in Brussels prompted new worries that Daesh is seeking to infiltrate and attack nuclear installations or to obtain radioactive materials to make a dirty bomb (insider threat).

Butler said the main driver for the terrorist threat continues to be Islamist extremism, in particular Al Qaeda, Daesh, and their global affiliates. In fact, despite the probable military defeat of Daesh in Iraq and Syria, the ideology of the group is likely to endure, possibly becoming more diffuse and dangerous. As Daesh loses territory in Iraq and Syria, the group may become more desperate to carry out devastating attacks using novel technologies and methodologies in Europe and elsewhere.

The March 2016 terrorist bombings in Brussels prompted new worries that Daesh is seeking to infiltrate and attack nuclear installations or to obtain radioactive materials to make a dirty bomb (insider threat). Investigators found that terrorists in Belgium were monitoring an employee of a highly enriched uranium research reactor that produces medical isotopes for a large part of Europe.

Butler also expressed concern about violent home-grown extremists—individuals who become self-radicalised and are inspired by online propaganda and who access recipes and guidance on making dirty bombs through the dark web. Perhaps the biggest challenge, however, is how security agencies and governments respond to the high number of experienced fighters who return to their home countries with newly acquired tactics, technologies, and experiences from the frontlines in Syria and Iraq.

The Radiological Risks and Comparison with an Improvised Nuclear Device

Andrew Bieniawski, Vice President for Material Security and Minimization, NTI


Andrew Bieniawski

Andrew Bieniawski described the various forms of and uses for radioactive isotopes and explained in detail why cesium-137 is of particular concern.

Unlike the materials needed for a nuclear weapon, which are located in fewer than 25 countries, the materials needed to build a dirty bomb can be found in thousands of hospitals, medical centres, research labs, and businesses in more than 150 countries—and many of those materials are poorly secured. That issue makes the threat of radiological terrorism a problem that requires global awareness and action.

Bieniawski described the four radiological isotopes of concern that are commonly used for cancer treatment, blood sterilisation, radiography, oil exploration, and more: cesium-137, cobalt-60, iridium-192, and americium-241. Those isotopes and their applications represent 99 per cent of all International Atomic Energy Agency highest-risk materials (Category 1 and Category 2).

Unlike cobalt and iridium, which are hard metals and are difficult to disperse, cesium-137 is the most attractive and dangerous isotope from a terrorist perspective because of its chemical form (powder). It can easily be dispersed with high explosives, is difficult to clean up, contains a very high level of dangerous radiation, and has a long half-life (30 years).

Bieniawski emphasised that these factors combine to create an exceptionally costly and high-consequence event if terrorists detonate a dirty bomb that contains cesium-137. Although such a bomb would not cause the immediate, large-scale loss of life and physical destruction associated with a nuclear detonation, the effects of a dirty bomb would be substantial because buildings would likely have to be demolished and access to the contaminated area could be denied for years. Also, the psychological impact would be significant given that a dirty bomb would magnify the public's fears of radiation.

The risk of radiological terrorism was highlighted at the 2016 Nuclear Security Summit, but more concrete steps are needed to accelerate global risk reduction efforts. Risk mitigation strategies should consider efforts to secure the most vulnerable highest-activity sources, to dispose of and remove disused and unwanted sources that have reached the end of their life cycle, and to accelerate efforts to replace cesium-137 blood and research irradiators with X-ray devices that cannot be used to make a dirty bomb.

The effects of a dirty bomb would be substantial because buildings would likely have to be demolished and access to the contaminated area could be denied for years. Also, the psychological impact would be significant given that a dirty bomb would magnify the public's fears of radiation.

International interest in, and support for, replacing high-risk sources is growing. Several countries have advanced well beyond advocacy for alternative technologies and are switching to non-isotopic alternatives. Norway, France, and Japan have begun phasing out the use of cesium-137 irradiators.

What Would an Event Look Like in the United Kingdom? Two Modelling Scenarios

Leonard W. Connell, Ph.D.

Stephen Johnson, Cranfield University

Leonard Connell, formerly of Sandia National Laboratories in the United States, and Stephen Johnson, from Cranfield University in the United Kingdom, each presented modelling scenarios—developed independently—that enhance understanding of the possible effects of a dirty bomb explosion in London. Both models showed how radioactive material might disperse in an urban environment and then assessed the economic impact if access to a section of London had to be denied for years following such an attack.

Each model was well documented and validated, and the two models came to the same conclusions regarding the extensive damage and costs related to a dirty bomb.

Connell and Johnson modelled the effects of a dirty bomb detonated near the centre of London, between Trafalgar Square and the statue of Charles I. The simulated explosion used cesium-137 from a blood irradiator. Connell used a standard U.S. dispersal code that models the essential elements of the dirty bomb problem, including real-time weather data for London. Johnson used a different code with similar capabilities but with the dirty bomb physics modelled in a slightly different manner.

Both models computed ground contamination footprints that showed the extent of radioactive contamination overlaid on a map of London. The footprints are defined by contour lines that are labelled with a contamination dose level. The area inside the contour line will have a contamination level at least as high as the level given on the contour line itself. Neither model detailed the effects of the city's buildings on the ground contamination contours.

Buildings can create complex three-dimensional flow fields below the canopy of the buildings, the so-called urban canyon effect. Computational fluid dynamics codes are needed to resolve the fate of the plume as it drifts into the urban canyon. The codes are very computationally demanding, taking hours or more to run a single problem. They are best suited for other scenarios (chemical, biological) where hot spots in the wake behind buildings can create localised hazard zones.

Such severe hazard conditions generally are not created with a dirty bomb, and the less computationally intense codes (used by Connell and Johnson) are sufficient to compute the extent of the contamination footprint. The urban canyon environment will push and pull the smooth contours computed by the simpler codes but will not significantly alter the total area contained in a given contour. Therefore, the simpler codes generally provide a ballpark answer—that is, within the level of uncertainty that already exists owing to the random plume mixing and motions created by air turbulence.

An important variable in controlling air turbulence and stability is the daily cycle of ground heating by the sun. In the morning when the ground is cool from overnight heat loss, the atmosphere tends to be stable with low turbulence, and a plume released in the morning will tend to fan out horizontally with not much vertical mixing. In the afternoon, when the ground is warm relative to the air, high turbulent mixing will occur with large looping motions created by rising and falling thermal air parcels. A plume released in the afternoon will see much greater vertical dispersion. Daily changes in wind speed and turbulence can have a significant impact on the ground contamination footprint, perhaps a factor of two or more, as was shown by Connell's results.

The main drivers for the development of dispersion codes have come from three agencies: nuclear power plant safety and regulatory agencies, which funded the development of plume models for reactor accidents; environmental agencies interested in modelling plume releases from industrial smoke stacks; and nuclear weapon and defence agencies, which funded the modelling of plutonium dispersal accidents.

The dispersion codes have been around since the 1960s but have been applied to atmospheric dispersal modelling of terrorism scenarios involving weapons of mass destruction only since the 1990s. They have been validated over the years by testing with short half-life radioactive tracers and other simulated materials and from actual plutonium dispersal tests in Nevada during the 1960s.

Although no international standards exist for deciding when to quarantine an area contaminated with radioactive materials, the international guideline is to quarantine and relocate the population when the dose to a member of the general public living in a contaminated zone would exceed 20 millisieverts (the international metric for measuring radiation exposure and dose) per year (mSv/yr). Unfortunately, there also is no international standard for decontamination; that is, how clean is clean enough and when should the public be allowed back into a quarantined zone? However, the international guideline for clean-up (as used at Fukushima) is that the long-term goal should reduce contamination to about 1 mSv/yr. Also, an intermediate goal for decontamination is often recommended, typically a value of 5 mSv/yr.

For a high population density, high economic zone, such as London, the financial impact of a dirty bomb could be in the tens of billions of pounds.

It is therefore common in dirty bomb modelling to show the ground contamination contours for 20 mSv/yr, 5 mSv/yr, and 1 mSv/yr. Results of Connell and Johnson's modelling were in good agreement. They obtained the following approximate contour areas: 20 mSv/yr contour area = 1 km2, 5 mSv/yr contour area = 5 km2, and 1 mSv/yr contour area = 20 km2.

Overall costs and business impacts are governed by the amount and type of area contained in the 20 mSv/yr and 1 mSv/yr contours. For a high population density, high economic zone, such as London, the financial impact of a dirty bomb could be in the tens of billions of pounds.

Panel: Application to the Healthcare Sector and Mitigation Measures

Deborah Rosenblum, Executive Vice President, NTI

Christopher Boyd, Assistant Commissioner, New York City Department of Health and Mental Hygiene

Dr. Jacob Kamen, Mount Sinai Hospital, New York City

Ioanna Iliopulos, NTI

Colin Mackie, U.K. Department for Business, Energy and Industrial Strategy

This panel explored the steps New York City has taken to mitigate the risk of a terrorist attack with a dirty bomb. Speakers described how cooperation among private industry, state government, and federal government helped ensure success. Colin Mackie, a U.K. official, described the U.K. government's strategy.

Boyd explained in detail how a terrorist could obtain a radioactive isotope from a piece of medical equipment and said it should be a priority to replace cesium-137 devices with alternative technologies. Given the socioeconomic cost of a dirty bomb detonation, public health officials must change the paradigm of how radiological security is approached.

New York City Efforts to Reduce the Risk

Given its history as the centre of the most devastating terrorist attack on the United States, New York City is at the forefront of national efforts to promote permanent threat reduction. In partnership with NTI, Christopher Boyd, Assistant Commissioner for the New York City Department of Health and Mental Hygiene, and Dr. Jacob Kamen, from Mount Sinai Hospital, described ongoing efforts to remove and replace the city's approximately 30 cesium-137 blood and research irradiators with X-ray technology.

This panel session highlighted the challenges and successes in New York City and the potential application to other major city initiatives.

Public health imperative: Boyd explained in detail how a terrorist could obtain a radioactive isotope from a piece of medical equipment and said it should be a priority to replace cesium-137 devices with alternative technologies. Given the socioeconomic cost of a dirty bomb detonation, public health officials must change the paradigm of how radiological security is approached. Boyd called it a public health issue. He said the protection and promotion of public health services require that government at all levels protect those services from any potential disruption resulting from a terrorist attack.

Peer-to-peer education, information sharing, and cooperation: Boyd shared his experiences in gaining support for and commitment to the adoption of alternative technologies. Success required educating hospital administration officials on the security, safety, and liability risks associated with high-activity radioactive material, because most hospital administrators do not fully understand that their facilities are responsible for their radiation sources from "cradle to grave" and for liability costs.

Physical security is not enough: Kamen shared Mount Sinai's experiences in reducing and removing the risks of malicious use of radioactive sources. He discussed his institution's experience, beginning in 2010, when the hospital concluded that physical security upgrades were not sufficient and decided to remove and replace its radiological sources.

Alternative technologies: Mount Sinai decided to replace all four of its blood and research irradiators with X-ray technology to eliminate both risk and liability. Kamen presented empirical data showing that X-ray devices provide data comparable to cesium-137 irradiators.

Costs and other practical matters: Obtaining commitments to implement a successful transition in New York City required securing federal and private funding to incentivise permanent risk reduction. Ioanna Iliopulos, former director of the Office of North and South American Threat Reduction in the U.S. Department of Energy's National Nuclear Security Administration, described several U.S. government programs that offer states help with implementing additional security measures, subsidies for replacement technology, training for law enforcement, and assistance with the removal of excess and unwanted radiological sources.

Iliopulos emphasised that cooperation between state governments and industry is critical to advancing threat reduction and promoting the use of safe new technologies in other major cities. With approximately 850 cesium-137 devices in the United States, hospitals, universities, and research facilities play a vital role in implementing security measures, providing patient care, and conducting important and sensitive research on a daily basis.

The U.K. Strategy

Colin Mackie from the U.K.'s Department for Business, Energy and Industrial Strategy described his government's strategy and his department's responsibility for approving security arrangements in the civil nuclear industry and for enforcing compliance to prevent the theft or sabotage of nuclear or other radioactive materials. He indicated that the department is addressing the full spectrum of protective measures, including physical protection, personnel security, and cybersecurity while evaluating the role that nuclear energy will play in the future.

The Insurance Perspective

Steve Coates, Chief Underwriting Officer, Pool Re

Steve Coates

Steve Coates explained how prior to the Irish Republican Army's bombing campaign in the United Kingdom, which culminated in the bombing of the Baltic Exchange building in April 1992, commercial property and business interruption policies automatically included damage caused by terrorist events, with such claims being paid as explosion claims and not separately categorised as terrorism. Following the Baltic Exchange attack, when reinsurers withdrew coverage, insurers in the United Kingdom would have had to exclude terrorism. After some lobbying, the government agreed to provide a line of credit to enable the industry to set up a mutual insurer to provide terrorism coverage. Pool Re was established in January 1993, and the coverage offered at that time was restricted to fires and explosions only.

Coverage from Pool Re continued on the fire and explosion basis until 2001 when, in light of the unprecedented nature of the

9/11 attacks, a review of the scheme was undertaken. The scale of the 9/11 attacks led to calls for extending protection to all risks, including damage caused by chemical and biological weapons as well as nuclear contamination. That protection became effective January 1, 2003. The provision of CBRN coverage was unusual in that the underlying property policies reinsured by Pool Re did not cover such perils, and it remains the position today.

Since 9/11, many other similar terrorism insurance schemes have been created around the world as the provision of reinsurance coverage became restricted; some of these global terrorism insurance pools cover CBRN risks. A lack of credible modelling techniques is one of the drivers for terrorism insurance schemes, and in many ways, the modelling of CBRN perils remains in its infancy. Pool Re is working on a new terrorism model, which will include more sophisticated analysis of CBRN losses, and it is one of the main reasons behind Pool Re's partnership with NTI.

> Handling significant damage and contamination claims arising from a radiological event could fit the definition of a super-catastrophe, which would involve damage and contamination on a massive scale, wider area damage, post-loss amplification, and impacts to the wider economy.

Coates explained that catastrophic events present special challenges for risk management because they can have severe long-term economic and social consequences that are difficult to assess quantitatively.

He noted that an attack involving radiological materials would involve unprecedented complexities (indemnity issues, legal and insurance precedents) for insurers and government schemes. Moreover, handling significant damage and contamination claims arising from a radiological event could fit the definition of a super-catastrophe, which would involve damage and contamination on a massive scale, wider area damage, post-loss amplification, and impacts to the wider economy. Such losses tend to exceed normal model parameters. A radiological event may also involve difficulties around the interpretation of insurance policy terminology, such as damage (molecular change, impairment of use, contamination), and may, in the absence of sufficient clarity around coverage, fall hostage to complicated post-event litigation to clarify policy terminology, coverage, and payout.

Coates said other insurance considerations must reflect incorporation of these perils, such as the setting of sums insured and indemnity periods. Risk mitigation instruments such as Business Continuity Planning, should also be appropriately adapted to reflect the likely aftermath of a CBRN event. Governments must play an important role in concert with the private sector in providing protection against losses from such an extreme event. Ultimately, said Coates, private–public partnerships are crucial when developing an insurance program that covers this type of terrorism risk.

For more information on the NTI/Pool Re Workshop, visit **www.nti.org/PoolReWorkshop**

About the Sponsors

Pool Re

Pool Re was established in 1993 as a response to the market failure that was triggered by the bombing of the Baltic Exchange. The costs of the Provisional IRA's mainland bombing campaign in the 1990s led to reinsurers withdrawing cover for terrorism-related damage, with insurers compelled to follow suit. Pool Re was founded by the insurance industry in cooperation with, and backed by funding from Her Majesty's Treasury, to form a private sector solution to a public policy objective.

Since its foundation, Pool Re has provided effective protection for the UK economy and currently underwrites over £2 trillion of exposure in commercial property to terrorism risk across the UK mainland. To date, Pool Re has paid out claims of more than £600 million at no cost to the UK taxpayer. The largest claim resulted from the 1993 Bishopsgate bombing in the City of London—then £262 million. The exposures in the same area today would be significantly in excess of that figure.

Nuclear Threat Initiative

The Nuclear Threat Initiative works to protect our lives, environment, and quality of life now and for future generations. We work to prevent catastrophic attacks with weapons of mass destruction and disruption (WMDD)—nuclear, biological, radiological, chemical, and cyber. Founded in 2001 by former U.S. Senator Sam Nunn and philanthropist Ted Turner, NTI is guided by a prestigious, international board of directors. Ernest J. Moniz is chief executive officer and co-chairman, with Sam Nunn and Ted Turner; Des Browne is vice chairman; and Joan Rohlfing serves as president.

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