NEWS

Nuclear Test Ban Treaty Gains Momentum With New and Upcoming Measures

PAGES 13–14

Although the Comprehensive Nuclear Test Ban Treaty (CTBT), which opened for signatures in 1996, still requires eight remaining "annex 2" countries—including the United States and China—to ratify it to enter into force, the treaty recently has gained some momentum.

In June 2013, for instance, U.S. president Barack Obama reaffirmed that he will work to build support in the United States to ratify the legally binding global ban on nuclear explosive testing that 183 countries, including the United States, have signed and that 161 have ratified.

In addition, the Comprehensive Nuclear Test Ban Treaty Organization's (CTBTO) preparatory commission is gearing up for an integrated field exercise. The exercise, scheduled to run between 3 November and 9 December 2014 in Jordan, will be a full-scale test of the treaty's onsite inspection regime.

Also, the International Monitoring System (IMS), CTBTO's technically advanced global network of sensors to detect and characterize nuclear explosions, is already demonstrating its usefulness as it nears completion, with 85% of an anticipated 337 monitoring stations already established. In 2013, for instance, a number of IMS stations, including radionuclide stations, detected evidence related to the 12 February 2013 nuclear test by North Korea. The IMS includes seismic, hydroacoustic, infrasound, and radionuclide stations, which send data to CTBTO headquarters in Vienna, Austria.

Chinese Stations Providing Key Data

Adding most recently to the treaty's momentum, as of 1 January, CTBTO's preparatory commission has begun to receive data from some of the 9 fully installed IMS stations hosted in China, the organization announced in a statement on 6 January. China's IMS stations are being phased in gradually as part of an extensive test and evaluation process, with well-established stations being the first to enter this process, CTBTO spokesperson Thomas Mützelburg told *Eos*.

The stations hosted by China that started to provide data on 1 January are ones that send data continuously. They include radionuclide stations (among which are those that are capable of detecting radioactive noble gases in addition to radioactive particles) and primary seismic stations (as opposed to auxiliary seismic stations that send data on demand only), Mützelburg noted. Prior to 2014, CTBTO had been receiving data continuously only from noble gas systems at radionuclide stations in Beijing and Guangzhou, China, he added.

"Any additional station adds to the International Monitoring System's global coverage by driving down the detection threshold. They improve detection, location and characterization capability and make the monitoring system more resilient. Radionuclide stations are particularly important in this regard as regional coverage increases the likelihood that minute quantities of radionuclides will be detected," he told *Eos*. "China's sending data sets an important example for other countries with outstanding issues regarding IMS stations. There are some encouraging first signs from discussions with relevant countries and we are now cautiously optimistic that China's example will help dismantle any remaining barriers to full completion of the IMS."

In the CTBTO statement on 6 January, the organization's executive secretary, Lassina Zerbo, noted, "The Chinese stations' data significantly enhances our system's global coverage. And it is more than that: China has demonstrated its dedication to the [CTBT] and its verification regime."

Earlier, during a 9 December session (U13A) about the CTBT at the AGU Fall Meeting in San Francisco, Calif., Zerbo expressed optimism that obtaining data from China would provide momentum for the treaty. "If we get that [Chinese data], we might get Iran to connect a station [to the IMS] and maybe get Egypt to build a station," he said, adding that those further steps could help close a gap in coverage in the Middle East.

In addition to the United States and China, six other annex 2 countries—whose signature and ratification are required for the treaty to enter into force—have not yet ratified it. Annex 2 countries Egypt, Iran, and Israel have not yet ratified the treaty; India, North Korea, and Pakistan have neither signed nor ratified it.

"People often say the United States is the 800-pound gorilla, and the rest are 300 pounds," he said, referring to annex 2 countries that still need to ratify the treaty. "There is no 300-pound and 800-pound. All the 8 remaining countries are 800-pound gorillas, because if you don't have the ratification of any of them, the treaty will not get into force."

"CTBT and its verification system are the ultimate expression of science for peace," said Zerbo, speaking before an audience that included a number of scientists who have contributed technical expertise to the treaty. "Scientists need to be more mobilized than ever. Assuring that the CTBT verification system is reliable and trustworthy is of utmost importance for the CTBT's entry into force."

Making the Case for the Treaty

During the same Fall Meeting session, U.S. Acting Under Secretary of Arms Control and International Security Rose Gottemoeller said that because of technical advances, there is a stronger case to be made for the treaty now than in 1999, when the U.S. Senate failed to ratify it.

In particular, she noted that there have been significant advances by the United States in maintaining its nuclear stockpile without nuclear testing. In addition, she said that there have also been significant strides regarding verification of the treaty, noting that the IMS was just a concept 2 decades ago and that onsite inspection is being developed into a valuable tool.

Gottemoeller said that she realizes that the treaty is not at the forefront of many people's minds these days and that she often is questioned about why the United States should bother to ratify the treaty when most countries are maintaining a moratorium on explosive nuclear testing. "To me, the answer is clear: entry into force of the CTBT will provide legally binding prohibition on nuclear explosive tests for all parties, thus hampering the nuclear arms race in places where it is hot today."

"It's a slow effort to build up again the knowledge and understanding of the treaty and then to be able bring it back to the Senate. I don't want to rush up there. That's the problem that we had with our last ratification fight, to be quite honest," she said. "It was rushed through the Senate and the result was not a good one. So I feel that we need to take some time and do this in a deliberate way but nevertheless in an intensive way. We've had, to be quite honest, a desultory effort over the past couple of years. Now is the time to intensify and really focus on getting this done."

She also called on the scientific and technical community to work further on the CTBT. "To the degree to which the technical community is willing to step forward and talk about the benefits of this treaty, it will be very important to our success down the road in working [the treaty] on Capitol Hill," she said.

At the AGU Fall Meeting session, Terry Wallace, principal associate director for global security at the U.S. Department of Energy's Los Alamos National Laboratory in New Mexico, called the CTBT "one of the most ambitious arms control treaties ever proposed" because it would outlaw tests of nuclear weapons globally. He said there are three technical issues that are the source of the heat of the debate over the treaty: whether the treaty is verifiable, is easily evaded, and gives a distinct military advantage to cheaters. However, he pointed to an increasing network of sensors and noted that there are many ways to catch test evaders.

Wallace provided several examples of the usefulness of the sensor network, including the monitoring system's value in tracking the Chelyabinsk meteor in Russia in 2013. "I cannot tell you how important this event was, by the way. This bolide streamed across Asia. It went across the most sensitive parts of the Russian nuclear complex," Wallace said. "Can you imagine if we had something streaming across, breaking windows, and shockwaves throughout our nuclear complex? But the fact is that in near-real time, an international monitoring system was able to say almost conclusively exactly what that was. This provided the very strong evidence from a monitoring sense for a sense of confidence."

Wallace noted that the challenges for nuclear detection are hardly over and that there is a need to look at smaller and smaller events. "But what we have seen is a remarkable change in the science" in the 50 years since Vela Uniform, an element of the U.S. Project Vela that was conducted to develop seismic methods for detecting underground nuclear testing, he said. "If you assume the science will continue to progress, these challenges are hardly extraordinary as compared to what they were back in 1963" when the earlier Limited Test Ban Treaty went into effect.

At the Fall Meeting session, Raymond Jeanloz, chair of the National Academy of Sciences Committee on International Security and Arms Control, discussed two academy reports about the treaty and noted that the CTBT "is a rare opportunity for our science and engineering technical community to really contribute to the greater good. CTBT is arguably the most complex, certainly one of the most technologically challenging treaties that we have around the globe. So we have an opportunity to serve the international community and also our own nation."

Jeanloz, who also is a professor in Earth and planetary science and in astronomy at the University of California at Berkeley, said that if the CTBT enters into force, it can help reduce the risk of clandestine nuclear weapons testing. The treaty "helps achieve our national security and international security goals by reducing the likelihood of the development of new kinds of weapons designs," he said.

Jeanloz also emphasized the usefulness of the IMS sensors for other purposes, including environmental monitoring, hazards warning, and mitigation responses to natural and human-induced accidents. "The CTBT organization has really been at the forefront of these so-called nontreaty applications, for example, in tsunami warning, volcanic eruptions, and Fukushima [the nuclear plant in Japan], and so on," he said.

Jeanloz added that nuclear explosion monitoring is part of a bigger picture of global environmental monitoring, which is advancing with the installation of more and more sensors by numerous groups. "There is a huge opportunity here to merge our science of global environmental monitoring with what the arms control community needs," he said.

For more information, see http://www.ctbto.org.

—Randy Showstack, Staff Writer