The Comprehensive Nuclear-Test-Ban Treaty prohibits all nuclear tests for any purposes. It is enforced through the extensive International Monitoring System designed to detect and deter nuclear explosions in atmosphere, underwater and underground.

A COMPREHENSIVE VERIFICATION REGIME WITH WIDE UTILITY

- The CTBT International Monitoring System is being set up to monitor the Earth for any sign of a nuclear explosion. Over 280 facilities worldwide are currently monitoring underground (seismic stations), the atmosphere (infrasound stations), and the oceans (hydro acoustic stations), and continuously sniff the air (radionuclide and noble gas stations) to detect even the smallest nuclear blast. When North Korea conducted nuclear tests in 2006 and 2009, the system proved its worth, detecting the tests reliably and confidently. Within an hour of the tests, CTBTO Member States received information about their location, magnitude, depth and time. When complete with the on-site inspection component, the system will represent the most sophisticated verification regime ever envisaged.

- In the process of monitoring and detecting a potential nuclear test - the system registers over 30,000 events a year – the vast majority of them are earthquakes. The civil and scientific applications of the CTBT data can be used to gain better understanding of the Earth, of climate change, of volcanic ash clouds, of the movements of whales and much more.

- The system has been contributing to tsunami warning since 2006. Over 50 seismic and hydroacoustic stations are currently contributing data directly to tsunami warning alert centres in the Indian and Pacific Oceans. The CTBTO data is one of the most reliable and speediest with as much as three minute lead time compared to most other data. On 11 March 2011, the system helped saved lives through its contribution to rapid tsunami warning alerts, the first being sent by the Japanese tsunami warning centre three minutes after the earthquake.

- Radioactive isotopes have been detected at CTBTO monitoring stations in Japan, Russia, the Pacific, the United States, Canada, the Atlantic Ocean and Europe. Through Atmospheric Transport Modelling in cooperation with the World Meteorological Organization, information has also been provided on the global dispersion of radioactive material. With information made available to the CTBTO by the IAEA on the release level of radioactive substances at the Fukushima power plant – the so-called source term – CTBTO experts were also able to provide quantitative measurements as part of the organization’s global dispersion predictions.
These are but a few examples of the comprehensiveness and wider utility of the CTBT verification regime and data. **For the system to be used at its full potential, it needs to be completed and made fully operational.** The necessary resources need to be invested – political, legal, financial, technical, scientific, and human resources.

This takes us to the Treaty. It is important to remember that safeguarding the International Monitoring System is closely linked to safeguarding the Treaty and its entry into force.

**THE IMPORTANCE OF THE CTBT FOR GLOBAL PEACE AND SECURITY**

- Just as the system is strong and comprehensive, so is the Treaty.

- The CTBT bans all nuclear test explosions regardless of yield. It is almost universal, with 182 signatures and 154 ratifications. We are driving to achieve 160 ratifications by the end of the year, and this will provide additional momentum towards entry into force (EIF) and universality.
• The Treaty is often already applied as a de-facto international norm, as the UN Security Council did when India and Pakistan tested in 1998 and North Korea tested in 2006 and 2009.

• The CTBT is essential for peace and security; it is a core element of the non-proliferation regime. It limits the ability of countries to develop advanced nuclear weapons technology. The issue of nuclear testing is clearly separate from the inalienable right of nuclear energy for peaceful purposes under Article IV of the NPT, as testing is not necessary to pursue a peaceful nuclear programme. If Iran wants to restore confidence in the exclusively peaceful nature of its nuclear programme, CTBT ratification would be a logical step. In the case of North Korea, the importance of a legally binding ban on nuclear testing is evident, and should be considered as a logical part of the Six Party talks.
• The CTBT is also a catalyst for nuclear disarmament. It curbs the development of new types and new designs of nuclear weapons. This will be essential when moving towards further deeper arms reductions between the United States and Russia, and in a future multilateral disarmament process that involves all the nuclear armed States.

• The CTBT could also serve as a regional **confidence and security building measure**. Ratification of the Treaty by States in the Middle East, in particular the Annex 2 countries Egypt, Iran and Israel, would be a positive catalyst for other security-related issues affecting the region. Similarly, there is a need to engage India and Pakistan on a range of security and arms-related issues. The CTBT would naturally be one of them, providing a cap on the further development of nuclear weapons and thus on the further production of weapons materials to that end. In a wider regional context, much would be gained for confidence- and security-building in Asia if the continent as a whole moved towards ratification.
The CTBT is of crucial relevance also in connection with the development of nuclear energy for peaceful purposes. Regardless of what the future of the predicted nuclear renaissance will be after the Fukushima accident, it is a fact that more and more States are mastering the nuclear fuel cycle. The decision between nuclear energy for peaceful or for weapons purposes will become more a political and legal issue rather than one of technology and knowhow. Legal instruments “upstream” of the nuclear fuel cycle are facing increasing difficulties when it comes to the delineation between prohibited and permitted activities (e.g. IAEA Safeguards regime in the case of the Iranian nuclear program). A nuclear test provides unquestionable “downstream” proof of the intentions of a State. The CTBT thus provides the last and clearly visible barrier between the two. This legal line needs to be drawn clearly and irrevocably. A CTBT in force would also be an incentive for ending the production of fissile material for weapons use, pending the entry into force of a Fissile Material Cut-Off Treaty, as well as reducing the stocks of such materials.
• **The CTBT sets a new legal and verification standard for nuclear weapons.** It is a non-discriminatory Treaty with the same rights and obligations for all Member States. Its verification regime is equally nondiscriminatory and provides equal access for all Member States to CTBTO data. This was very important in the UN Security Council deliberations in 2006 and 2009 after North Korea had tested. All UNSC members – big and small, NWS and NNWS alike – received the same data and information about the tests.

![Graph showing Xenon-133 activity concentration and background noise level over time.](chart.png)

**LEADERSHIP NEEDED**

• However, despite the overwhelming support for the CTBT, the Treaty’s unusual EIF provisions have prevented the Treaty from entering into force. **44 specific nuclear holding countries, the so-called Annex 2 States, need to ratify the Treaty for EIF; nine of them still remain: China, Egypt, India, Indonesia, Iran, Israel, North Korea, Pakistan and the United States.** India, Pakistan and North Korea have yet to sign the Treaty and become Members of the CTBTO. Indonesia at the other side of the spectrum has initiated its ratification process.

• **Clearing the final hurdle of achieving the Treaty’s EIF requires leadership** both from the 154 States that have already ratified the Treaty, and from States that have not – particularly the remaining nine countries that have to ratify the Treaty for it to enter into force.
The two remaining nuclear weapon States among the Annex 2 States, China and the United States, have the opportunity to demonstrate the political will to secure the Treaty’s ratification. Indonesia is currently in the process of pursuing its own ratification, as mentioned. **If these three Annex 2 States ratify the CTBT, enormous momentum for the Treaty will be created and a path will emerge with the Treaty’s EIF within sight.**

Among the 154 countries, representing over 75% of the countries of the world that have already ratified the Treaty, countries that are members of Nuclear-Weapon-Free Zones (NWFZ) just as Kazakhstan is a member of the Central Asian NWFZ in can play a unique role. They are essential contributors to regional and global peace and security, and have committed themselves to nuclear non-proliferation and disarmament. They have all renounced nuclear weapons as non-nuclear weapon States under the NPT and under the NWFZs and this carries strong moral authority.

**Nuclear Weapons Free Zones** are concrete confirmations of its parties support to the CTBT. Both NWFZs and the CTBT include legal obligations to prohibit nuclear tests. In addition to the legal ban, the CTBT provides the verification mechanism that the NWFZ treaties do not have. Although the CTBT has not yet entered into force, it is already *de facto* in force given the requirements of the NWFZ treaties. Together, the CTBT and NWFZ treaties represent concrete and verifiable disarmament actions. The United Nations Secretary-General also stated during the Conference of Member States of NWFZ last year that the entry into force of the CTBT will complement and reinforce the status of the zones.

**CAPACITY DEVELOPMENT FOR THE FUTURE**

- I have underlined the importance of safeguarding both the Treaty and its entry into force as well as its verification regime for the sake of global and regional peace and security, and for the sake of safety, human welfare and development.

- To be able to do this, we need to ensure that we have the necessary capacities and knowledge base now and in the future. This means that we need to invest in education – disarmament education as well as education in the monitoring and verification sciences.

- The CTBTO’s capacity development initiative is part of our efforts to build and enhance the necessary capacities in Member States to enable them to participate equally in the implementation of the Treaty and benefit equally from the services of the Treaty’s verification regime.

- The initiative is based on the recognition that building and maintaining the necessary capacity to confront the technical, scientific, political, and legal challenges facing non-proliferation and disarmament effectively is of critical importance now as it will be in the years to come.
The initiative is aimed at strengthening national capabilities in areas related to the Treaty’s verification technologies by restructuring training activities, further consolidating training courses and workshops, and better integrating their curricula.

To this end, from 5 to 9 September 2011, the PTS organized the course on the Comprehensive Nuclear-Test-Ban Treaty (CTBT) entitled “Strengthening Verification, Enhancing Security: The Science and Significance of the CTBT” at the headquarters of the Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO) in Vienna.

In addition to around 100 participants who attended the course in Vienna, more than 120 participants followed the course online via live-streamed or archived video lectures. Participants from a total of 79 countries took part in the course, including 63 diplomats and 25 United Nations Disarmament Fellows.

Over five days and a series of 17 lectures, participants learned from some of the world’s foremost experts on the CTBT. The three main aspects covered by the course were:

- The political aspects of the Treaty and its contributions to fostering international security and promoting nuclear disarmament and non-proliferation;
- The technologies underpinning the CTBT verification regime;
- The civil and scientific applications of CTBT monitoring technologies, including the contribution to the Fukushima crisis response.

But this is not the whole story. In the Commission, we recognize the true value of the investment with which we were entrusted by member states. We see this investment as a platform for scientific knowledge and capacity development in member states. Member states from developing countries are the prime potential beneficiaries of this investment. The unique verification system which is being shaped offers a host of opportunities for applications of scientific research and everyday life. Whether it is in the area of early tsunami warning, aviation safety, climate change, or marine life research, the four monitoring technologies have an obvious advantage.

The Commission has offered hundreds of training opportunities in technologies associated with the verification system for researchers and scientists from member states. As an organization operating at the cutting edge of scientific and technological knowledge, we are determined to share that knowledge with our member states. We seek to strengthen the scientific capability of member states in the four technologies used in the verification system. In order to ensure the readiness of member states for the entry into force of the Treaty, the Commission is providing assistance in the legislative and constitutional issues arising from the Treaty.

The Commission is also working closely with member states to set up their National Data Centres. Through the provision of the necessary training, technical infrastructure and equipment, we ensure that member states reap the benefits of this unique organization. Such capacity building and development enhances the real and potential scientific and technical capabilities of member states. These new skills have a spillover effect into other areas of development.
• Since its establishment, the Commission has trained more than two thousand technicians and professionals from member states. We are currently financing the participation of nine technical experts from developing countries in official technical meetings of the Commission for a whole year. We are also working on a multi-year project to assist member states from Africa and Latin America to establish their national data centres. As you know, these Centres are necessary to access and analyse the invaluable data and other products generated by the International Monitoring System and the International Data Centre.

• The CTBT represents a benchmark of multilateral cooperation, aimed at enhancing regional and global security. What is needed urgently is leadership and commitment to move the Treaty into force.

Nonproliferation

Much of the nuclear power technology associated with the fuel cycle is the same technology needed to develop nuclear weapons. Purification techniques used in the manufacture of fuel rods for nuclear power plants are also applicable to producing weapons grade nuclear material. Thus, expansion of nuclear power includes an increased risk of nuclear weapons proliferation by diversion or misuse of fuel cycle facilities.

Ensuring the nonproliferation of nuclear weapons is an international challenge that requires an international solution. The international community must guide the nuclear fuel cycle development in ways that reinforce shared non-proliferation objectives. The proliferation risk must be analyzed at the front end of the fuel cycle and measures developed to reduce this risk. Additional measures for determining a State’s intentions regarding nuclear weapons development can also be used to provide incentives not to proliferate.

The major effort by the international community to curb proliferation is provided by the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) on the front end of the fuel cycle, and the Comprehensive Nuclear-Test-Ban Treaty (CTBT), which includes a verification system for detecting nuclear tests, providing unquestionable proof of the intentions of the state.

The NPT is effectively a promise by the non-weapons states not to develop nuclear weapons, a commitment by the nuclear-weapons states to the goal total disarmament, and a recognition of that all parties to the Treaty have the right to develop and be assisted in the development of nuclear energy for civilian purposes.

The International Atomic Energy Agency (IAEA) is responsible for monitoring compliance with the NPT regarding fuel cycle facilities. However, IAEA safeguarding efforts are constrained by the scope of their authorities, and an optional Additional Protocol has been used to “reshape the IAEA’s safeguards regime from a quantitative system focused on accounting for known quantities of materials and monitoring declared activities to a qualitative system aimed at gathering a comprehensive picture of a state’s nuclear and nuclear-related activities, including all nuclear-related imports and exports. The Additional Protocol also substantially expands the IAEA’s ability to
check for clandestine nuclear facilities by providing the agency with authority to visit any facility, declared or not, to investigate questions about or inconsistencies in a state’s nuclear declarations. NPT states-parties are not required to adopt an additional protocol, although the IAEA is urging all to do so” (Arms Control Association, 2010).

Monitoring the nuclear fuel cycle is difficult, particularly because the line between permitted and prohibited activities can be blurry. One suggestion that has been made by the IAEA is to remove the need for controlling the entire fuel cycle by creating a nuclear fuel “bank” as a means to provide security for the nuclear fuel supply. The bank would be stocked with donations from countries with an enrichment capability, and all States could make withdrawals to supply their nuclear reactors. This idea removes the need for many countries to develop the enrichment part of the nuclear fuel cycle thereby significantly reducing the risk that these countries would develop the capability to manufacture weapons-grade material.

The concept of providing an assured supply of nuclear fuel and thus avoiding the need for countries to build indigenous nuclear fuel production capability has long been proposed as a way to curb the proliferation of nuclear weapons and, eventually, eliminate them altogether (UN News Centre, 2009). Many Countries have supported various concepts of an international fuel bank, but others have been reluctant to embrace any of these proposals for varying reasons.

IAEA monitoring and alternatives to developing a complete fuel cycle capability discourage proliferation. The other part of the NPT – the commitment by the nuclear-weapons states to the goal total disarmament is just as important. Why should a non-nuclear state agree not to develop weapons when those who do have these weapons potentially constitute a threat to their security?

A step in the commitment by nuclear weapons states to the goal of total disarmament is a cessation of testing, which is banned anywhere on earth by the Comprehensive Nuclear-Test-Ban Treaty (CTBT). The CTBT also provides a deterrent to proliferation, in that its extensive verification regime has a high probability of detecting explosions in the atmosphere, in the seas, or underground.

The CTBT’s International Monitoring System (IMS) network includes 170 seismic, 11 hydroacoustic, 60 infrasonic, and 80 radionuclide stations that can detect and locate nuclear tests anywhere on earth. The data are available to all member states so that they can formulate their own decisions on the nature of any event that is detected by the IMS, and potentially call for an on-site inspection.

Another application of the IMS can be envisioned for the radionuclide stations. Of the 80 globally distributed radionuclide stations, 40 will include Noble Gas systems for detecting radioactive xenon isotopes (i.e. Xe-131m, Xe-133m, Xe-133, Xe-135). The data collected from these stations could be used to identify releases from nuclear facilities or other facilities using or handling radioactive material. ATM backtracking capabilities that are part of the CTBT verification system would help identify possible source regions of abnormal activity. While this is beyond the mandate of the CTBTO, the organization does collect valuable data and uses technology that has applications in the field of nuclear monitoring and safety.

To date, 182 states have signed the CTBT, 153 have ratified it, and only 9 additional states (China, Democratic People’s Republic of Korea, Egypt, Indonesia, India, Iran, Israel, Pakistan, and the United
States) must deposit their instruments of ratification with the UN in order for the treaty to enter into force. Even in its incomplete state, the IMS provides comprehensive coverage over most of the earth.

**Summary**

The nuclear energy option is arguably a must when the long-term consequences of global warming along with the projected increased energy demands are considered. However, many technological challenges must be overcome. Safety records must be improved, measures must be taken to harden nuclear facilities against attack, a long-term solution to the nuclear waste problem must be agreed to and implemented, and the potential for nuclear weapon proliferation must be averted.

I am confident that the technical challenges can be met if the will to meet them is present. In this sense, the political and legal challenges may be the most difficult. The NPT, with its three legs of non-proliferation, disarmament, and access to peaceful nuclear technology along with the CTBT is the international effort to meet the part of these challenges related to nuclear nonproliferation. These challenges are particularly difficult because technology will no longer be the defining factor in the decision by states to use nuclear energy for peaceful or weapons purposes. Legal instruments “upstream” of the nuclear fuel cycle are facing increasing difficulties when it comes to the delineation between permitted and prohibited activity. However, a nuclear test provides unquestionable “downstream” proof of the intentions of the state. The CTBT, with its global monitoring system, thus provides the last and clearly visible barrier between the two.