

Beacons in the nuclear night

Maintaining the health of the International Monitoring System BY PETER RICKWOOD

Shouting voices, a flaming brand, and one after the other the beacons burst into flames sending the signal from hilltop to hilltop.

Beacons have offered protection by raising the alarm against danger for more than two thousand years. They've dispatched the signal about impending invasions and borne the message that led to the defeat of navies. The light of a beacon, the lighthouse on a treacherous shore, has guided sailors to safety.

Today a network of beacons girds the planet, monitoring the land, sea and air for the dangers of nuclear explosions. It employs advanced technologies, yet its purpose is fundamentally the same as its hilltop predecessors: it offers vigilance and the means to warn of danger.

TSUNAMI WARNING IN 2011

In March 2011 the International Monitoring System (IMS) registered the huge earthquake off the coast of Japan, flashing messages to tsunami warning centres. Then sensors that sniff the air started tracking radiation in the atmosphere from the damaged Fukushima nuclear reactors.

The requirement of a lighthouse keeper was to ensure that there would always be a beam of light flashing from the lighthouse. Enshrined in the Comprehensive Nuclear-Test-Ban



Natalie Brely, Chief of the Monitoring Support Facilities Section at the International Monitoring System Division.

Treaty (CTBT) is a performance requirement just as rigid. There is only a two per cent allowance for failure by land and sea facilities in reporting data. In other words, the system has to meet a 98 per cent standard for making data available to the International Data Centre (IDC) in Vienna. Atmospheric monitoring has to meet a 95 percent criterion.

Ensuring maintenance and logistical support for the system to meet these requirements is the task of a group of some 25 women and men (regular and temporary staff) headed by Natalie Brely at the Vienna headquarters of the Preparatory Commission for the Comprehensive Nuclear-Test-Ban Organization (CTBTO).

It sounds straightforward. But access to stations in remote locations such as Antarctica is limited to a few months every year. Logistical challenges for other isolated facilities also require extensive planning. And, the more mundane task of avoiding delays to delivery of equipment at States' customs posts may be just as challenging.

CTBTO LIGHTHOUSE KEEPERS

"We have to ensure that the woman or man running a CTBTO facility has all the necessary tools, equipment and knowledge to attempt to avoid problems or be able to fix them as fast as possible. The bottom line

is that a station can be down for no more than seven days, which requires us to detect, troubleshoot, identify and repair a failure as fast as possible. It is important that the station is brought back to operation as soon as possible," Brelly said.

As of the end of February 2011, there were nearly 1,000 women and men in 84 countries, the CTBTO equivalent of lighthouse keepers, operating its monitoring facilities.

"Each station, when it's built, is provisioned with spare parts, manuals and tools in order to be able to react in the event of a break down," Brelly said. "When a station is certified, which means that it meets Treaty requirements and is capable of being part of the monitoring system, we have a snapshot of all its components and an environment which allows us to adapt the support and supply chain structure in an optimal manner."

Some parts, such as computers and digitizers, have a life expectancy of three to 10 years, said Brelly. A seismometer may have a 20 year life expectancy. "Good engineering attempts to ensure that all these components are designed in a modular fashion. If a part breaks down, you replace it with a new one."

STAYING AHEAD OF THE SYSTEM'S NEEDS

Which, loosely translated, means that Brelly and her team must remain in continuous motion to stay ahead of the huge system's routine maintenance needs and replacement of parts. That doesn't take into account the unforeseen, emergencies and catastrophic failures, "but we do try to plan for these as best as possible" she says with a smile.

And when facilities are located in the middle of deserts, on remote islands, or close to the Earth's poles, keeping them running becomes even more of a challenge.

From an investment of 1 billion USD over the last 15 years, engineers have installed a system of monitors, some in the world's most desolate places, to detect any evidence of nuclear explosions. This system is the verification arm of the Treaty.

By the end of 2011, 280 of 337 facilities when the system is complete, will have been certified. The cost of operating and sustaining the network in 2011 will be nearly 30 million USD.

Data are collected round the clock by a planet-wide stethoscope, amplifying sounds from the Earth to determine if any of them could be a nuclear explosion. Seismic and infrasound facilities monitor underground, and the Earth's atmosphere and hydroacoustic stations listen for sounds in the oceans. Radionuclide facilities sniff the atmosphere for evidence of radioactive particles and gases.

A DELUGE OF DATA

Every year IMS facilities log about 30,000 events. In the deluge of data dispatched to the CTBTO headquarters in Vienna by satellite, these are the signals that could indicate a nuclear explosion.

The information is provided in a form known as waveform data. To the uninitiated it appears to be indecipherable squiggles. The squiggles, however, are the language in which the electronic record of seismic, infrasound and hydroacoustic monitoring data are expressed.

On a daily basis ten gigabytes of such data are transmitted by satellite to the CTBTO's headquarters. Under the terms of the Treaty, all of its 182 Member States have equal rights to make use of the data. "This is the beauty of this Treaty," says Brelly. "No matter if a country hosts one, none or many monitoring facilities, all Member States have equal rights to all the data."

The numbers belie the fact that the monitoring system is not only the sum of its technologies and facilities but also the operators serving it, Brelly says.

The response is to have a policy of forward investment, she explains, one that makes every effort to ensure station operators have all the tools, knowledge and equipment they need.

"We need to make sure that all the operators understand their role and each one recognizes the importance and value of the system. Only by accomplishing that will we be able to really ensure that the monitoring system and the CTBT in its entirety will be sustainable and reliable for years to come."

Brelly, a Canadian born mother of four children, honed her skills to manage support of the CTBTO monitoring facilities from 20 years experience in maintenance and logistics in the Canadian armed forces. "It taught me the indisputable value of the power of a team and the reality that it's only as strong as its weakest link," she said.

REGIONAL DEPOTS

To ensure swift delivery of services, the CTBTO is setting up regional depots, providing supplies and technical support in a timely manner.

Still, Brelly and her team are mission control for the network, on standby to support its operators and their stations, prepared to send out a breakdown crew when there is no alternative.

"If the station operator can't fix a problem, we'll send a maintenance team," Brelly said. However, the service comes with a condition. "One of our objectives is that a maintenance team won't travel twice to a station for the same problem. The station operator will need to be part of the repair mission so that she/he learn and can do it herself/himself the next time around."



Natalie Brely meets with Ilse Adonis (centre) from the South African Permanent Mission and Rael Sheti (left) from the IMS, to discuss the timely and cost free customs clearance of IMS equipment in South Africa.
Photo: Pablo Mehlhorn

SELF-RELIANCE

Self-reliance becomes even more of an issue for Brely regarding the 120 auxiliary stations in the system, which provide information only upon request. Under Treaty terms, they are the responsibility of the countries in which they are located.

The CTBTO can provide remote technical support and training for their operators, but otherwise Brely is limited to using moral suasion to ensure these operators and the host countries play their important role in the system.

“Our responsibility is limited to providing remote technical support, documentation and training. I can identify someone who needs more training but that is all I can do. The host country has to figure out how to do it by itself. It has to fund operations and maintenance – national implementation has been a huge issue that we are addressing.”

Auxiliary stations have a vital role to play in ensuring compliance with the Treaty. They are required to help narrow the focus in an area suspected to have

been the site of a concealed nuclear explosion. Then, after entry into force, the ultimate tool at the Treaty’s disposal can be used, feet on the ground – an on-site inspection to provide further evidence that a test has taken place.

BUILDING OWNERSHIP

“We’re continually trying to enhance local understanding, to create the sense of ownership that’s required. This is a joint venture – we can’t do it alone, we want the countries with auxiliary stations to take pride in them and encourage their operators to be proud as well. They need to put into place the necessary support structure to allow their operators to fulfill their role,” Brely said.

“The station operator is our ambassador, our first line of defense. If the operators of auxiliary stations as well as all other CTBTO stations aren’t treated properly, they won’t be part of the solution.”

More than two thousand years ago in the Han Dynasty, beacons were a feature of China’s Great Wall. In 290 B.C. Ptolemy erected a 100-metre high lighthouse at the entrance to the

harbour of Alexandria, which became one of the Seven Wonders of the classical world. In Iran in the Middle Ages large minaret lighthouses were erected beside the sea route at the mouth of the Persian Gulf.

Following the fall of the Roman Empire no new lighthouses were constructed in Europe until after the end of the so-called Dark Ages. Since 1945, nuclear weapons have imposed their own darkness from the threat that their use risked immolation of the planet.

The CTBT and its monitoring system represent a beacon for a new direction away from such dangers. Historians of the future may well view its verification network as the first signs of safety emerging from the perils of an era of nuclear weapons.

BIOGRAPHICAL NOTE

PETER RICKWOOD

worked for most of his career as a journalist before joining the International Atomic Energy Agency (IAEA) as a press officer in 2001 where he worked for eight years. He has been working for CTBTO Public Information since October 2009.

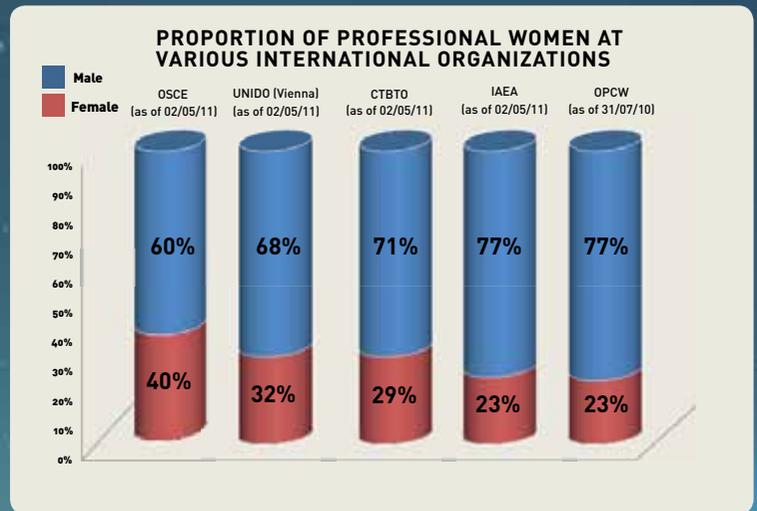
Employment opportunities for women

The Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO) is currently establishing a global verification regime to monitor compliance with the Comprehensive Nuclear-Test-Ban Treaty. Great progress has been made since 1996 thanks to the extensive skills and experience of the CTBTO's international workforce.

As we strive to reach our goal to end all nuclear explosions once and for all, we welcome applications from suitably qualified individuals committed to helping us achieve this objective. Qualified women candidates are highly encouraged to apply. Exciting opportunities exist for professionals in a range of disciplines, and we are particularly interested in candidates with strong scientific and technical backgrounds.

OUR STRENGTH LIES IN THE QUALITY OF OUR PEOPLE.

Visit our website now for more information. www.ctbto.org



IAEA – International Atomic Energy Agency
 OPCW – Organisation for the Prohibition of Chemical Weapons
 OSCE – Organization for Security and Co-operation in Europe
 UNIDO – United Nations Industrial Development Organization



Celebrating International Women's Day at the CTBTO, 8 March 2011.



At the beginning of February 2011, seven of the 37 senior management staff at the CTBTO were women. Back row – left to right: Natalie Brelly, Lisa Tabassi, Regina Kusuma, Grace Okungu, Silvia Alamo. Front row – left to right: Hongmei Deng and Annika Thunborg.

