The International Monitoring System (IMS) is a global network of sensors for detecting and providing evidence of possible nuclear explosions. Upon completion, the IMS will consist of 321 monitoring stations and 16 radionuclide laboratories throughout the world in locations designated by the Treaty. Many of these facilities are located in areas that are remote and difficult to access, posing major engineering and logistical challenges.

The IMS uses seismic, hydroacoustic and infrasound monitoring technologies to detect the energy released from an explosion or a naturally occurring event in the underground, underwater and atmospheric environments.

Radionuclide monitoring is also an integral part of the IMS. This advanced monitoring technology uses air samplers to collect particulate matter from the atmosphere. Samples are then analysed for evidence of physical products created by a nuclear explosion and carried through the atmosphere. The analysis of the radionuclide content can confirm whether an event recorded by the other monitoring technologies was actually a nuclear explosion.

To enhance the radionuclide monitoring, systems for detecting radioactive forms of noble gases such as argon and xenon are being installed at stations in the radionuclide network and are being integrated into routine operations. The addition of such systems will strengthen the capacity of the IMS and continue the cutting-edge approach to the creation of the verification system.
In 2007, significant progress was made towards the completion of the IMS, with the continued build-up of the system in all four technologies (seismic, hydroacoustic, infrasound and radionuclide). Eleven stations and five noble gas systems were installed or upgraded in total. Thus, by the end of 2007, 249 IMS stations were established, representing 78% of the entire network. Sixteen noble gas systems were also established, representing 40% of the total planned.

During the year, 30 stations and one radionuclide laboratory were certified, bringing the total number of certified stations to 214 (67% of the entire network) and the total number of certified radionuclide laboratories to ten (63% of the total).
Table 1. Status of the Station Installation Programme (31 December 2007)

<table>
<thead>
<tr>
<th>IMS Station Type</th>
<th>Installation Complete Certified</th>
<th>Not Certified</th>
<th>Under Construction</th>
<th>Contract Under Negotiation</th>
<th>Not Started</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary seismic</td>
<td>37</td>
<td>5</td>
<td>3</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Auxiliary seismic</td>
<td>78</td>
<td>21</td>
<td>8</td>
<td>2</td>
<td>11</td>
</tr>
<tr>
<td>Hydroacoustic</td>
<td>10</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Infrasound</td>
<td>39</td>
<td>0</td>
<td>7</td>
<td>2</td>
<td>12</td>
</tr>
<tr>
<td>Radionuclide</td>
<td>50</td>
<td>8</td>
<td>8</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>214</strong></td>
<td><strong>35</strong></td>
<td><strong>26</strong></td>
<td><strong>9</strong></td>
<td><strong>37</strong></td>
</tr>
</tbody>
</table>

Table 2. Status of Radionuclide Laboratory Certifications (31 December 2007)

<table>
<thead>
<tr>
<th>Total Number of Laboratories</th>
<th>Certified Laboratories</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>10</td>
</tr>
</tbody>
</table>
AGREEMENTS FOR MONITORING FACILITIES

IMS facility agreements and arrangements are concluded between the Commission and those States hosting IMS facilities in order to regulate activities such as site surveys, installation or upgrading work and certification, as well as post-certification activities (PCAs). They come into effect either upon signature by the parties or on the date on which the State informs the Commission that the national requirements have been fulfilled for the agreement or arrangement to take effect.

In 2007, an IMS facility agreement was concluded and entered into force with one State, the United Republic of Tanzania (December 2007). In comparison, in 2006 three facility agreements were concluded and four entered into force.

In total, 37 facility agreements or arrangements had been concluded by the end of the year, of which 30 have entered into force. Appropriate legal arrangements
CERTIFICATION MILESTONE: HA11, PACIFIC OCEAN

One of the milestones for 2007 in the build-up of the IMS was the completion and certification of station HA11 in June. The station is located at Wake Island (United States of America) in the middle of the Pacific Ocean. Its remoteness was a contributing factor in making this station the most expensive that the Commission has built to date. Its certification represents an important building block in the completion of the hydroacoustic network.

HA11 is a typical hydrophone station using underwater microphones. In this case, the hydrophones were installed above underwater seamounts, moored at a depth of 750 m. Cables needed to be laid across distances of about 100 km between the hydrophone and the island. Depths of up to 5000 m along the cable routes had to be taken into account and equipment was specially designed to withstand 500 bars of pressure, temperatures close to freezing point and the corrosive saline environment.

Only after clean-up teams had swiftly dealt with the legacy of Super Typhoon Ioke, which passed directly over Wake Island in August 2006, was the island declared accessible to the Commission. Work was completed there on 15 February 2007. The hydroacoustic station was certified on 8 June 2007.

With the Wake Island station installed, the hydroacoustic network is nearing completion. Ten of the eleven stations in the network are now in operation. When the final hydroacoustic station is running, the planet’s oceans will be under constant surveillance through the Operations Centre in Vienna, ensuring that any underwater nuclear explosion is monitored.
are in place for 327 facilities in 85 countries. The number of concluded agreements or arrangements and the number of agreements or arrangements that have taken effect indicate strong support by States for the establishment of the global verification regime.

SUSTAINING MONITORING FACILITIES

As the IMS installation and certification phase approaches completion, the importance of reviewing and improving operation and support of IMS facilities in provisional operations increases.
Sustainment of monitoring facilities and of the IMS network itself involves management, coordination and support for the full life cycle of each facility component, performed as efficiently and effectively as possible, as well as planning for recapitalization of a new life cycle.

In 2007, the PTS set into motion several sustainment initiatives to define, develop, implement and continuously improve the life cycle support given to IMS facilities and the network while continuing to address specific facility problems. One example is the creation of a section in the PTS specifically to handle support issues. In 2007, it saw the first full year of operation, strengthening the support and logistical aspects of IMS sustainment.

**AFTER CERTIFICATION**

Following the certification of a station and its incorporation into the IMS, the post-certification phase of its operation is focused on, ultimately, delivery of data to the IDC.

PCA contracts represent the fixed-cost contracts between the PTS and station operators to cover expenditure associated with this phase of activities. The total PCA expenditure in 2007 was US$14 355 000 distributed over 127 monitoring stations and 11 radionuclide laboratories. During the year, PCA contractual agreements for 10 new stations and 3 radionuclide laboratories were agreed. Existing contracts for 18 stations were also revised.

Management of PCAs changed in 2007 as a result of a new orientation in support of facility operations, involving an integrated approach across technologies. And, for the first time, all PCA expenditures were considered together by the Commission, including the projections for the coming years. Under these circumstances, PCA costs were identified as one of the highest fixed costs of the organization’s budget. These will continue to rise as the IMS network grows.

Another innovation in 2007 was the introduction of an automatic system to request the annual station summary report from the primary seismic, hydroacoustic and infrasonic stations (this feature was previously implemented for radionuclide stations) with a view to enhancing the management of PCA contracts and developing future maintenance, logistics and overall sustainment plans for stations. Providing such reports is one of the requirements of station operators, for which they are paid under the PCA contract. Good implementation and management of these station summary reports will potentially optimize sustainment activities and overall life cycle costs.

Visits were made by PTS staff to facilities in France, Germany, Kazakhstan, Kenya and the Republic of Korea in order to determine the essential services needed for the operation and support of stations under the present guidelines on provisional operations. Such efforts are instrumental in seeking ways to contain rising PCA costs while continuing to take into consideration the full life cycle sustainment costs of the IMS.