Geophysical Research Abstracts
Vol. 15, EGU2013-10434-1, 2013
EGU General Assembly 2013

Technology Foresight and nuclear test verification: a structured and participatory approach

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As part of its mandate, the CTBTO's nuclear explosion monitoring programme aims to maintain its sustainability, effectiveness and its long-term relevance to the verification regime. As such, the PTS is conducting a Technology Foresight programme of activities to identify technologies, processes, concepts and ideas that may serve said purpose and become applicable within the next 20 years.

Through the Technology Foresight activities (online conferences, interviews, surveys, workshops and other) we have involved the wider science community in the fields of seismology, infrasound, hydroacoustics, radionuclide technology, remote sensing and geophysical techniques. We have assembled a catalogue of over 200 items, which incorporate technologies, processes, concepts and ideas which will have direct future relevance to the IMS (International Monitoring System), IDC (International Data Centre) and OSI (On-Site Inspection) activities within the PTS.

In order to render this catalogue as applicable and useful as possible for strategy and planning, we have devised a "taxonomy" based on seven categories, against which each technology is assessed through a peer-review mechanism. These categories are:
1. Focus area of the technology in question: identify whether the technology relates to (one or more of the following) improving our understanding of source and source physics; propagation modelling; data acquisition; data transport; data processing; broad modelling concepts; quality assurance and data storage.
2. Current Development Stage of the technology in question. Based on a scale from one to six, this measure is specific to PTS needs and broadly reflects Technology Readiness Levels (TRLs).
3. Impact of the technology on each of the following capabilities: detection, location, characterization, sustainment and confidence building.
4. Development cost: the anticipated monetary cost of validating a prototype (i.e. Development Stage 3) of the technology in question.
5. Time to maturity: the number of years until the technology in question reaches Development Stage 3 (i.e. prototype validated).
6. Integration effort: the anticipated level of effort required by the PTS to fully integrate the technology, process, concept or idea into is verification environment.
7. Time to impact: the number of years until the technology is fully developed and integrated into the PTS verification environment and delivers on its full potential.

The resulting database is coupled to Pivot, a novel information management software tool which offers powerful visualisation of the taxonomy's parameters for each technology. Pivot offers many advantages over conventional spreadhseet-interfaced database tools: based on shared categories in the taxonomy, users can quickly and intuitively discover linkages, communalities and various interpretations about prospective CTBT pertinent technologies. It is easily possible to visualise a resulting sub-set of technologies that conform to the specific user-selected attributes from the full range of taxonomy categories.

In this presentation we will illustrate the range of future technologies, processes, concepts and ideas; we will demonstrate how the Pivot tool can be fruitfully applied to assist in strategic planning and development, and to identify gaps apparent on the technology development horizon. Finally, we will show how the Pivot tool together with the taxonomy offer real and emerging insights to make sense of large amounts of disparate technologies.