Synthesis of the Neutron from Hydrogen and Its Practical Application in the Detection of WMD Fissionable Nuclear Materials

Summary of issue

Nuclear proliferation in the modern era is an undeniable fact. The Stockholm International Peace Research Institute reports that nine nations currently hold over 15,000 nuclear weapons. Of those, many are retired and waiting to be dismantled. While the active weapons in each country are under closely guarded, military control, in some places around the world, the retired nukes are a prime target for theft, or outright sale of their nuclear payload. This dangerous condition is exacerbated, first, by the breakup of the former Soviet Union, (leaving numerous nuclear weapon sites unguarded) and second, the formation of terrorist organizations and rogue state nations that have little regard for preserving peace in the world, let alone their own survival.

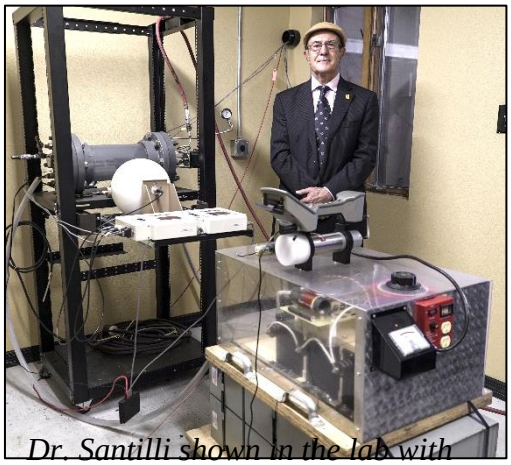
For many years, the DHS has sought any practical way to identify possible nuclear material being smuggled into the United States – through airports, border crossings and shipping ports. In spite of record sums spent to develop a tracking or scanning method, to date nothing has been successfully deployed. The use of x-rays and other detection devices have proven largely unsuccessful, due to the fact that much of the radioactive material available is in the form of a stable metal.

As the threat of a domestic WMD event increases daily, the need for a highly reliable and scalable solution that can be developed, tested, and deployed quickly has reached a critical stage. Fortunately, Thunder Energies Corporation (TEC), a U.S. publicly traded company, (symbol: TNRG), is developing a Thermal Neutron Source (TEC-TNS) based on the *synthesis on demand* of neutrons from hydrogen gas, that when complemented with suitable detection devices, allow for the development of a Nuclear Weapon Detection Station (NWDS).

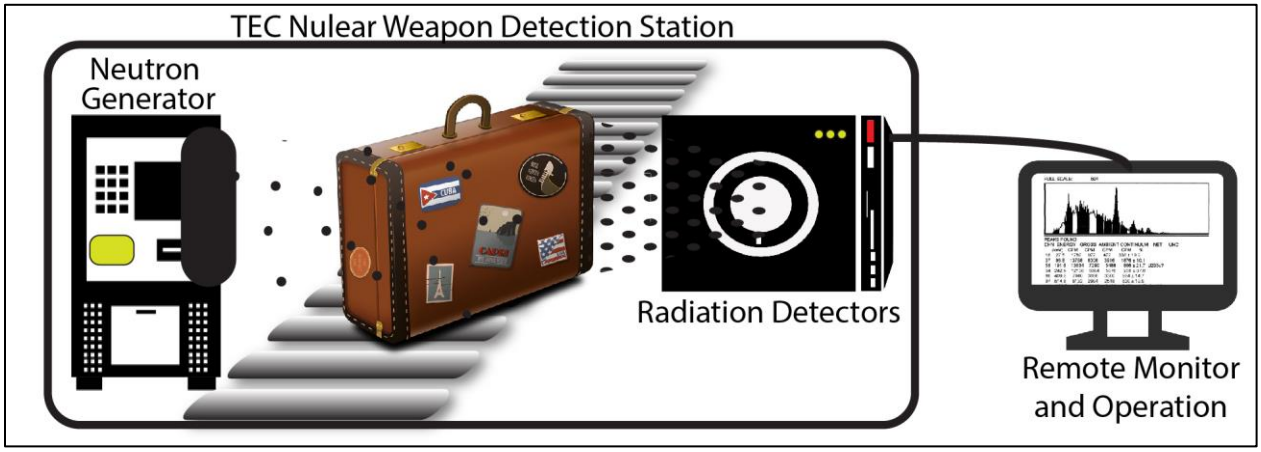
Introduction of concept

Within the scientific community of particle physics, it is widely understood that “free” neutrons – such as those present in cosmic rays – will readily pass through all types of materials, including metal, wood, cardboard and plastics. As they do, the neutrons interact with the nuclei of various substances, but generally, the low energy neutrons have little effect on the state of that material.

Following decades of research initiated at Harvard University under a DOE contract [1] Dr. Ruggero M. Santilli, a U.S. citizen and TEC Chief Scientist, has achieved the synthesis of neutroids from hydrogen [2].



Dr. Santilli shown in the lab with one of several Hadronic Reactors used to synthesize neutrons in 2016.



When suspected material is bombarded by low energy thermal neutrons (produced by the Hadron neutron generator), the nuclei of the fissile materials are split into smaller, more stable isotopes, and various radiations are released. This increase in neutrons is immediately detected by various detectors which monitor and record the anomalies. Whenever a spike in neutrons is identified by the computer software, the suspected container can be flagged for further examination by DHS/TSA authorities.

The currently available TEC-TNS (international patent pending) consists of a cylindrical 1' OD x 2' L vessel containing the hydrogen gas at 30 PSI pressure and comprising internal electrodes. A particular form of high voltage (at least 15kV) and high energy (at least 10 kJ) electric discharge between internal tungsten electrodes ionizes the hydrogen and produces a flux of low energy neutrons synthesized from the protons and electrons in a fully controllable way.

When nuclear fissile materials are exposed to a higher concentration of low energy thermal neutrons, such as in a neutron flux or beam, the nuclei of the Uranium-235 and other nuclear fuels will split into smaller, more stable isotopes, and release a variety of easily detectable radiations. The increase in radiations released from the nuclei is immediate and can be instantly detected with a variety of neutron detection devices.

Dr. Ruggero M. Santilli has been studying the underlying particle physics of this phenomenon for more than three decades. Through his experimentation and development of hadronic physics and isomathematics, Dr. Santilli's research has produced an effective solution to the problem of nuclear material smuggling. The system can be used to scan freight and baggage on a conveyor, and scaled up to scan large shipping containers and semitrailers passing through a seaport or border crossing. His methodology is based on the unmistakable neutron signature of fissile material passing through the proposed TEC Nuclear Weapon Detection Station (NWDS).

TEC NWDS Design

The TEC NWDS would be designed as a self-contained, pass-through or bridge-over section of a luggage/freight conveyor or truck drive-thru. Components of the station would be enclosed and shielded for worker safety. Operation of the neutron generator and detectors would be remotely controlled, and computer software would monitor and record any anomalies in the neutron flux as

luggage and freight pass through the station. Suspected items would be identified and pulled from the line for further inspection.

Much like a shielded x-ray machine, use of the NWDS would not pose any lingering radiation threat to the luggage or, if encountered, nuclear contraband. The low fission cross-section is not high enough to trigger a chain reaction, and the neutron flux dissipates within 12 minutes. As arriving airfreight and baggage moves from the tarmac to baggage claim, incoming international baggage can be routed through the NWDS quickly and without noticeable delays.

The TEC NWDS can also be scaled up to meet the detection needs of the port authority for ship container inspection. The design envisioned would allow full semi-trucks with containers to pass through the detection station to be quickly scanned without harmful effects to the truck driver.

Qualifications of Dr. Ruggero M. Santilli

Ruggero Maria Santilli was born and educated in Italy where he received his Ph.D. in theoretical physics in 1966 from the University of Torino. In 1967, he moved with his family to the USA where he held academic positions in various institutions including the Center for Theoretical Physics of the University of Miami, Florida; the Department of Physics of Boston University; the Center for Theoretical Physics at the Massachusetts Institute of Technology; the Lyman Laboratory of Physics; and the Department of Mathematics, Harvard University.

Dr. Santilli is the author of 259 scientific papers, 18 post Ph.D. monographs in mathematics, physics and chemistry; the organizer of over fifty scientific meetings in various countries. Dr. Santilli was the founder and chief scientist of the MagneGas Corporation from initiation to trading at NASDAQ (symbol: MGNA), the producer of a clear burning “American” fuel (synthesized from American feedstocks).

Government Support

In light of the national security nature of the Hadron neutron generation and detection process used in the TEC NWDS, we feel that the involvement of university students or other academic support could potentially expose this defensive technology to the public, and counter-measures by terrorist groups. No doubt, knowing the location and scanning methods of the detection station would allow terrorists to seek other entry points or ways to defeat the sensors. Although much of our detection premise has already been discussed in lectures and on the Internet, TEC feels that keeping the development timeline, deployment locations, and methods used by our NWDS would improve its overall success rate. We do intend to fully involve government experts in the DHS, NRC, TSA, and port authorities to identify issues that may slow our development progress. We also hope to utilize secure government facilities to assemble and test the NWDS as part of our validation and verification processes.

What we seek in funding and support

With appropriate funding to cover the cost of equipment and personnel, Thunder Energies is confident that our successes to-date can be developed into a full scale prototype NWDS within 24

months. We anticipate limited, direct support from the Defense Threat Reduction Agency and the Department of Defense in completing this project.

The project is broken into three phases:

Phase I – Design a new TEC-TNS, including the software for the remote detection of data and control of the operations, and study the effects of low energy neutrons on fissionable and non-fissionable material. Personnel: a nuclear physicist, an electrical engineer, a mechanical engineer. Duration: six months.

Phase II – Construct three prototypes of remotely operated NWDS for the sensing of baggage-size containers, including three TEC-TNS, three sets of all needed detectors and three shields for the protection of the environment. Construction to be subcontracted to U.S. manufacturers specialized in high voltage rapid discharges, radiation detection and shielding. Duration: 1 year.

Phase III – Conduct systematic tests on the irradiation of containers and suitcases with a thermal neutron beams of various energy and flux, in collaboration with the National Laboratory. Duration: six months.

An estimate of the funds needed are shown below.

Suggested Financial Forecast over a 2 Year Period

Thunder Energies NWDS Development, Manufacture, and Test	
Office/Facilities/Personnel • 7 Technicians + Administrative Staff • Accounting and Auditing • Required Travel	$1.8M
Equipment • Construction of three baggage-size NWDS (Bulk paid to U.S. subcontractors)	$6.0M
Systematic Testing • Validation and Test of NWDS Machines • On-site Setup and Testing	$0.5M
TOTAL ESTIMATED PROGRAM COST	**$8.3M**

References

[1] I. Gandzha and J. Kadeisvili, "New Sciences for a New Era: Mathematical, Physical and Chemical Discoveries of Ruggero Maria Santilli" Sankata Printing Press, Nepal (2011), http://www.santilli-foundation.org/docs/RMS.pdf

[2] R. M. Santilli and A. Nas, "Confirmation of the Laboratory Synthesis of Neutrons from a Hydrogen Gas," Journal of Computational Methods in Sciences and Eng, 14 (2014) 405–414. www.thunder-energies.com/docs/neutron-synthesis-2014.pdf 12 minute film on the TEC-TNS: www.world-lecture-series.org/newtron-synthesis-08-14

[3] R. M. Santilli CV http://www.world-lecture-series.org/santilli-cv; Scientific Awards: http://santilli-foundation.org/santilli-nobel-nominations.htm; Nominations for the Nobel Prize in Physics and separately in Chemistry. http://nobelprizeweb.com; Scientific archives http://www.santilli-foundation.org/news.html; Corporate archives: http://thunder-energies.com/index.php/ct-menu-item-1