

KEY TECHNICAL CHALLENGES FOR TARD ARE:

- **Cost-effective equipment** with sufficient performance to ensure widespread deployment
- **Enhanced wide area search** in a variety of scenarios, including urban and highly cluttered environments
- Monitoring along **challenging GND pathways**, including general aviation, small vessels, and areas between ports of entry
- **Detection of special nuclear material (SNM)**, even when heavily shielded [29].

TARD has developed a broader set of technical objectives to address the Grand Challenges. These technical objectives include:

- Gamma-ray detection **materials** with improved resolution and room-temperature operation that are environmentally rugged and producible in large volume at low cost.
- Neutron detection materials to provide an **alternative to** ^3He , and support both passive and active sensing of SNM.
- Passive detection systems with higher sensitivity and **specificity** that can discriminate threat materials
- Increased **stand-off** detection of threats through both passive and active systems.
- Low-dose active portal systems, including radiography, which can automatically detect nuclear and radiological threats and concealment methods such as **shielding**.
- **Highly mobile** active systems for surge and intelligence driven applications.
- Advanced localization and tracking systems through autonomous, directional, imaging, and/or networked systems that enable **wide area search** and monitoring.
- **Algorithms** and data fusion for enhanced detection, localization, and identification for both passive and active systems.
- Accurate **modeling** and simulation capabilities of RN detection systems to aid in their development, testing, and employment. 37

C. Study Charge

POPA STUDY TITLE:

Technical Review of the proposed long term R&D plan for the Transformational and Applied Research Directorate of the Domestic Nuclear Detection Organization

POPA PROPOSER

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POPA TOPICAL AREA

National Security

OBJECTIVE

The Transformational and Applied Research Directorate (TAR) of the Department of Homeland Security (DHS) Domestic Nuclear Detection Organization (DNDO) has requested POPA review their proposed R&D path forward over the next 10 years. This review will provide comments about the DHS/DNDO long-term R&D plan and vision for the next 10 years. To ensure the presence of a broad range of expertise, POPA is teaming with the IEEE Nuclear and Plasma Society and its Radiation and Instrumentation Steering Committee. The IEEE team members bring significant engineering, systems, and operational experience to the review. The goal will be to produce a POPA report produced and published jointly with IEEE describing the outcome of the review. This report will be used by DNDO for evaluating their current program. Because the report will be made publically available, it could be used by Congress, the Administration and others to answer questions about the DNDO and TAR technical direction.

OPPORTUNITY

DNDO has received significant Congressional scrutiny in the last few years with several GAO reports that have been critical of major DNDO technical efforts. In partial response, DNDO and TAR are trying to determine the best path forward over the next 10 years for their R&D program. They are reaching out to us for help. This review presents the APS the opportunity to significantly impact this path and to ensure a highly credible R&D program at TAR.

The detection of nuclear weapons and ensuring nuclear security have long been areas of concern for the American Physical Society. Some of its members conduct much of the research that goes into the detection of nuclear weapons and have many of the key capabilities required for these efforts.

APPROACH

The APS Panel on Public Affairs (POPA) and the IEEE Radiation and Instrumentation Steering Committee will jointly conduct the review. The review will have a series of activities culminating with a two-day workshop.

A workshop steering committee will be formed to help organize and facilitate the workshop. The committee will include representatives from APS, IEEE and other organizations as appropriate. To prevent any perceived or actual conflicts of interest, members of the steering committee cannot be principal investigators funded by DNDO.

The steering committee led by POPA's James Trebes will create the workshop participant invitation list, determine the detailed workshop format, and oversee the workshop.

An important part of the advance effort will be the creation of key questions and issues to be resolved during the workshop. The DNDO will brief the steering committee on current capabilities and needs, long-term goals and the proposed R&D path forward prior to the workshop. The steering committee will use the briefing as the basis for the creation of key questions and issues to be addressed during the workshop. These questions and issues will be assigned, in advance, to selected teams of workshop participants so that these teams can undertake a more detailed investigation into these questions and perform the requisite analyses. Possible issues for consideration include: key operational constraints and their effects on R&D plans, leveraging and coordination of R&D with other Federal agencies, translation plans for R&D to operational capabilities, methods for identifying, including, gaps and requirements, and exploiting new S&T as it develops worldwide. The results of these examinations will form the basis for leading discussion sessions in the workshop. The briefing by DNDO will take place in mid to late April if possible.

Steering committee members and invited participants will be invited (but not funded) to attend the

IEEE Symposium on Radiation Measurements and Applications (SORMA) WEST in Oakland, California May 14-17th. During the symposium, nearly 50% of R&D funded by TAR will be presented. .

On July 23-25, POPA, DNDO, and IEEE will then jointly host a 2-day workshop, timed to coincide with the DNDO-sponsored Academic Research Initiative (ARI)¹ Grantees Conference at the National Conference Center in Lansdowne, Virginia. This workshop will be composed of DNDO personnel and a wide range of nuclear detection experts selected from across Academia, Government, the National Labs, and Industry. Expertise in detection, systems, operations, and policy will be included. We anticipate having approximately 35 total participants. Combining with the ARI Conference allows POPA/IEEE review participants to hear about other DNDO-funded TAR projects. It will also save on travel costs and time as some of the ARI conference participants will also participate in the APS/IEEE workshop. Some of the workshop participants are already DNDO reviewers and will be funded separately by DNDO to attend.

At the workshop, DNDO/TAR will brief the workshop participants on current capabilities and limitations, long-term needs and requirements, and the proposed long term R&D plan and vision for the next 10 years. Then each group pre-assigned a topic will report out their results to the workshop and carry on a discussion of those results. The discussion will be open to the entire workshop. The workshop will work through each of the questions and issues in turn. Each group with a pre- assigned topic will have a person taking notes on the discussion.

At the end of the first day new questions or issues that need to be discussed can be brought forward and groups formed to provide some analysis for the next day.

After the conclusion of the workshop, a report committee composed of APS and IEEE participants will generate a report reviewing the proposed TAR S&T strategy and proposed path forward. The report will be based on the written summaries and the results of further discussions by APS and IEEE report committee members. A draft report will be provided to DNDO/TAR for comments about possible technical corrections to the subject matter. The APS/POPA and IEEE will have final editorial control, and the report will not be available as a DNDO discussion aid or for release until the APS POPA and IEEE approve the report text as final. The APS and the IEEE, after using their existing internal approval processes, will then jointly publish the workshop report and provide copies to all participants.

PARTICIPANTS

The participants will span the full range of government, industry, academia, and national laboratories. Expertise will include detector science and engineering, systems analysis, policy, and operations. Committee members were recommended by POPA and IEEE key participants.

The draft steering committee currently consists of:

Dahlburg, Jill	NRL
Davis, Jay	Hertz Foundation
Donnelly, John	DC Fire Department
Isles, Adam	The Chertoff Group
Johnson, Neil	NRL
Knoll, Glenn	U. of Michigan
Kouzes, Dick	PNNL
Lanza, Richard	MIT
Larson, Ray	SLAC
Lavietes, Tony	IAEA
Perrone, Cosmo	LA/Long Beach Port Security (former)
Prussin, Stan	U. C. Berkeley
Schwitters, Roy	U. of Texas
Trebes, Jim	LLNL

¹ The DNDO/TAR Academic Research Initiative (ARI) is a joint National Science Foundation and DNDO program established through a formal Memorandum of Understanding in January 2007 to conduct basic and long-term research to stimulate innovation across many radiation detection sectors while augmenting the ER program and supporting the DNDO research goals. The ARI is also aimed at developing and training the next generation of researchers in nuclear detection technology.

Staff Advisors: Jodi Lieberman
Francis Slakey

This committee may change somewhat as people schedules and availability change. If a person is not available someone of comparable capability and experience will be invited to join.

The full list of workshop participants has not yet been developed.

DELIVERABLES

Formation of steering committee	now
Initial briefing by DNDO/TAR	late April, early May
Investigation of key issues	July 23
Workshop	July 26, 27
Draft report to DNDO/TAR	mid to late September
Draft report to POPA	October 5 – POPA meeting
Final report	after approval and any required revisions
Publication	after all approvals

NOTE: The IEEE approval process calendar needs to be added.

DURATION AND FUNDING

The duration will be less than one year with a goal of final report completed before end of 2012. Funding will be \$25K from POPA, \$25K from IEEE, with the workshop site funded by DNDO. The POPA and IEEE funding will be used to pay travel and per diem for the workshop participants. This level of funding is currently being reviewed.

KEY ISSUES

The review will take place on an aggressive schedule in order to utilize existing meeting venues and to assist DNDO by providing comments about the DHS/DNDO long-term R&D plan and vision for the next 10 years. This schedule is complicated by teaming with the IEEE. They have their own independent approval and funding process. It appears to be running about 2 weeks behind the APS, but there is no certainty of outcome to the process. DNDO is aware of all this. We will inform DNDO in writing that meeting the aggressive schedule is a “best effort” and not a certain deliverable. DNDO is also aware that an actionable POPA/IEEE report must go through approval processes that will take the time it takes. These processes are critical for quality assurance. DNDO will also receive this condition in writing.

The IEEE participation is not certain. At the moment they are working through their approval process and a favorable outcome is expected. If IEEE decides not to participate the original plan will now be unaffordable. The back up plan is to reduce the size of the steering committee by 4 and to have a subset of workshop participants attend the ARI review. This subset will report out to the APS/IEEE workshop. Additionally we will utilize DNDO-funded ARI reviewers and we can add a few people to this list. DNDO has agreed to this.