# NRC NEWS

**U.S. NUCLEAR REGULATORY COMMISSION**
**Office of Public Affairs** **Telephone: 301/415-8200**
**Washington, D.C. 20555-0001** **E-mail: opa@nrc.gov**
**Web Site: http://www.nrc.gov**

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**Remarks Prepared By**
**Dr. Peter B. Lyons, Commissioner**
**U.S. Nuclear Regulatory Commission**


## Managing Technical Support Organizations at the U.S. Nuclear Regulatory Commission

**Keynote Address**
**to the**
**IAEA International Conference on the Challenges Faced by Technical and Scientific Support Organizations in Enhancing Nuclear Safety**

**April 23-27, 2007**

### I. Introduction and Overview

It is a great honor to speak to you here in beautiful Aix-en-Provence on behalf of the United States Nuclear Regulatory Commission (NRC). This is not the first time I have been to this wonderful city, and I'm pleased to return.

Both my colleague, Mr. Mark Cunningham, Director of the Division of Fuel, Engineering & Radiological Research, and I look forward to sharing our perspectives on the role that Technical Support Organizations (TSOs) will have in helping the NRC meet its future challenges.

Today, I'd like to share with you my views about the benefits that the NRC derives from its diverse TSOs, a perspective shaped in part by my own research career. That career, prior to becoming a Commissioner, included more than 34 years at the Los Alamos National Laboratory. During my laboratory career I had many opportunities to interact and work with colleagues around the world, including a memorable five month assignment with the French CEA at Bruyères le Châtel, in addition to many years of collaborative research conducted under the auspices of the North Atlantic Treaty Organization (NATO).

## II. The Benefits of TSO Diversity

I am a strong supporter of NRC regulatory research and a strong supporter of international research collaboration. I am guided by my career experience, and by my strong belief that we must be led by facts and data, not just theory and speculation, to move forward into a future that safely achieves the benefits of technology. One of the best expressions of this idea comes from writer Robert Heinlein, who asks:

> "What are the facts? Again and again and again - what are the facts... and to how many decimal places? You pilot always into an unknown future; facts are your single clue. Get the facts!"

In my first speech as an NRC Commissioner, I reflected on one example from Los Alamos relating to my research group's pioneering work on some aspects of laser fusion. There was immense optimism then that modestly sized lasers would provide enough energy to ignite fuel and enable efficient energy production. Early calculations suggested energy breakeven required only about a kilojoule of laser energy. Some assumed that laser fusion would soon be producing power.

Now, 30 years later you don't hear much about laser fusion supplying power in the near future. That anticipation of success with one-kilojoule lasers has been replaced with construction of the multi-billion dollar National Ignition Facility to provide almost 2,000,000 joules, where ignition and energy gain might be demonstrated. The increase in required power, by almost 2,000 times, traces to many careful experiments, some done by my group at Los Alamos, which simply did not support that early optimism.

Calculations and modeling have a critical role in any technically complex endeavor, certainly including the work of the Commission. But I've learned that computational models are as good, or as bad, as the depth of the physics and engineering underpinning them. Models used for regulatory decisions require careful validation, and that requires careful research.

Today, at the NRC, we face many diverse challenges and require correspondingly diverse approaches to meet them. We rely on TSOs not only for many of our research needs, but also to augment our own staff in completing regulatory licensing reviews and inspections. We are also planning to use TSOs to assist us with regulatory reviews of expected new reactor applications.

Our Office of Nuclear Regulatory Research is the principal coordinating organization that contracts with external TSOs for our research needs, coordinates and guides such research, and collects and instills the knowledge gained from this research into a retrievable corporate memory of documents, literature, and procedures. These TSOs not only include the national laboratories with which I am personally most familiar, but also include universities, private commercial contractors, consensus standards committees, national research centers such as the NRC-sponsored Center to support a potential high level waste geologic repository, and international research centers and programs. In addition, each of our three principal program offices, for reactors, materials, and security, also manages certain contracts for external TSO assistance in licensing, inspection, and other support functions.

The NRC's regulatory mission was created when it was separated from our Department of Energy's (DOE's) promotional research and development mission, and it is, therefore, not surprising that much of NRC's research is performed by national laboratories that also perform

research for DOE. The NRC continues to take advantage of the wide diversity of expertise and capability in national laboratories such as Argonne, Brookhaven, Idaho, Los Alamos, Livermore, Oak Ridge, Pacific Northwest, and Sandia.

Such diversity remains highly valuable to the NRC, in some cases allowing us to choose from a variety of sources or approaches or test capabilities to best fulfill our regulatory research needs. One good example is the support we need for reviewing advanced computer-based safety systems and instrumentation and controls. We have obtained this support from a variety of TSOs over many years, including the National Research Council of the National Academies of Science and Engineering and the international research center at Halden. The extremely competitive job market for these skills requires that we continue to maintain a diverse pool of sources of such expertise. However, this increases the challenge of sharing and retaining information among the various TSOs. Improving this situation in the long-term may require that the NRC explore new approaches that centralize such expertise, perhaps in collaboration with other industries and government agencies. Such an approach might also better attract and retain the expertise we need.

Another useful approach for the NRC has been to access similar capabilities among different TSOs. This can help to address certain issues in a more timely manner. One recent example is the utilization of three separate national laboratories to conduct a spectrum of tests to determine the effects of water chemistry on potential clogging of PWR emergency sump filter screens.

From a funding perspective, in recent fiscal years the NRC total budget has been roughly $700 million, and of that sum about $160 million was budgeted for contract support in the reactor and material programs together, about a third of which was budgeted through our Office of Nuclear Regulatory Research. It should be noted here that the NRC recovers 90% of its budget from fees assessed to our licensees.

Let me further itemize our various regulatory and research needs and how the NRC meets them through TSOs.

First and foremost is our need to maintain the safety of our operating reactor plants. Most of these plants will request renewal of their licenses to operate beyond the original 40 years, and our research approach must continue to seek a better understanding of the materials aging issues that we have seen or that we can predict. The nuclear industry is addressing these issues, and the NRC continues to review the results of industry-sponsored research and to contract with our national laboratories to verify such results when necessary.

Other potential challenges to safety margins must also be addressed, such as the effects of water chemistry on PWR emergency recirculation that could precipitate solids and, in addition to clogging sump screens, could also interfere with mechanical components or heat transfer. Other operating reactor issues include vibration and associated increased mechanical stress that can occur in certain components due to increases in reactor power ratings. As the affected licensees and industry have worked to resolve these issues, the NRC has contracted with private engineering firms to perform independent simulations and calculations to provide the level of assurance we need to ensure that the resolutions are adequate.

Over the past 15 years the NRC has certified four new reactor designs: the General Electric ABWR, Combustion Engineering System 80+, and the Westinghouse AP600 and AP1000. We are

currently reviewing the General Electric ESBWR and are planning to begin a review of the Areva EPR later this year. The adequacy of new safety features in these new designs must rest on facts, not theory. For example, we employed university researchers to provide the test data we needed to certify the passive safety system design of the Westinghouse AP600 and AP1000, and future university research capability remains a valuable tool in our research toolbag. In addition, more than 25 years of research into severe accidents by different TSOs from many countries have contributed greatly to developing severe accident design features.

The somewhat uncertain number of new reactor plant applications expected over the next few years has made it necessary for the NRC to plan for contracting with a diverse set of TSOs to supplement our review capability if the demand for such reviews exceeds our in-house capability. For this purpose, we have identified TSOs that can be categorized into two main groups: those with very specialized skills or expertise that the NRC staff does not possess and for which adding full-time staff would not be cost-effective, and those with more general engineering expertise that are needed to augment the staff.

Our national laboratories are coordinating closely to serve this need, allowing for an efficient process for NRC to obtain needed resources from these laboratories. In addition, we have looked to other federal agencies with specific expertise, such as the U.S. Army Corps of Engineers and U.S. Geological Survey, for their environmental and geological/seismic expertise. Finally, we have identified a pool of approximately 1,200 persons from small commercial businesses and consulting firms that have potentially no or limited conflicts-of-interest from prior work with licensees.

Looking even further into the future, the NRC is planning for the possible licensing of the Next Generation Nuclear Plant and Global Nuclear Energy Partnership (GNEP) facilities. The technical bases developed for these technologies will be valuable not only to the U.S. DOE as the principal advocate for pursuing them, but also to the NRC as the principal safety reviewer for their licensing. Of course, the NRC must remain independent at all times. However, while bearing this in mind, there may still be advantages to sharing the cost and benefits of related research activities between the NRC and DOE.

On the security front, we must use the best available insights regarding threats such as aircraft crashes, using computer simulations that are extraordinarily challenging to benchmark against actual data. However, we have worked in this area with our national laboratories, which are equipped to handle the classified and sensitive information involved and have extensive and highly relevant test facilities.

In preparation for review of an application for a high-level waste repository at Yucca Mountain, we created a dedicated research center, the Center for Nuclear Waste Regulatory Analyses (CNWRA), to focus on the related unique research challenges. We are also looking at the CNWRA as having the expertise needed for our regulatory needs outside of the waste area, in our materials and even reactor programs. In the special case of the Yucca Mountain application, DOE is the applicant and will have extensively utilized its laboratories in preparing the application. Therefore, an extremely important advantage of the CNWRA is that it will provide us with the necessary technical support without any concern over a conflict of interest that might otherwise arise had we instead used DOE laboratories.

## III. Avoiding Conflicts-of-Interest

In awarding contracts, the NRC is required by law to avoid contracting with sources that have conflicts-of-interest due to their work with the nuclear industry or specific licensees. Avoiding such conflicts-of-interest is extremely important in maintaining the confidence of the public. Our contracting procedures require that contractor proposals affirm in writing the absence of any conflict-of-interest, and NRC specialists in contracts and technical monitoring are required to carefully examine and check the basis for this assertion. In addition, contract language specifically requires that should a conflict-of-interest arise or become apparent during the implementation of the contract, the contractor must immediately inform the NRC. In such situations, the NRC may have civil remedies against a contractor for non-compliance with these terms, and in certain cases, there can even be criminal sanctions imposed. The overall goal of avoiding conflict-of-interest is always present in our contracting activities.

This challenge has recently become greater as DOE has chosen to use large engineering firms to manage or co-manage its national laboratories. Many such large firms also have extensive involvement in the nuclear industry, and this is likely to increase with any new reactor construction. In fact, any renaissance of nuclear plant construction in the U.S. will also attract many small and mid-sized commercial engineering and consulting firms, which could limit the NRC's ability to use them for supplemental support in licensing and inspection of these new plants.

## IV. Closing

As I noted earlier, I am a strong believer in international collaborations that address nuclear science and technology. I also strongly support collaborations among international regulatory bodies and value the expertise of their associated TSOs. Each regulatory body has its own unique needs for TSO support related to the technologies it regulates and manner in which it is organized. I believe there can be many benefits from collaborative arrangements between countries with shared interests and needs. Such benefits can be found from specific technical collaborations as well as more general regulatory collaborations. It can also be very beneficial in international conferences such as this one to share our experiences in effectively utilizing TSOs.

Finally, if I let my thoughts drift northward for a moment to Cadarache, the future home of the International Thermonuclear Experimental Reactor (ITER), I see one of the most impressive and complex examples of an international commitment to research collaboration. I believe that such commitments are necessary to solve the most significant problems that face our global human society today.

Again, I am very pleased to be invited to join you, and I hope you have a very productive exchange while you are here. I look forward to my further discussions with you on this very important topic.

Thank you for your kind attention.