SAND2008-1994C

TRANSPARENCY: BUILDING TRUST AND CONFIDENCE ON AN INTERNATIONAL LEVEL

Carmen M. Méndez[1], Virginia Cleary[2], Gary Rochau[2]

[1]Sociotecnia Solutions, LLC - 4581 Weston Rd #174, Weston, FL 33331
[2]Sandia National Laboratories - P.O. Box 5800 MS0748, Albuquerque, NM 87185

ABSTRACT

A key objective to the global deployment of nuclear technology is maintaining transparency among nation-states and international communities to assure the safe and legitimate use of nuclear material and related technology. To date, safeguards have been effective as a means to minimize opportunities for proliferation. However, recent changes in the global political climate require that trust relationships be enhanced among nation-states. An advanced transparency framework that provides instantaneous assessment of conditions at a nuclear fuel cycle facility, in addition to international safeguards, can increase confidence that a facility is not being used for diversion. This paper will outline how advanced transparency concepts can be applied to future nuclear facilities, and how the application of advanced transparency can provide a means to increase trust among nation-states and international parties.

Key Words: Transparency, Confidence, Trust

"To create confidence a country may wish to go beyond the openness that follows from routine safeguards arrangements."
---Hans Blix (director general's statement to the February 1992 Board of Governors)

INTRODUCTION

The increasing demand for energy alternatives and renewed interest in the global deployment of nuclear technology has raised safety and proliferation concerns within the international community. Historically, the International Atomic Energy Agency (IAEA) safeguards have been effective as a means to minimize opportunities for proliferation. However, the current political climate calls for advanced strategies to generate trust and confidence among nuclear hosts and their stakeholders. To this end, transparency principles have been developed with focus on building trust relationships among nation-states, specifically between the country operating nuclear technology and other countries that are concerned about that country's operations.

In the context of the nuclear fuel cycle, we define Transparency as "a confidence building approach among political entities, possibly in support of multi-lateral agreements, to ensure civilian nuclear facilities are not being used for the development of nuclear weapons. …Nuclear fuel cycle transparency involves the cooperative sharing of relevant nuclear material, process, and facility information among all authorized parties to ensure the *safe and legitimate use* of nuclear material and technology." [1]

Building trust and confidence is a process primarily based on a stakeholder's interpretation of information that is readily available, including perceptions of interactions and conversations. As stated by Larrimore, et al, "A determination of transparency results from an assessment by others and thus is a perceived virtue of an organization, government, or state. A government or state cannot achieve transparency simply by proclaiming it." [2]

Due to the subjectivity in perception relationships, we believe that full disclosure of information regarding a particular issue of concern is required to ensure that transparency is effective in building trust. Ranging from what information is available at a facility, to how the information is collected and analyzed, and what the results of the analysis are; relevant information that is withheld could indicate to the other party that there might be something to hide. As a principle, all parties involved commit to complete sharing of all information relevant to an issue of concern and the way in which the information is and will be used. Figure 1 illustrates that relevant information must be shared by both the host and stakeholders. Trust and confidence are enhanced by the cumulative sharing of relevant information from all parties involved in the transparent relationship.

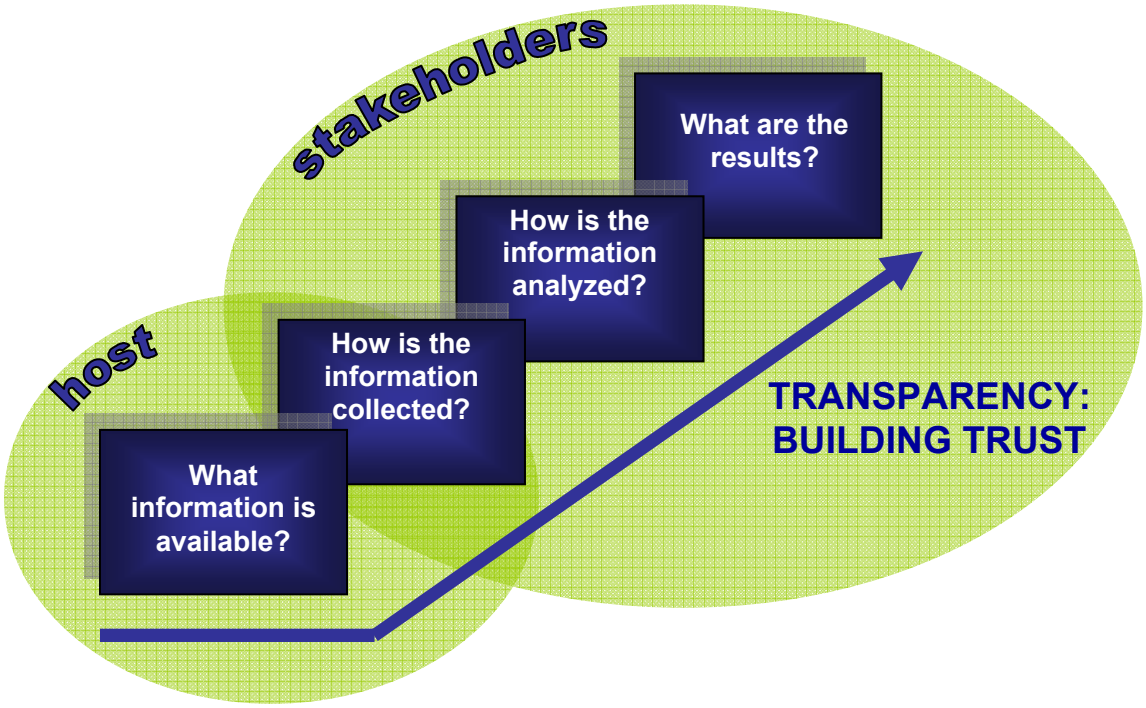

Figure 1: Transparency is focused on building trust relationships between a host and its stakeholders. For this to occur, complete sharing of information relevant to the transparent issue is required from both parties.

TRANSPARENCY AND SAFEGUARDS

Transparency is not equivalent to IAEA safeguards. Safeguards are the activities and systems that allow the IAEA to independently verify declared operations at the nuclear facility. While safeguards have been used historically as a means to minimize opportunities for proliferation, transparency – and advanced transparency – was designed for the purpose of building trust relationships among stakeholders (i.e. countries,

facilities, general public, etc). Larrimore, et al, defined transparency in international safeguards and nonproliferation context as "the condition in which a state's nuclear programs, activities, facilities, capabilities, and intentions are known to other members of the international community, through explicit policies and actions of the state, by reason of its general climate and culture of openness, and by independent information available on the state." [2]

Transparency principles and specifically advanced transparency's capability for real-time analysis, as proposed by Sandia National Laboratories [1], can support IAEA's safeguards efforts by providing an alternative source of objective data to flag real-time deviations from declared operations.

IAEA safeguards are negotiated between IAEA and the host country. The location of monitors and availability of information is agreed upon within a formal and political environment. Instead, the only decisions involved in transparency are who the host decides to be transparent to and what issue they decide to be transparent about (i.e. safeguards, safety, materials accountancy, radiation, etc). Defined by diverse interests and concerns, stakeholders can range from the general public living near a nuclear facility to the neighboring country or the international community. For a transparent facility, safeguards become complementary; IAEA's independent verification becomes another way to build trust and confidence by confirming the integrity of the host's operations.

When a host agrees to enter into a transparent relationship with a stakeholder, there is no negotiation and no withholding information regarding the specified issue from the stakeholder. However, only information relevant to the issue that is basis for the transparent relationship is required to be shared. For example, if Facility X decides to enter into a transparent relationship with City Y -located within a 35 radius- regarding radiation, they would share information with the city's representatives regarding their radiation levels and readings, how these are obtained and the results. They are not required to share information about their safeguards, materials accountancy, or any other details not relevant to radiation. Likewise, if Country A wants to be transparent to Country B about their materials accountancy, they would share all information that is available regarding the type of materials they are using, but not physical protection or safety data.

It is important to point out that an agreement to be transparent with one stakeholder does not rule out a transparent relationship with another. It is possible for a host to simultaneously be transparent to multiple stakeholders, whether it is about the same or different issues. Each transparent relationship is independent and exclusively between the host and the stakeholder. However, being transparent to different stakeholders does not mean that the information that is transparent to one must also be transparent to the other. For example, if Country A is transparent to Country B regarding materials accountancy and is transparent to City D regarding radiation, it would share all its materials information with Country B and all its radiation information with City D's officials, but it would not share materials information with City D or radiation information with Country B.

In reciprocity, to build trust, both stakeholders receiving the information must independently protect it from being released outside of their exclusive relationship with the host. While transparency requires full disclosure of relevant information within the transparent relationship, it does not imply full disclosure of information to the world. In

fact, the stakeholder receiving the information is required to protect transparent information in the same way the host protects the information outside of their agreement. Therefore, there is no means for outsiders to exploit transparency as a vulnerability to physical protection beyond the methods that would normally be attempted to gather information directly and illegally from the source.

The way in which transparency builds confidence depends on who the stakeholders are, their concerns, and their needs. A transparent relationship can focus their efforts to build confidence by customizing the analysis to address the specific concerns of the target audience. However, the process of data collection, analysis and conclusions from transparency efforts must also be transparent to the target audience in order for trust and confidence to be achieved. For example, it is not enough that City Y is told by its representatives that the radiation levels released from Facility X are acceptable. For City Y residents to trust this statement, it is essential that they are also informed of the process through which they came to this conclusion (i.e. "After obtaining data sources A, B, and C provided by Facility X and analyzing this information through means D and E, we have come to the conclusion that Facility X's radiation levels are safe in accordance to our knowledge of science, as stated in references F, G, and H.")

Notice that while no details are necessary when disclosing conclusions to the target audience (thus maintaining the release of pertinent information only to the educated representatives of the stakeholder that are capable of collecting, analyzing, and securing the information), the process through which these conclusions were obtained must be transparent to the audience.

ADVANCED TRANSPARENCY FOR GLOBAL DEPLOYMENT

Proliferation intent would be a political decision made by the host nation. As technical scientists, we cannot offer political solutions to prevent proliferation. Instead, by relying on technology we can provide an objective means to identify suspicious activity.

Larrimore, et al, stated that "When transparency is used, a qualifier is frequently added, often "full transparency." This reflects one of the major problems with the term transparency-the tendency to think of it as complete, when it is unlikely to be complete given the many aspects involved."

The advanced transparency framework [1, 3] proposed by Sandia National Laboratories (SNL) provides a means to address this challenge by uniformly gathering intrinsic process data from an automated facility to support confidence building. The framework supports the collection of all automated data available from a facility, collected directly from the source as it is generated, and continuously monitors operations to assess diversion risk in support of overall plant transparency. Utilizing the abundance of process data generated by automated facilities, the advanced transparency framework is capable of identifying when there is a higher probability that a host nation has started diverting materials. The "diversion risk" quantifies the probability and consequence of a host nation diverting nuclear materials from a civilian fuel cycle facility.

The advanced transparency framework was developed under the premise that higher levels of transparency should be engineered into a facility, simultaneously while the

facility is designed, rather than added-on after the facility is built and deployed. We have identified the fundamental principles that must be met to ensure a facility design that is compatible with built-in advanced transparency:

- *All processes should be automated. There should be limited hands-on operation with limited access to the system.* Manual operation and human intervention represent gaps in intrinsic sensor data availability and should be designed out of a process when possible. When these events are inevitable, engineering controls and extrinsic sensors must be put in place to ensure the framework's ability to verify the operation.
- *All signals should pass through a single central processing unit for all plant operations.* A direct link from the facility data bus to the sensor signal database will ensure that all generated data is available for analysis on a centralized location.
- *System components and sensors should be highly reliable, fail-safe, and tamper resistant. Technology should be in place to provide secured plant process data.* During the initial design and construction, controls will be engineered to ensure that the data used by the transparency framework is secure. A detailed systems analysis, *a priori,* will identify the types of data that must be collected to ensure a fail-safe system and tamper-resistant data collection. Any attempt to intercept or manipulate the data will be detected by the technology tools.
- *Secure information systems to distribute the data without providing data to potential adversaries.* The information system to transfer data from the facility data bus into the analysis tool should provide for secure, encrypted communication and intrusion detection technologies.
- *Analysis tools to digest the data provided into a uniform standard.* The system must ensure that large amounts of data that will be generated by an Advanced Transparency facility can be analyzed in a manner that can be reported to regulatory entities and the international community.

Transparency is not just nonproliferation. Figure 2 suggests that Advanced Transparency can be utilized to address integrated safety, safeguards, operations, and security (ISSOS). A surplus of inherent operational data from automated facilities is available for analysis with regards to insuring ISSOS of the facility. Using the work developed by a SNL and Japan Atomic Energy Agency (JAEA) as a basis, SNL is currently in the process of developing the methodology for evaluating Security, Safeguards, Operations and Safety and defining the optimal relationship between the four factors. The results of this work will enable the future exportation of nuclear facilities by providing a monitoring system capable of ensuring transparent operations that are safe, secure and legitimate.

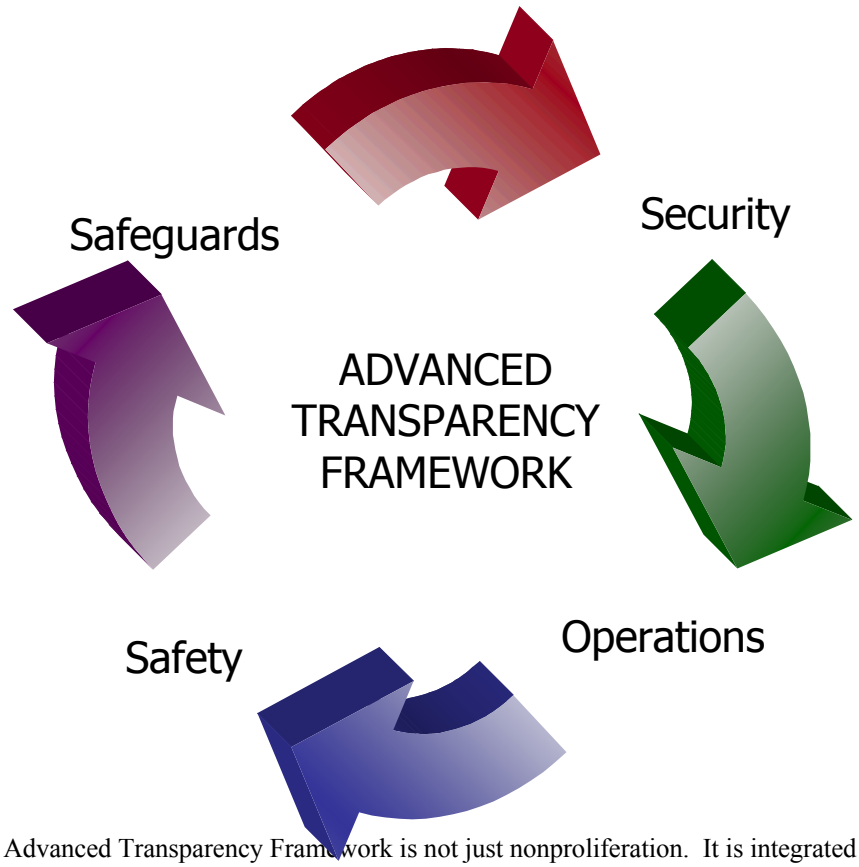

Figure 2: The Advanced Transparency Framework is not just nonproliferation. It is integrated safety, safeguards, operations, and security (ISSOS).

CONCLUSION

Transparent relationships are a confidence building approach that requires complete openness and sharing of information. Negotiated relationships imply a certain degree of secrecy, which can easily hinder trust and confidence between the relationship partners.

Implementing advanced transparency at a facility provides a means to increase trust among nation-states and international parties. We propose a new paradigm for the development of deployable nuclear technology, by designing the highest levels of transparency into all aspects of the nuclear fuel cycle. In the future, when advanced transparency is designed-in, rather than added-on to a facility, it can be used to minimize the risk of host diversion and theft, minimizes cost by eliminating the need for retrofitting the facility with extrinsic monitors and sensors, increases safety and reliability of operations by allowing detection of failure, and provides secure data to the IAEA for process monitoring.

With the upcoming age of the nuclear renaissance, the ability for the U.S. to export nuclear technology/facilities to advanced and developing countries is necessary. However, in order to ensure that the importer of these technologies operates the nuclear facilities in a safe and secure manner, a monitoring system must be in place that can insure the safe, secure, and legitimate operation of the nuclear facility. New U.S. nuclear facilities are becoming increasingly automated and require minimal human intervention. An automated system generates real-time data that can be used to track and measure the status of processes and materials at any given point in time. Built-in advanced

transparency will allow nuclear suppliers a means of designing systems that are demonstrably safe and proliferation resistant. When implemented, an advanced transparency facility will have the confidence that every aspect of proliferation concern has been addressed in the design.

ACKNOWLEDGEMENTS

Sandia National Laboratories is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company, for the United States Department of Energy under contract DE-AC04-94AL85000.

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