

LA-UR-04-4412

Approved for public release;
distribution is unlimited.

Title: AN APPROACH TO MANAGING CREDIBLE ROLLUP TO
REDUCE OPERATIONAL IMPACTS

Author(s): Steven Croney, S-DO, MS G729
David Young, S-4, MS G735
Los Alamos National Laboratory
Los Alamos, NM 87545

Submitted to: Institute of Nuclear Materials Management 45th Annual
Meeting, Orlando, Florida
July 18-22, 2004



Los Alamos National Laboratory, an affirmative action/equal opportunity employer, is operated by the University of California for the U.S. Department of Energy under contract W-7405-ENG-36. By acceptance of this article, the publisher recognizes that the U.S. Government retains a nonexclusive, royalty-free license to publish or reproduce the published form of this contribution, or to allow others to do so, for U.S. Government purposes. Los Alamos National Laboratory requests that the publisher identify this article as work performed under the auspices of the U.S. Department of Energy. Los Alamos National Laboratory strongly supports academic freedom and a researcher's right to publish; as an institution, however, the Laboratory does not endorse the viewpoint of a publication or guarantee its technical correctness.



An Approach to Managing Credible Rollup to Reduce Operational Impacts

Steven Croney and David Young
Security and Safeguards Division
Los Alamos National Laboratory
Los Alamos, NM 87545
(505) 667-5886

Abstract

The rollup methodology presented in this paper provides a framework for managing the dynamic flow of materials between multiple facilities at a site to monitor and prevent credible rollup while meeting the changing needs of operations. This approach to rollup management reduces the operational impact by lessening the restrictions on quantities of materials needed by a facility. The approach improves effectiveness and operational efficiency. LANL has developed a set of criteria to be applied in determining the credible rollup value for the site. The total quantity of material is evaluated against the criteria to determine which portion of the total should be considered as part of credible rollup. The material exclusion principles will be presented.

Background

DOE order 474.1A¹ requires that “Facilities having multiple Category III and IV locations containing Attractiveness level B and C material outside a protected area (PA) must ensure that these areas do not contain a total inventory of Category II or greater quantity unless a VA demonstrates that an unauthorized accumulation of a Category I quantity of material from these facilities is not credible.”

Rollup is defined in the DOE Safeguards and Security Glossary of Terms² as follows:

The accumulation of smaller quantities of special nuclear material to obtain a higher category quantity.

A paper published by John R Shultz³ addresses the complexity of defining credible rollup. His paper and the order requirements make a clear case that we can not simply establish safeguards requirements by using MBA categorization without considering rollup between MBAs. He defines rollup as the accumulation of smaller quantities of SNM based on a compliance standard while credible rollup is the risk based evaluation of the security measures used to protect the material based on a performance standard. The standard is defined in the Design Basis Threat (DBT).

The Orders define the protection requirements as compliance standards for material by Category while the DBT specifies the threat spectrum that must be evaluated as a performance standard using the vulnerability analysis methodology. The results of a VA actually determine the minimum protection elements required. Thus the evaluation of safeguards requirements to prevent credible rollup can not look only at the minimum

order requirements for a single MBA but must look at the entire facility, considering the delay and detection elements in place. While each MBA might be only Category III or IV the entire inventory must be looked at as a target and if it results in a rollup to Category I or II quantity it must be evaluated using the DBT to determine if it is a credible rollup.

The checks and balances built into the MC&A program for Cat III and IV can effectively deal with the non-violent active insider but most MC&A elements are ineffective against the violent adversary. MC&A elements may provide detection, but detection cannot defeat the violent adversary without an appropriate response. In addition MC&A elements might need to provide more timely detection when rollup is considered.

The question of how to define the materials that are considered part of the credible rollup is key to this process. LANL has adopted a policy of considering MBAs that have timely detection, sufficient delay in combination with local protective force response to not be part of the credible rollup. This would generally be material within a PA as referred to in the order, although a site might have material outside of a PA with adequate delay, detection and neutralization capability. LANL also considers all accountable quantities of SNM for categorization of a single MBA or MBAs collocated in a facility, although for site wide rollup items less than 6 grams Pu and 11 grams U are not included. This decision was made because of the difficulty for an adversary to locate and identify these items in multiple MBAs across the site.

The fact that material from multiple MBAs must be physically accumulated from various locations works to help us defend the material by adding complexity to the task and increasing the acquisition time. We still need neutralization capability if a Cat I target exists. Detection times can be too long if the minimum order requirements are employed for Category IV and III MBAs and the VA may show the need for improved detection times (e.g. alarms as opposed to guard patrol).

Back in the early 90s LANL did not have a problem with rollup as the site had 7 Cat I locations and operations requiring Category III and IV quantities could be conducted in these areas. Consolidation of SNM has left us with two and soon to be only one Cat I facility. The result of the consolidation to eliminate Cat-1 has resulted in an increase in the number of Cat III and IV locations needed by programs that could previously operate or store extra material in the Cat I facilities.

LANL currently has 10 Category IV and 9 category III MBAs that are considered as part of a credible roll up. Many of these MBAs are not at their maximum limit, although based on operations they may need to approach their limit. To prevent the credible rollup to Category I LANL monitors the cumulative of these MBAs as well as the individual MBA limits. When the credible rollup to Category I is approached, MBAs are restricted from receiving more material even if they have not reached their category limit. Once the laboratory wide limit is reached operations must return material from any of the credible rollup MBAs to an MBA that is not part of the credible rollup before additional material can be added.

Up to this time LANL has assumed that any SNM that does not have timely detection and local neutralization capability is part of the credible rollup. With the pending reduction to one Category I MBA and the need for more Category III and IV MBAs outside of a PA thorough analysis of the credibility of rollup will need to be done. This analysis will need to establish the better probabilities for detection, delay/task times and neutralization and determine if additional credit can be taken to exclude some materials/operations from the credible rollup quantity.

The changes in the DBT have added additional performance criteria to the order requirements that must be considered in this analysis.

One can propose that adequate protection of a portion of the rollup quantity make that quantity not part of the credible quantity. The problem with this argument is defining the level of protection required. Consider a site that consists of two locations with multiple MBAs and other single MBAs. In this case what level of protection would be required for one of the multiple locations to make rollup with the other sites not credible. Protecting one of the locations to the level of that total might not be adequate since the DBT threat could be at the level of all locations. For example if each of two sites have a Cat II rollup the protection measures required at both locations might not be adequate to meet the threat of the cumulative Category I and requires a site specific analysis as suggested by Mr. Shultz.

Conclusion

Los Alamos has established a set of criteria that defines the condition required to define material that is not part of a credible rollup and manages the credible rollup inventory to minimize the impacts on operation. The pending reduction of Category I sites will require a more detailed analysis of credible rollup to determine if an increase in the number of Category III and IV locations can occur. This analysis will need to identify additional protection measures that can support removing materials from the credible rollup category.

REFERENCES:

¹ DOE M 474.1-1A, "Manual for Control and Accountability of Nuclear Materials", dated 11-22-00. Published by the US Department of Energy.

² Safeguards and Security Glossary of Terms, 12-18-95, USDOE Office of Security Affairs.

³ Shultz, John, "Rollup of Nuclear Material, and Problems in Determining "Credibility" of Rollup" 43rd Annual Meeting of the Institute of Nuclear Materials Management, Orlando Fl., July 23-27, 2002