

LA-UR-

*Approved for public release;
distribution is unlimited.*

Title:

Author(s):

Intended for:



Los Alamos National Laboratory, an affirmative action/equal opportunity employer, is operated by the Los Alamos National Security, LLC for the National Nuclear Security Administration of the U.S. Department of Energy under contract DE-AC52-06NA25396. 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.

Evaluation of CMRR 3-Building Construction Option

The CMRR Project has been under development since 2001 and is currently based on a technical approach of two separate facilities: 1) a Radiological Lab/Utility/Office Building, (RLUOB) and 2) a single Hazard Category 2, Security Category I/II Nuclear Facility (NF) in accordance with the 2004 Record of Decision for the 2003 CMRR Environmental Impact Statement (EIS). With construction of the RLUOB complete and development of a Supplemental EIS underway for construction of the CMRR NF, consideration of a slight variant of a previously evaluated construction option to a single NF is warranted. This construction option would presumably obtain advantages through construction of two separate, distinct laboratory buildings in lieu of building a single NF. One laboratory would be Security Category I/II and the other would be Security Category III.

The original CMRR Project alternatives analysis examined three construction alternatives for the CMRR Nuclear Facility (NF), two of which segregated the operations according to the expected Hazard Categorization of the facilities (2 and 3) and one that examined a single Hazard Category 2 facility. This latter option was chosen as the preferred option for many reasons, the details of which are part of the CMRR Conceptual Design Report (CDR). The analysis essentially showed that none of the alternatives carried a significant cost advantage and thus operational, safety, and security issues drove the decision to a single facility. These CMRR NF construction alternatives previously evaluated in the CMRR EIS are considered to be comprehensive relative to the primary criteria of an Environmental Impact Statement. One similar option to those previously evaluated would be to segregate CMRR NF operations according to security category; however, in large part, this segregation would be very similar to the segregation according to hazard category – the operations that work on materials that contain more plutonium and therefore require a Hazard Category 2 facility are also the operations that would need Security Category I/II levels of protection. The nuclear materials vault is assumed to be a part of the Security Category I/II facility, which would reside inside of the PIDADS; the Security Category III facility would reside at the TA-55 site outside of the PIDADS.

To be complete, this section examines some of the qualitative features of an option that segregates NF operations according to security category. First, to meet mission requirements, the space requirements do not change appreciably (in fact, with two separate facilities, the amount of laboratory and overall space would increase to account for doubling the support requirements, including security access, personnel change rooms, utility support, and materials storage and management activities). The two buildings would nominally contain about the same amount of laboratory space relative to each other, and both would require ventilation systems that support gloveboxes, open-front gloveboxes, and fume hoods. Appropriate credited safety systems would be required to ensure that each facility would not challenge the offsite dose Evaluation Guideline.

Qualitative evaluation of this option yields few if any improvements over the baseline option of constructing a single Hazard Category 2, Security Category I/II facility. Some of the main areas of consideration, with brief descriptions, are listed below.

- Nuclear safety: Credited safety systems for the Hazard Category 2, Security Category I/II facility component in this two-building approach would require safety-class (SC) pedigree. To provide this SC pedigree, significant or major reduction in the overall two-facility footprint is not possible over the current CMRR NF design. The relative material-at-risk (MAR) quantities associated with the vault and materials characterization components of the program requirements mandate SC controls and inclusion of these program elements in the Security Category I/II facility. Furthermore, segregation of the analytical chemistry component of the program requirements that would only require Security Category III levels of security protection would still require credited safety controls to meet evaluation guideline requirements.
- Space requirements: The overall facility space would increase as a result of having to install multiple utility systems; laboratory space would also increase as discussed above. While there is an approximate 50/50 split in laboratory space when considering security categorization, it is important to note that MAR limitations for analytical chemistry operations that could be segregated into Security Category III would be operationally restrictive. To prevent this, it is likely that SC controls would be needed in the Security Category III facility to meet nuclear safety requirements. As such, nuclear safety considerations arguably have more effect on overall NF footprint than security considerations.
- Personnel requirements: Personnel requirements would increase as a result of having to support the operations in two independent facilities. Operational support would be the primary area where additional personnel are needed, but there would also be some increase in the programmatic personnel requirements to handle additional material transfer requirements, packaging, etc.
- Throughput/capacity: The overall chemistry and materials characterization throughput is reduced both in the interim and long term perspectives. During the interim period, LANL and NNSA are reliant on capability-only support in PF-4 and the existing CMR Building for a longer time (thereby also introducing programmatic risk), and having operations spread through multiple facilities will reduce capacity from material transport requirements.
- Security considerations: In general, having fewer facilities to protect is more advantageous from a security perspective. Segregating lower security-category operations in a separate stand-alone Security Category III facility would be expected to provide a reduction in the amount of personnel required to be in the HRP program over housing all functions in a single Security Category I/II facility. This reduction would provide reduced HRP life-cycle costs; however, these savings would not be sufficient to offset the increased construction costs and likely significant operational costs of operating two separate high-hazard facilities.
- Construction Sequencing: A two-building construction option would require a facility redesign, thereby delaying the overall schedule. Programmatically, construction of the Security Category I/II building first to relieve PF-4 of storage issues (vault) and temporarily suspended materials characterization capabilities and capacity would be advantageous. This two-building option

could provide some flexibility if budgetary constraints materialize, but given the time required for full design of two new facilities, it is unlikely that construction of the Security Category III facility could proceed to allow earlier CMR facility exit. In addition, this would not alleviate the vault and MC capability constraints, and would not be considered the most effective response to preserving CMR programmatic capabilities. Lastly, if the two buildings were built in series, this would further delay the schedule and increase the reliance (and associated risk) on the existing CMR Building.

- Safety Considerations – Site Construction: If the buildings are constructed in parallel, LANL and NNSA would have to manage site safety at two adjacent construction sites, both of which are adjacent to an operational nuclear facility (PF-4) and RLUOB.
- Overall Construction Cost: The overall construction cost would increase for three reasons: 1) the cost of redesign, 2) the costs of duplicating facility systems, and 3) the costs associated with increased escalation from the delays.
- Overall Construction Materials and Site Impacts: Constructing two facilities instead of one would increase the amount of site space impacted by the CMRR NF, and the amounts of construction material requirements would be expected to increase because of duplicative systems.

While segregation of the CMRR NF into two separate elements based on security classification could provide short-term budgetary flexibility, relative to the baseline single CMRR-NF option the additional costs, schedule, and risks, associated with this option do not make it a viable options that would warrant further investigation.