Modern Pit Facility Site Screening Report

INTRODUCTION

Based on the May 24, 2002 approval of the critical decision on mission need (CD-0) by the Secretary of Energy, the National Nuclear Security Administration (NNSA) is planning to design, construct and operate a new modern pit facility (MPF) that will provide a significantly larger capacity than the interim production capacity being established at Los Alamos National Laboratory (LANL). As a key step in the planning, the NNSA will prepare a Supplemental Environmental Impact Statement (SEIS) to the Stockpile Stewardship and Management Programmatic Environmental Impact Statement (SSM PEIS) [hereafter, that SEIS will be referred to as the MPF Siting EIS]. The MPF siting EIS will support a decision on host site selection. To continue with the development of an MPF, the Office of the Secretary of Energy will issue a Record of Decision (ROD) including the selected MPF host site. Following this ROD, a tiered, project-specific EIS will be prepared, as necessary, to support decisions related to design, construction and operation of the MPF at the selected host site. The purpose of this paper is to describe the results of the site screening process used to develop the reasonable site alternatives that will be evaluated in the MPF Siting EIS.

OVERVIEW OF SITE SCREENING

The purpose of the site screening process was two-fold: (1) to identify reasonable site alternatives for the MPF Siting EIS; and (2) to identify unsuitable site alternatives and document why these alternatives were not reasonable for the MPF Siting EIS. A two-step screening process was employed: first, all potential sites were judged against "go/no go" criteria; and second, those sites satisfying the go/no go criteria were judged against desired, weighted criteria. The desired criteria and weights were developed by members of the MPF project office. Federal employees from the NNSA and other relevant DOE program offices then "scored" the potential sites using the desired criteria. Aggregate scores for the alternatives were then tallied, and the reasonable site alternatives were determined.

SITES UNDER CONSIDERATION

Existing, major Department of Energy (DOE) sites were considered to serve as the host location for the MPF. Non-DOE or new sites were not considered to avoid potential contamination issues at a new location that had not previously been associated with plutonium or plutonium-bearing waste operations. Many DOE sites did not satisfy the go/no-go criteria and were eliminated during the first step of the screening process. The seven sites that were evaluated through both steps of the screening process were: Idaho National Engineering and Environmental Laboratory (INEEL), Los Alamos National Laboratory (LANL), Nevada Test Site (NTS), Pantex (PX), Savannah River Site (SRS), Waste Isolation Pilot Plant (WIPP) site at Carlsbad, and Y-12 on the Oak Ridge Reservation.

SITE SCREENING PROCESS

The first step in the site screening process was to develop go/no go criteria that any potential site had to satisfy to be judged further as a reasonable site alternative for the MPF. Sites not satisfying these go/no go criteria were not judged any further in the screening process. Members of the MPF project office determined that security and safety to workers and the public were the two most important factors. Accordingly, population encroachment and mission compatibility were deemed the appropriate go/no go criteria for siting the MPF, as explained below.

With respect to population encroachment, two types of data were factored into the criterion: density of surrounding population and nearness to a major city. Sites surrounded by populations greater than 1,000,000 people (based on a 50-mile radius population) were determined to be unsuitable. Sites contiguous to major cities were also determined to be unsuitable, due to the potential for future population encroachment and economic disruption and deleterious health impacts in the unlikely event of a major accident.

With respect to mission compatibility, it was decided that sites not currently conducting "DOE nuclear operations" were unsuitable for the MPF. Sites that currently conduct "DOE nuclear operations" have an established nuclear facility Environment, Safety, and Health (ES&H) and security infrastructure that were determined to be essential. Non-DOE nuclear sites were eliminated from consideration because of concerns regarding long-term mission compatibility and the absence of an existing DOE ES&H and security infrastructure. Sites predominantly engaged in "clean-up" missions were also determined to be unsuitable for the MPF because proposing a major new nuclear facility had the potential to distract from efforts related to site clean-up.

Sites that satisfied the go/no go criteria were then judged against desired, weighted criteria to determine the comparative reasonableness of each site alternative. The following weighted criteria were utilized: population encroachment, mission compatibility, margin for safety/security, synergy with existing/future plutonium operations, minimizing transportation of plutonium, NNSA site, and infrastructure.

Technical judgments were utilized to establish criterion weighting. The most important criteria were assigned a relative weight of 5, the remaining criterion were assigned a weight of 3. Of the desired criteria, the NNSA determined that population encroachment, mission compatibility, margin for safety/security, and synergy with existing/future plutonium operations were of greatest importance and thus, were assigned the highest weighting of 5. Minimizing transportation of plutonium, current use as an NNSA site, and infrastructure were assigned a weighting of 3.

SITE SCREENING CRITERIA

Population Encroachment: Population encroachment considered the population density within a fifty-mile radius of the site. The population density near the site boundary and population centers within 10 miles of the site boundary were also considered. Because population encroachment has strong security implications, as well the potential to affect ES&H risks to the public, this criterion was rated one of the most important criterion and assigned a weighting of 5.

Sites with the smallest population at the greatest distance from the MPF received the highest rating of 10.

Sites with the highest population closest to the MPF received the lowest rating of 0.

Sites in-between received a rating of 2.5, 5, or 7.5, depending upon the relative population encroachment

These scores were then multiplied by a factor of five to determine the final score for this criterion.

Mission Compatibility: Mission compatibility referred to the capability of the MPF to be constructed and operated in harmony with a site's existing missions. For example, a site conducting similar operations to those of the MPF, i.e., receipt and storage of Category I quantities of plutonium, large scale plutonium chemical processing operations, plutonium foundry, plutonium machining and joining, assembly, post assembly testing, extensive analytical and metallurgical laboratories, and waste handling of high level and TRU waste, was expected to be more suitable for constructing and operating the MPF compared to a site without such operations. Sites conducting similar missions were expected to have a higher likelihood of successfully accomplishing the MPF mission on schedule and on budget; thus, this criterion was rated one of the most important criterion and assigned a weighting of 5.

Sites with existing missions most similar to those of the MPF received the highest score of 10.

Sites with existing missions least similar to those of the MPF received the lowest score of 0.

Sites in-between received ratings of 2.5, 5, or 7.5, depending upon the relative similarity of their missions to those of the MPF.

These scores were then multiplied by a factor of five to determine the final score for this criterion.

Synergy with Plutonium Operations: While similar to mission compatibility, this criterion took into account specific attributes associated with plutonium manufacturing and processing, including potential synergies with existing/future plutonium missions that have the potential to improve the efficiency/reduce the costs of constructing/operating the MPF. Factors such as the extent of existing/future plutonium manufacturing and processing, experience with plutonium manufacturing and processing, existing/future plutonium radiological labs and analytical capability, existence of emergency operation personnel and equipment are examples of factors that were considered. This criterion was rated one of the most important criterion and assigned a weighting of 5.

> Sites which conduct the most plutonium manufacturing and processing, or which have the potential to conduct the most plutonium manufacturing and processing in the future, or which have or may have the greatest plutonium infrastructure received the highest score of 10.
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> Sites which conduct the least plutonium manufacturing and processing, or which have the potential to conduct the least plutonium manufacturing and processing in the future, or which have or may have the least plutonium infrastructure received the lowest score of 0.
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> Sites in-between received scores of 2.5, 5, or 7.5, depending upon the relative amount of plutonium manufacturing and processing/infrastructure afforded by the site.

These scores were then multiplied by a factor of five to determine the final score for this criterion.

Margin for Safety/Security: Margin for safety and security referred to a site's inherent ability to provide a safe and secure operating environment against threats and to minimize potential effects of accidents. Factors such as remoteness, terrain, proximity to military bases, controlled air space, proximity to commercial flight paths, and visibility from public highways are examples of factors that were considered. Sites with greatest margins for safety/security provided a higher likelihood of successfully accomplishing the MPF mission; thus, this criterion was rated one of the most important criterion and assigned a weighting of 5.

> Sites with the greatest margin for safety/security received the highest score of 10.
>
> Sites with the lowest margin for safety/security received the lowest score of 0.
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> Sites in-between received scores of 2.5, 5, or 7.5, depending upon the relative margin for safety/security afforded by the site.

These scores were then multiplied by a factor of five to determine the final score for this criterion.

Minimization of Transportation: Candidate sites were scored, on a relative basis, according to their geographic location and the amount of hazardous material transportation that would be required to support the location of the MPF at that site. Reducing the total distance that plutonium feedstock, manufactured product, and radioactive waste are transported has potentially substantial operational, cost, safety, and security benefits. This criterion was assigned a weighting of 3.

Sites requiring the least plutonium transportation received the highest score of 10.

Sites requiring the most plutonium transportation received the lowest score of 0.

Sites in-between received scores of 2.5, 5, or 7.5, depending upon the relative amount of plutonium transportation associated with the site.

These scores were then multiplied by a factor of three to determine the final score for this criterion.

NNSA Sites: Existing NNSA sites (including non-NNSA sites that conduct a significant amount of NNSA work) with NNSA procedures, NNSA management, safety, security, and administrative procedures in place were deemed more desirable than sites that do not conduct a significant amount of NNSA work. This criterion was assigned a weighting of 3.

NNSA sites (including non-NNSA sites that conduct a significant amount of NNSA work) received the highest score of 10.

Non-NNSA sites that do not conduct a significant amount of NNSA work received the lowest score of 0.

Sites in-between received scores of 2.5, 5, or 7.5, depending upon the relative amount of NNSA work associated with the site.

These scores were then multiplied by a factor of three to determine the final score for this criterion.

Existing Infrastructure: Candidate sites were scored, on a relative basis, on the amount of existing relevant infrastructure. Factors such as existing security forces and structures, existing administrative facilities, existing safety equipment and personnel, available utilities, existence of on-site technical capability to provide applied R&D and manufacturing technical support, and existence of a waste handling infrastructure for both higher level and TRU waste are examples of factors that would make a site a more desirable location for the MPF. This criterion was assigned a weighting of 3.

Sites with the greatest existing infrastructure received the highest score of 10.

Sites with the least existing infrastructure received the lowest score of 0.

Sites in-between received scores of 2.5, 5, or 7.5, depending upon the relative amount of infrastructure at the site.

These scores were then multiplied by a factor of three to determine the final score for this criterion.

RESULTS OF SITE SCREENING PROCESS

All major DOE sites were initially considered. Many DOE sites did not satisfy the go/no-go criteria. For example, Hanford, although remote, did not satisfy the mission compatibility criteria. Hanford is clearly a remediation site which no longer has a weapons mission. Siting a new weapons production facility at Hanford would clearly conflict with the future plans for the site. Kansas City Plant did not satisfy either of the two go/no-go criteria as it is a non-nuclear facility located in the midst of a large urban setting. Both SNL and LLNL, due to their proximity to large, rapidly growing populations, did not satisfy the go/no-go criterion for population encroachment. Rocky Flats did not satisfy either of the go/no-go criterion. This facility is in close proximity to a large population, no longer has a weapons mission, and is considered to be a remediation site. Other major DOE sites, such as ANL-East or BNL, that do not have national security-related missions and/or are close to major urban centers were eliminated for similar reasons.

Seven DOE sites remained after initial go/no-go screening. These remaining DOE sites (Carlsbad, INEEL, LANL, Nevada Test Site, Oak Ridge Reservation (Y-12), Pantex and Savannah River site) were then ranked, on a relative basis, using each of the site screening criteria and the weighting factors described above. Each of the DOE reviewing officials independently scored these seven sites using the criteria described above. Scores of each reviewer were then averaged for each criteria. Weighted scores for the sites were then tallied, yielding the results shown below:

Average Weighted Site Selection Scores

	LANL	SRS	NTS	Pantex	Carlsbad	INEEL	Y-12
Population Encroachment	23.5	14	50	23.5	47	40.5	0
Mission Compatibility	48.5	47	9.5	28	11	6.5	9.5
Margin for Safety/Security	20.5	29.5	50	17	33	31.5	8
Synergy With Pu Ops	48.5	47	12.5	19	11	6.5	0
Transportation Minimization	20.7	0.9	8.4	30	29.1	6.6	3.9
NNSA Site	28.8	28.2	28.2	28.2	3.9	3.9	25.2
Infrastructure	28.2	28.8	10.2	15.9	8.4	8.4	11.4
TOTAL WEIGHTED SCORE	**218.7**	**195.4**	**168.8**	**161.6**	**143.4**	**103.9**	**58**

CONCLUSION

Based on the weighted scores shown above, Y-12 and INEEL scored significantly less than the other five sites, thereby creating a significant break among the seven sites. Carlsbad, LANL, NTS, Pantex and SRS all received scores of at least 28% higher than INEEL, and at least 60% higher than Y-12. The average score for the five highest ranked sites was 178, and the five highest-scoring sites were within 20% of this average. INEEL and Y-12 were 42% and 67% below this average respectively.

In addition, the results of the site screening scoring process were reviewed to determine if one or more "variant" scores influenced the results. A sensitivity analysis was performed in which both

the high and low scores were eliminated in an attempt to add more consistency to the average scores. The results determined that no single individual score influenced the final results of the process.

Another sensitivity analysis was performed to examine the importance of the weighting factor for transportation that is a criterion that could have broad interest from citizens in several states. This criterion was assessed using a weighting factor of 5 instead of 3. The increased weighting yielded higher scores for Carlsbad and Pantex (which were already score the highest for this criterion based on a weighting factor of 3), while not changing the relative ranking of any of the sites. The net result was an even more significant break between the top 5 sites and the bottom 2 sites, thus, corroborating the original results.

The results of these sensitivity analyses confirmed both the relative rankings of the seven sites and the significant "break point" between the top five sites and the bottom two sites. As a result of the site screening process, it was determined that Carlsbad, LANL, NTS, Pantex and SRS represented a reasonable range of alternatives sites that should be evaluated in detail in the MPF Siting EIS.