Report of the Nuclear Weapons Complex Infrastructure Task Force

Recommendations for the Nuclear Weapons Complex of the Future

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Draft Final Report

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4. **A weapons assembly and disassembly hall**. This will be the location where HE and SNM components for the sustainable stockpile are assembled as a unit. The assembly area will support primary assembly, integration of the primary with the secondary, and the installation of all non-nuclear components into the weapon assembly, as well as surveillance and disassembly of the sustainable stockpile.
5. **Plutonium and pit storage facility.** This building will house all the pits and plutonium raw material.
6. **An HEU and secondary canned assembly storage area.** This facility could be contiguous to the HEU production facility or the plutonium storage facility. This will house all HEU for production and the CSAs.
7. **Facility for secure transportation and shipping/receiving of nuclear weapons.** This facility will be devoted exclusively to shipment and receipt of weapons.
8. **Non-nuclear component assembly and storage.** This facility will be devoted to non-nuclear parts and components to support operation. For security cost savings, most of these components would be stored at the commercial vendor's location or another Complex facility but consistent with just-in-time commercial practices.
9. **Environmental reclamation and waste recovery facility.** This facility will perform all of the reclamation and processing of the plutonium and uranium waste streams. That material which can be recovered will be recycled within the production Complex; the remaining will be packaged for shipment to SRS, NTS, or other DOE disposal sites.

Equipment in the CNPC

The CNPC must avail itself of modern production techniques and practices, modern production equipment, quality assurance, and quality controls. We suggest that the facility use numerically controlled machines and non-contact quality assurance and quality control techniques to the degree such technology can be procured from the commercial sector. To the degree that the processes can be automated and human contact reduced, the quality and uniformity will go up, the environmental costs will go down, and risks to employees will be reduced. Overall, the modest increases in non-contact, numerically controlled capital equipment will more than pay for itself in environmental and production cost reductions. Of particular importance is the ability to do rapid prototyping and free-form fabrication integrated with the numerically controlled machine tools found in modern production plants. These technologies will be used for both low-volume production and the production of tooling, and of course the first-article prototype. The latter is an important element of the responsive character of the Complex.

The NNSA already has conceptual or detailed designs for most of the larger facilities such as the MPF, the UPF, and the Chemistry and Metallurgy Research Replacement (CMRR) building. Note that both the MPF and UPF have laboratory capability that is already identified in the CMRR, and constitute about two-thirds of the cost of the CMRR. By locating all of these at the CNPC, major savings in the elimination of redundant capital equipment and construction costs are realized.

Current designs envision above-ground structures. However, the Task Force notes that underground facilities will prevent an adversarial force from surveying the site or from targeting particular CNPC facilities with weapons of choice. Going underground will simplify and greatly reduce operating costs for security. Site selection alternatives should consider the total life-cycle cost of the facility, including the security and capital costs.

We recognize that the design-basis threat (DBT) will evolve over time as the character, methods, and actions of potential terrorist threats continue to evolve. Therefore, it is imperative that the site incorporates an inherent flexibility to meet future security requirements, preferably through technological innovation. Clear buffer zones and underground facilities would provide high degrees of flexibility for the future. Further discussion of the DBT is found in Appendix G.

A classified Supplement[2] analyzes the issue of timing for the CNPC for a stockpile of 2200 active and 1000 reserve and the expected pit manufacturing capacity of the future Complex. The conclusion is that if the NNSA is required to: 1) protect a pit lifetime of 45 years, 2) support the above stockpile numbers, and 3) demonstrate production rates of 125 production pits to the stockpile per year, the CNPC must be functional by 2014. If one accepts the uncertainty of pit lifetime of 60 years, the CNPC can be delayed to 2034. In either case TA-55 is assumed to be producing 50 production pits to the stockpile per year.

4.2 Industrial Benchmarks

We considered production perspectives that a commercial company, with experience in comparable materials, might have on the Complex pit production operations and facilities.

Since there is no commercial experience with plutonium outside the Complex, the Task Force had a study group look at pit production and future facility needs from a beryllium manufacturing perspective. Beryllium components are used in some current primary designs and have very similar machining requirements and tolerances to the plutonium pits. A number of the casting techniques are different, but not sufficiently different that the physical nature of the facility is altered. Rather, the hazardous nature of beryllium and plutonium make handling specifications and restrictions similar.

The Task Force feels that the Complex would benefit greatly from a greater reliance on advanced manufacturing tools, methodology, and experienced personnel drawn from the commercial state of the art manufacturing industry rather than a modernization of approaches developed 40 years ago within the Complex. The inclusion of such outside experts would likely have a great impact on cost of the CNPC and productivity of the future production complex. More detailed perspectives are included in Appendix H, including consideration of another commercial industry that also has developed highly efficient, secretive production approaches that may be relevant to the production complex of the future.

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[2] *Classified Supplement to the NWCITF Report Recommendations for the Nuclear Weapons Complex of the Future*

Options for the MPF

Several ideas that should be considered before they are discarded, since the savings are large for each option, and several of the options could result in additive savings:

- Reduce the structure costs to meet the DBT by using (buying) more land, obtaining advantage of earlier detection and thereby denying approach.
- Consider placing the process building underground.
- Consider placing of the process building inside of a mountain.
- Review the DOE DBT and see if there are other technologies that can be deployed to reduce the cost of the building and still achieve the DBT requirements, but at lower capital and operating cost.
- The size of the MPF is scaled by the production rate of 125 per year. If that number could be reduced by ½ the footprint of the production building should scale, but not quite linearly.
- Reduce the types of pits to be produced. Designing for pits of the future rather than the unique and hard to make pits of the Cold war stockpile would save a lot of money.

It is the Study Group's opinion that the last bullet may have the greatest impact on capital cost reduction, from a technical perspective.

The DBT, which is not a technical requirement, also drives the cost. The Study Group believes that constructing underground, in a mine, or an equivalent, could be the cheapest method to address the DBT is burial. Traditional mining companies can profitably mine underground ore valued at $200/cubic yard. Thus, ~ $50 M should provide a substantially subsurface cavity to house a "thin walled" pit manufacturing facility or any other equivalent type work space.

SRS has utilized good engineering practices and teamwork in the MPF project to date. SRS developed a scope of work, a "model", and established a design criteria and production output level. SRS has designed the MPF given the current set of regulations, guidelines, DBT, safety considerations at today's standards. If these standards or other factors change, it will only make this facility more difficult to build and more costly, if it is done in the traditional DOE manner. It should also be recognized that construction raw material costs are escalating higher on a daily basis. This will also drive project costs higher. Consideration should be given to spend more time and effort on the "Design" phase to reduce contingency and uncertainty in the cost estimate.

TA-55 Operations Commentary

TA-55 is a remarkable facility. The attention to detail at every level of manufacture is to be commended. It is obvious that **processes have been laboriously developed** to provide a quality product safely. However, the manufacturing priorities appear to be: (1) Safety, (2) Security, (3) Quality. **The one missing element is: Productivity**.