
**Report of the Nuclear Weapons
Complex Infrastructure Task Force**

**Recommendations for the
Nuclear Weapons Complex of
the Future**

**July 13, 2005
Final Report**

**Secretary of Energy Advisory Board
U.S. Department of Energy**

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.**

Due to the nature of the processes, safety and security requirements must take a priority. This is obvious a given a facility of this critical nature. Unfortunately, the manufacturing operation at TA-55 is extremely inefficient when compared with any conventional manufacturing operation. There is little evidence of modern manufacturing techniques being employed. The fundamental process design is grounded in a seriously outdated “inspect quality in” mentality. Modern manufacturing techniques including Lean Manufacturing, Six Sigma, Design of Manufacturability and Assembly, and others, if applied rigorously could yield unprecedented reductions in TA-55 pit manufacturing costs and cycle time.

The enormous investment made in the TA-55 facility has not yielded anywhere near the productivity levels this facility should be capable of attaining. The process is operated with little sense of urgency. It appears that each manufacturing step is “an event” attracting numerous witnesses and visitors. The process of actually building a pit seems to be a secondary mission of the facility, not the primary focus.

At every phase of operation, there appears to be numerous opportunities to “lean-out” the operation. The current process follows 1950’s “inspect in” quality methodology. As such, the vast majority of the time the plutonium material, raw or in the process of becoming a pit, is waiting to be inspected, to be tested, waiting for test results, etc. This is an incredible waste of time. This is not to say that quality inspection does not have its place, it does. But given the many years of pit manufacturing experience, we should know how to make these components by well characterized processes which should not require the current amount of sequential testing which absolutely kills productivity. At a minimum, a rigorous review to determine necessary testing requirements would be valuable. In addition, current analytical metrology techniques, if applied, should yield superior results in much shorter time frames.

Lean Manufacturing techniques such as Value Stream Mapping could easily be applied to the pit manufacturing process. Fundamentally, the pit facility produces one product, yet it appears that every pit produced is a “hand crafted individual object”. This method of production yields process inefficiencies in every operation. Additionally, process automation at several steps of this process would be quite valuable. Currently available CNC machining centers, modified for the unique safety hazards would yield a wealth of productivity gains.

From a modern industry standpoint, world class productivity, quality, and safety can all be attained at the TA-55 facility by thorough and rigorous analysis and hard work on the production floor. The cursory analysis of the TA-55 facility yields a ratio of value-added to non-value-added work of perhaps 1:20 or much worse. This indicates a tremendous opportunity for improvement. The available productive capacity of this plant is being wasted by inefficient utilization of plant equipment and personnel.

In conclusion, the TA-55 facility is an expensive national asset, which has the opportunity to be a dramatically more effective and efficient facility if operated as a modern production facility, utilizing available automation and world class operations management techniques.