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# Results and Conclusions Test Capabilities Task Group Summary Report



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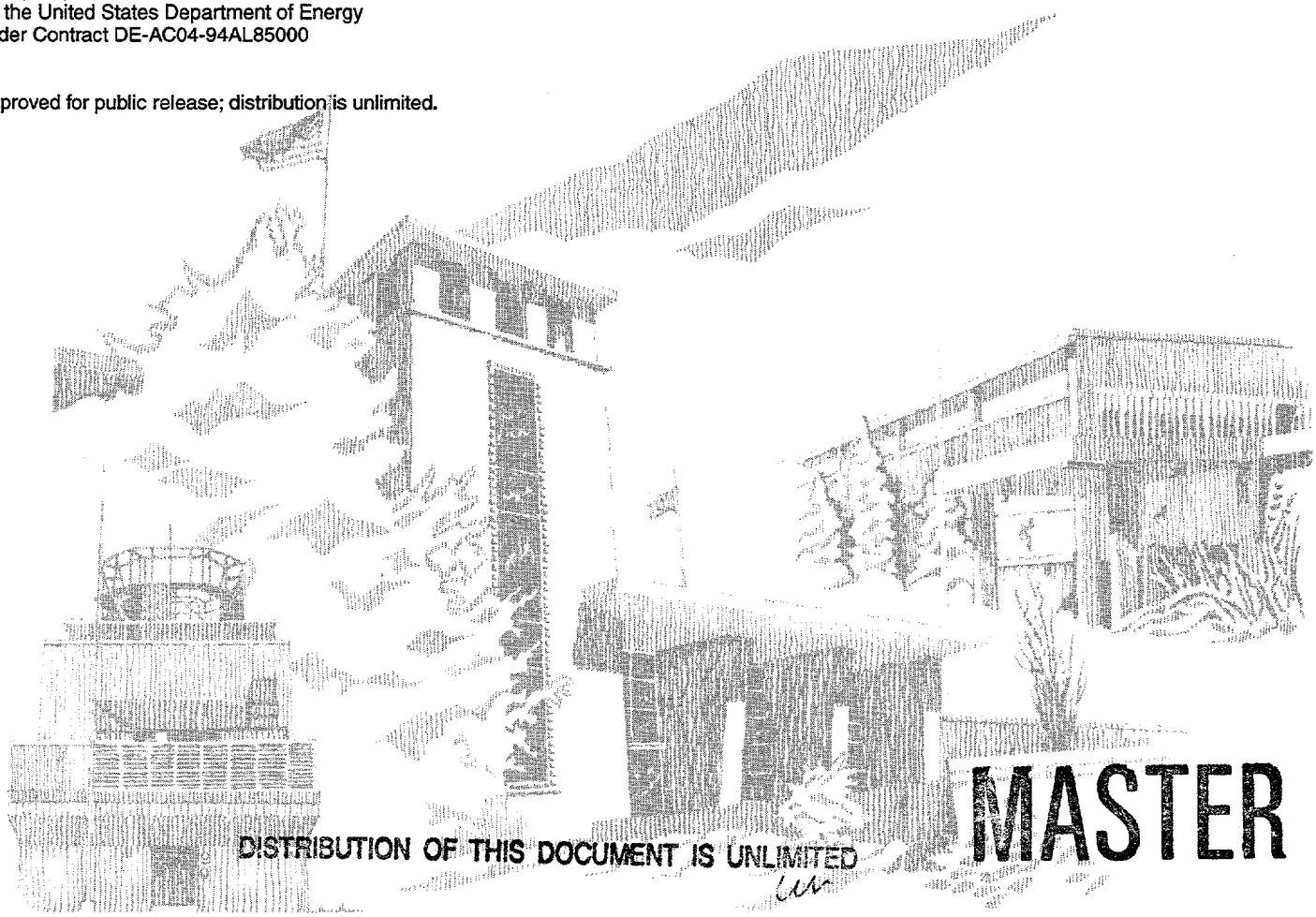

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# Results and Conclusions Test Capabilities Task Group Summary Report

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## Abstract

This annotated briefing documents an economic analysis of Sandia's system-level test facilities maintained and operated by the Design, Evaluation, and Test Technology Center 9700. The study was divided into four primary sub-tasks:

1. Estimation of the future system-level test workload,
2. Development of a consistent economic model to estimate the cost of maintaining and operating the test facilities,
3. Determination of the availability of viable alternative test sites, and
4. Assessment of the potential savings through reduction of excess capacity under various facility-closure scenarios

The analysis indicated that potential savings from closing all facilities could approach $6 million per year. However, large uncertainties in these savings remove any sound economic arguments for such closure: it is possible that testing at alternative sites could cost more than maintaining the current set of system-level test facilities. Finally, a number of programmatic risks incurred by facility closure were identified. Consideration of facility closure requires a careful weighing of any projected economic benefit against these programmatic risks.

This summary report covers the briefing given to upper management. A more detailed discussion of the data and analyses is given in the full report, available for internal use from the technical library.

# *Results and Conclusions*
# *Test Capabilities Task Group*

**Tom Bomber, Ken Pierce, Rob Easterling, Jon Rogers**
**Strategic Studies & Operational Analysis Center 5400**

**Sandia National Laboratories**

This annotated briefing documents the results and conclusions of the Test Capabilities Task Group (TCTG). The TCTG was formed in March 1996 and met weekly through September 1996. The objectives were to:

- perform an economic analysis of the system-level test facilities,
- estimate cost-savings from facility closure, and
- identify programmatic risks involved in facility closure.

## *TCTG Personnel*

**Steve Rottler**
**Joe Polito**
**Jim Asay**

**Steve Vasey**

**Dan Rondeau**

**Doug Ammerman**

**Kathy Roach**
**John Garcia**
**Rod May**
**Marlo Maxson**

**Rob Easterling**
**Tom Bomber**
**Ken Pierce**
**Jon Rogers**

**Other Contributors: Jaime Moya, Dave Davis, Kathy Fortune, Pat Sena, Steve Heffelfinger, John Barnum**

These are the primary contributors to this study. The study was initiated by Jim Asay, the Essential Capabilities Crosscut Manager, and Steve Rottler, the Validation and Certification Backbone Manager. Joe Polito has succeeded Steve Rottler as the V&C Backbone Manager. The study personnel included representatives from the California Lab, the WFO and E&E sectors, the test organization (9700), and the systems studies group (5400).

A large number of other individuals, both operators and users of the test facilities, also provided significant contributions to this study. These individuals are identified on later charts.

## *Sandia's System-Level Test Capabilities*

**Two Views:**

- ✓ **A unique, defining capability -- it sets us apart**
- ✓ **A drain on the (NS) budget -- requires annual subsidies of $2M to $7M (?)**

**Study Objectives:** ***Just the Facts!***

- ✓ **Estimate the future workload for system-level test facilities**
- ✓ **Estimate the "cost" of maintaining excess capacity under different workload scenarios**

There are at least two views of Sandia's system-level test capabilities. One view is that these capabilities help define Sandia and set us apart from the other national laboratories and major R&D organizations. The other view is that these capabilities are a drain on the NS budget, requiring from $2 million to $7 million in annual subsidies. Missing from discussions of these views has been a clear accounting of the costs involved in maintaining this capability and a focused assessment of the costs associated with excess capacity.

The subsidy figures are from a previous study of the facilities. The accuracy and applicability of these figures is difficult to ascertain for a number of reasons:

- They represent a mix of cost and pricing approaches,
- The Sandia budgeting system is not set up to answer questions concerning the cost of operating specific facilities and does not easily yield such information, and
- There have been significant changes in operating procedures.

"Subsidies" are the direct result of maintaining excess testing capacity. This study endeavored to estimate in a consistent manner the cost of maintaining excess capacity under various scenarios of estimated workloads at the test facilities.

This study concentrated on economic aspects of operating these facilities, but less quantifiable questions are also addressed.

## *System-Level Facilities*

| Facilities Included: | |
|---|---|
| Drop Tower - - - | John Garcia |
| Cable Site | |
| Sled Track | |
| Gun Site | |
| Centrifuge | |
| Vibration Labs | |
| Shock Lab | |
| Lightning | |
| Anechoic Chamber | |
| Direct Drive | |
| Photometrics | |
| Electrostatic Discharge - | Marv Morris |
| Mode-Stirred Chamber | |
| Burn Site - - - | Jaime Moya |
| Radiant Heat | |
| Modal - - - | Tom Baca |
| Mass Properties | |
| Static Lab - - - | Bill Shurtleff |
| X-Ray - - - | Mark Garrett |
| MIC's - - - | Dave Davis |
| Laser Tracker | |

**Facilities Not Included:**

- Tonapah Test Range
- Kauai Test Facility
- Area III Explosive Test Facilities (non 9700)
- Component Testing (Bldg 860)
  - vibration labs
  - climatic chambers
  - structures test lab
  - component shock lab
  - small centrifuges
- Satellite Thermal Vacuum Facilities (Bldg 890)
- Aerodynamics Labs (Bldg 865)
- Radiation Effects Test Facilities (Areas IV & V)
- Primary Standards Labs (Bldg 827)
- Radar Ranges (Bldg 9972)
- Explosive Component Facility (Bldg 905)
- •
- •
- •

This study was limited to system-level test capabilities maintained and operated by Organization 9700. The column on the left lists the facilities considered and the managers responsible for those facilities. The decision to limit the study to these facilities was based not only on limited time and budget, but also because of the perception that these facilities are costly and unable to cover expenses. Mothballed facilities - LIHE, Thunder Range, EMES - were not included even though some program managers indicated the need for tests at these or similar facilities.

The column on the right lists specific facilities and test capabilities not considered in this study. Tonapah Test Range and the Kauai Test Facility have been considered in other efforts and specific management decisions have recently been made concerning these two facilities. Area III explosive test facilities operated by organizations other than 9700 were not considered. Because of its use in systems-level testing, the large structures frame in the static lab located in building 860 was included; but test facilities in building 860 dedicated to component testing were not.

A complete list of test facilities at Sandia would be extensive. This study concentrated on the facilities in the left column and the conclusions and recommendations pertain only to this subset of the total test capability at Sandia.

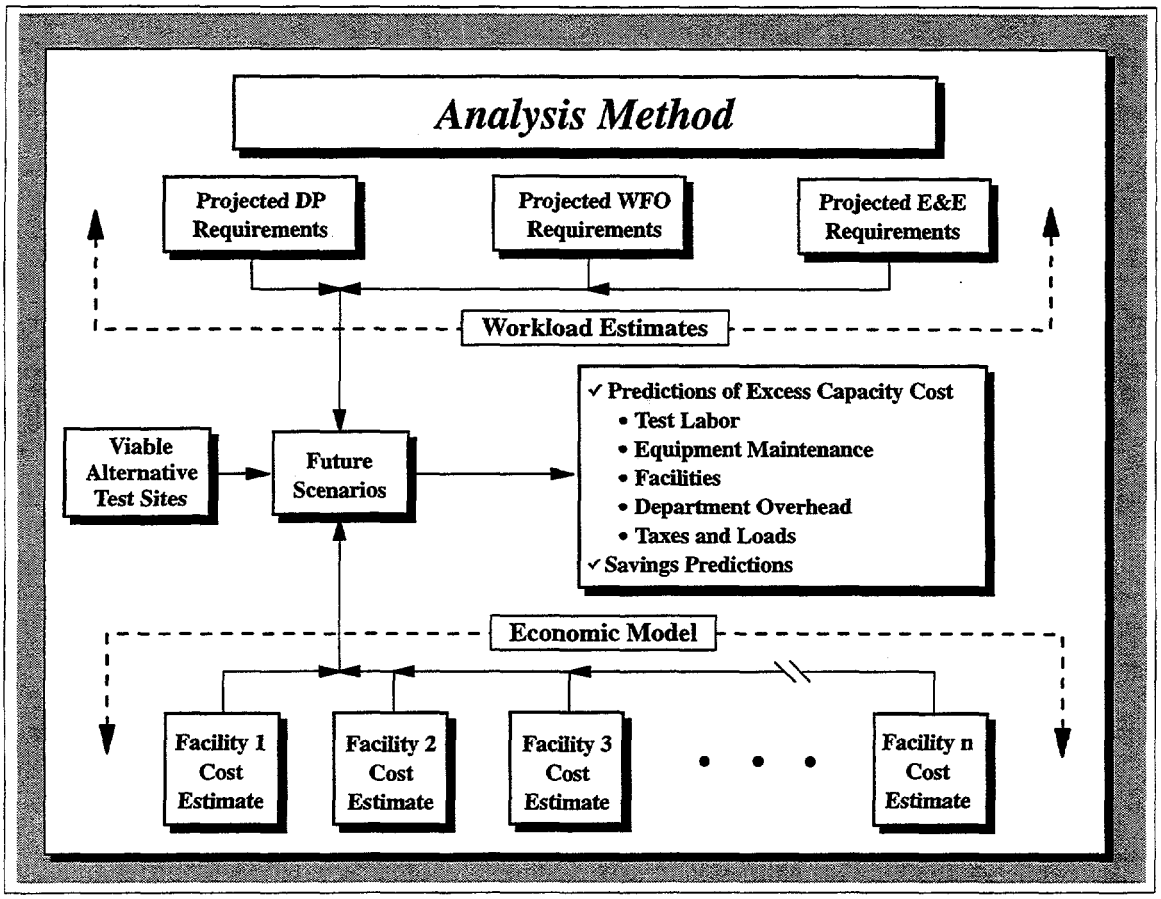
## *Test Facilities Perspective*

| | |
|---|---|
| **Facility Replacement Costs (FY96 dollars)** | |
| **Buildings and construction** | **$36 million** |
| **Test equipment and installation*** | **$127 million** |
| **Total** | **$163 million** |
| | ***controlled property only** |
| **Operational cost** | **$12 million/year** |
| **Direct test personnel** | **28 Sandians** |
| | **6 Contractors** |

This chart gives some indication of the magnitude of Sandia's investment in system-level test facilities. Since the estimated facility replacement cost of $163 million does not include the cost of tools and instruments not in Sandia's property system, this figure is a lower bound on the actual investment.

The average annual O&M costs for large aerospace systems and facilities doing business with the DOD are about 10% of the capital investment in R&D and acquisition. Sandia's O&M costs of about $12 million are comparable to this figure.

This perspective illustrates the total investment involved in operating and maintaining system test facilities. A primary objective of the following analyses is to estimate how much of this pie will be used in revenue-producing activities (doing tests for customers) and how much of it represents unused, or excess, capacity.




Five key activities involved in the analysis are:

1. Develop workload estimates,
2. Develop consistent economic models of test cost for each facility,
3. Use the models to predict excess capacity cost for the various workload estimates,
4. Determine the viable alternative test sites available, and
5. Develop various facility-closure scenarios and estimate potential cost savings under the different scenarios.

The next few charts summarize the analysis methodology and results.

## *Workload Estimates*

- ✓ **Data obtained as weeks of test by program by facility in NS:**
  - **B61-3,4,10 upgrade (Mike Skaggs/Mark Rosenthal)**
  - **B61 Alts 335 & 339 (Walt Errickson/Jim Harrison)**
  - **B61 Mod 11 (Garth Maxam/Don McCoy)**
  - **BIOS (Hank Fell)**
  - **W80 JTA (Owen Berg)**
  - **SWPP (Pat Sena/Doug Henson)**
  - **W76/Mk4 Dual Revalidation (Pat Sena)**
  - **W76, W78, and W88 Systems (Pat Sena)**
  - **Container Recertifications (Bob Glass)**
  - **Stockpile Evaluation (Ron Hahn/John Middleton)**
  - **Satellites (Mark Terhune)**
  - **Bomb Phase 3 (Walt Errickson/Jim Harrison)**
  - **RB/RV Phase 3 (W88 Development Reports)**
  - **Cruise Missile Phase 3 (W80 Development Reports)**
- ✓ **Sector Projections obtained for E&E and WFO (demand characterized by dollars or weeks of tests by facility):**
  - **Energy and Environment (Doug Ammerman)**
  - **Work For Others (Dan Rondeau)**

Estimates of the future testing requirements for the NS Sector were made from interviews with managers of current programs. These data were supplied as the expected number of tests at each facility.

E&E Sector estimates were also based on a survey of individual programs; however, these data were generally given as the expected weeks of testing. High, low, and expected estimates of needed testing were obtained for the E&E Sector based on the best, worst, and expected cases for funding.

The estimates of the future workload in the WFO sector were based on FY96 WFO testing. From this base, WFO test expenditures were projected over the next five years using the best available information concerning the direction of ongoing and expected programs. This provided an upper limit on future WFO-funded testing. The lower limit was determined by using FY96 testing without escalation.

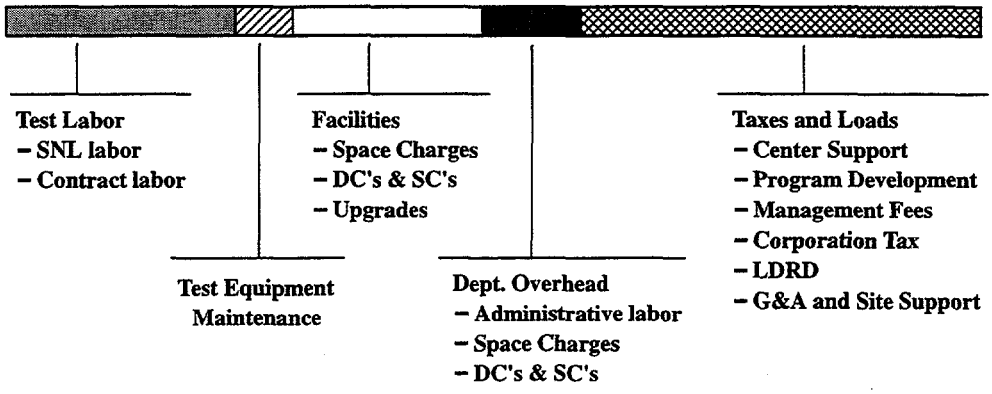
Two estimates of future testing workload were defined from these data. The high-baseline workload assumes that all NS programs will continue as currently planned, the E&E Sector will receive best-case funding, and the WFO projections are accurate. The low-baseline workload assumes only 50% of NS testing will be accomplished, the E&E Sector will receive worst-case funding, and WFO expenditures are frozen at their FY96 levels.

Historical records were employed in developing the minimum number of system-level tests required during engineering development (weapon Phase 3) programs; however, Phase 3 testing was not included in the estimates of future workload. No specific tests for model validation were included either.

## *Economic Model*

- ✓ **Determine costs by activities to the extent possible**
- ✓ **Assign just those costs incurred by the activity**
- ✓ **Define activities as an average week of test at each facility**

**Example:**




The economic model is based on the principles of activity-based costing (ABC). The costs assigned to specific facilities include space charges, DC's and SC's, and equipment and facility upgrade costs (maintenance-of-capability). Test labor was assigned according to the test type and facility. Costs were calculated such that only full utilization (defined as 46 weeks/year of testing) would result in full cost recovery. Anything less than full utilization will result in failure to fully recover costs. Thus, this model was constructed precisely to estimate the cost of maintaining unused capacity.

Test equipment maintenance and department overhead were loaded on test labor. It would be preferable to charge equipment maintenance directly to the individual facilities; however, the information necessary to break out maintenance costs in this fashion is not currently available.

Taxes and loads, including center support and corporate indirect, are loaded according to the formulas established for FY97.

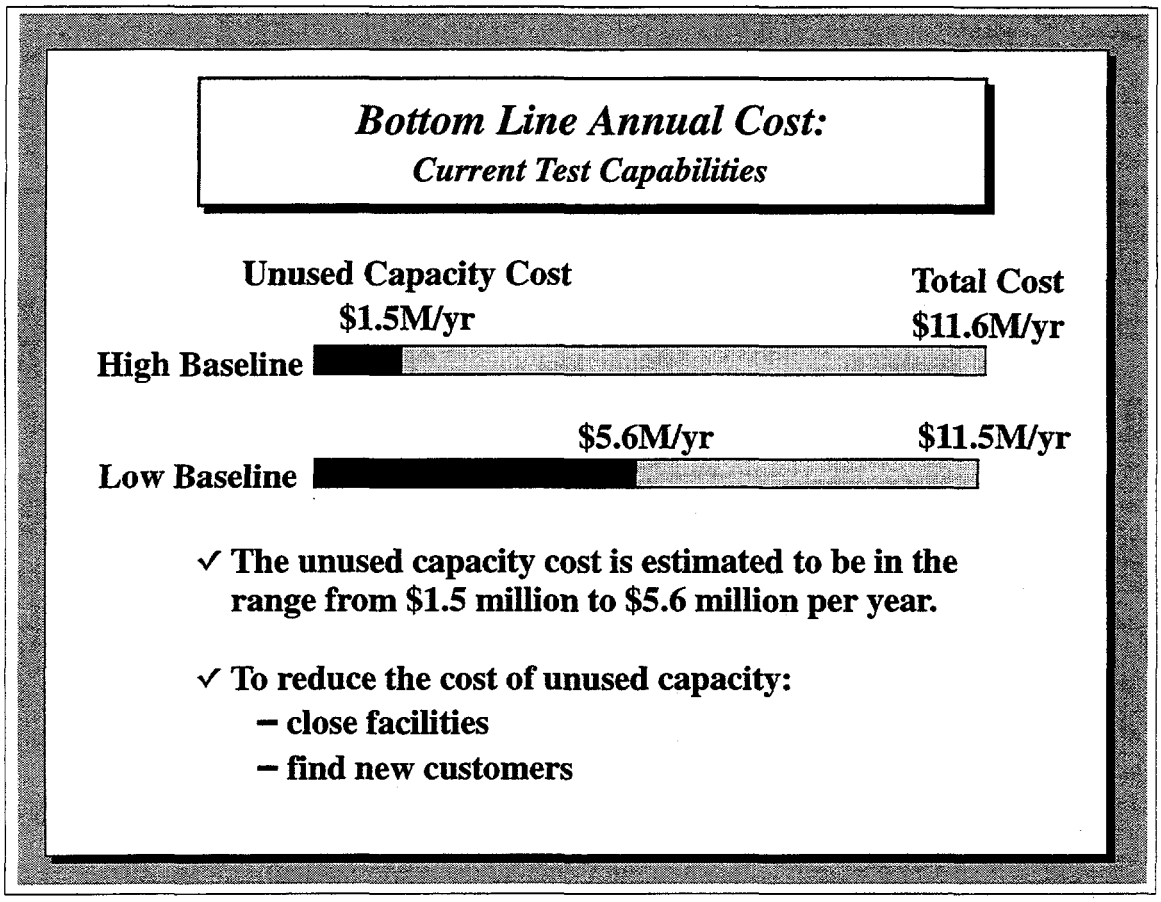
The shaded bar above was developed from the average cost of the test facilities (not including data acquisition capabilities or currently mothballed facilities). This bar is divided proportionately by the various categories of costs. Taxes and loads are the largest single cost for the average facility.

## *Site Visits*

- ✓ **Los Alamos National Laboratory - July 30**
  - **Subset of Sandia capabilities, could do some vibration and modal work**
- ✓ **China Lake - August 6**
  - **Large ordnance testing, some capabilities, no engineering support available**
- ✓ **Lawrence Livermore National Laboratory - August 28**
  - **Several capabilities, perhaps the best match, short on staff**
- ✓ **White Sands Missile Range / Holloman AFB - August 19 and 20**
  - **Wide range of capabilities, security may need to be provided for classified hardware, no engineering support available**
- ✓ **Aberdeen Test Center - August 22**
  - **Exceptional gun facilities, modest overlap in other areas, no engineering support available**

Five sites with multiple test facilities potentially capable of performing system-level testing were visited and initial evaluations were made of their ability to meet Sandia's testing needs. The summary findings are given above. An in-depth evaluation would be needed before deciding to move testing to these facilities.

While no carbon copy of Sandia test facilities was found, only two facilities - the large centrifuge and the lightning simulation facility - were judged to be truly unique in the US.




This chart summarizes the economic analysis. Current test facilities cost close to $12 million per year to operate.

As shown on page 9, about two-thirds of this cost is fully-loaded labor and about one-third can be tied directly to facilities. Under the high-baseline workload, facility utilization is such that the total cost of excess capacity is estimated to be $1.5 million per year; under the low-baseline workload, this cost is estimated to be $5.6 million per year. Excess capacity costs for individual facilities are discussed in the full report.

There are at least two ways to reduce the cost of unused capacity: (1) close facilities, or (2) find new customers. This study concentrated on the first - closing facilities as a way to reduce costs.

The concept of excess capacity is important to understanding this study and the costs of operating the test facilities. Pricing policies are a way to help pay for unused capacity, but such policies do not change the cost itself. Some unused capacity is both necessary and inevitable - it is necessary to maintain the ability to cover surges, unexpected test requirements, and contingencies - it is inevitable because it is not possible to maintain only a portion of a facility. For example, Sandia must either maintain a sled track or not, but unscheduled time on the sled track is excess capacity. Thus, a goal of zero excess capacity is neither appropriate nor realistic.

It is also important to realize that only the cost of excess capacity, not the total O&M cost, may be saved by closing test facilities. Test money currently spent at Sandia and used to help cover O&M costs will be spent at other test sites if the required test capabilities are not available locally.

To illustrate potential savings achievable by facility closure, the three scenarios described in the following pages were considered.

## *Three Closure Scenarios*

- ✓ **$100k Scenario**
  - **Close all facilities with excess capacity costs exceeding $100 thousand per year**
- ✓ **50% Scenario**
  - **Close all facilities with utilization below 50%**
- ✓ **Close All Scenario**
  - **Close all system-level test facilities without regard to capacity, utilization, or uniqueness**

- ✓ **All scenarios use the low-baseline workload as a reference**
- ✓ **For each scenario, the maximum potential savings are estimated considering reductions in unused capacity, savings in expenditures for upgrades, and closure costs**

Three scenarios resulting in closure of from just a few facilities to all system-level test facilities were considered. These scenarios are illustrations, not recommendations. Many other considerations discussed later would influence closure decisions.

A previous analysis of the test facilities, the Capabilities and Strategic Planning PMT, defined "sufficient customer demand" for a facility as less than $100 thousand under-recovery. The $100k criterion was adopted and applied to the cost of excess capacity to define the first closure scenario. The second scenario closes all facilities with less than 50% utilization (an arbitrary choice) and the final scenario closes all system-level test facilities.

All scenarios assume the low baseline workload as the reference for estimating the savings due to closure. This assumption provides for the maximum potential savings. Greater test workloads will reduce the cost of excess capacity and hence the potential savings.

For each scenario, the maximum possible savings are estimated. Factors that could affect the magnitude of these savings are discussed later.

## *$100k Scenario*

***Close Facilities with Excess Capacity Costs more than $100k***

## *Low Baseline*

**Facilities:**

- **× Gun Site**
  **Lightning ***
- **× Anechoic Chamber**
- **× Mode Stirred Chamber**
- **× Burn Site****
- **× Static Lab ****
- **× Mass Properties ****

* **unique facility (not closed)**
** **significant other testing**

| | |
|---|---|
| **Unused Capacity - Low Baseline** | **$5.6M/yr** |
| **Potential Savings:** | |
| **Reduction in unused capacity** | **$0.8M/yr** |
| **Additional upgrade cost savings** | **$0.1M/yr** |
| **Decommission Rent** | **($0.2M)/yr** |
| **Total Saving** | **$0.7M/yr** |
| **Test FTE Reduction** | |
| **Sandia** | **2** |
| **Contractors** | **1** |

Under the $100k Scenario, seven facilities with more than $100 thousand in excess capacity costs would be closed. However, since the lightning facility has been identified as a unique capability, it was not closed. Closure of the remaining six facilities is estimated to reduce the cost of excess capacity with the low baseline workload by $800 thousand

Current DOD Directive 3200 indicates that other federal agencies using DOD test facilities will not be charged for depreciation (i.e. general facility upgrades). Therefore it was assumed that Sandia would not be charged for upgrades at other sites. This results in an additional upgrade-cost savings on the tests conducted at the other sites.

If the closed facilities are simply decommissioned, there will be $200 thousand per year decommission rent on the six closed facilities offsetting a portion of the possible savings.

The total savings due to closure of these facilities is thus estimated to be $700 thousand per year. It is further estimated that closing this group of facilities will free two FTEs from testing for assignment elsewhere and reduce the need for contractor support by one FTE.

Anecdotal evidence indicates that three facilities (the burn site, the static lab, and the mass properties lab) may have significant amounts of testing other than system-level. These should be investigated further before a final closure decision is made.

## *50% Use Scenario*

***Close Facilities with Utilization Below 50%***

## *Low Baseline*

**Facilities:**

- **× Drop Towers**
- **× Gun Site**
  **Centrifuge***
- **× Shock Lab**
  **Lightning ***
- **× Anechoic Chamber**
- **× Direct Drive**
- **× Electrostatic Discharge****
- **× Mode Stirred Chamber**
- **× Burn Site****
- **× Radiant Heat**
- **× Static Lab ****
- **× Mass Properties ****

* **unique facility (not closed)**
** **significant other testing**

| | |
|---|---|
| **Unused Capacity - Low Baseline** | **$5.6M/yr** |
| **Potential Savings:** | |
| **Reduction in unused capacity** | **$2.3M/yr** |
| **Additional upgrade cost savings** | **$0.1M/yr** |
| **Decommission rent** | **($0.3M)/yr** |
| **Total saving** | **$2.1M/yr** |
| **Test FTE Reduction** | |
| **Sandia** | **7** |
| **Contractors** | **2** |

Under the low-baseline workload, thirteen facilities are projected to have utilization below 50%. However, since the lightning and centrifuge facilities have been identified as unique capabilities, they are not closed. Closure of the remaining eleven facilities is estimated to reduce the cost of excess capacity by $2.3 million. If Sandia is not charged for maintenance-of-capability, there will be additional upgrade-cost savings on the testing conducted at the alternative test sites (these savings are more than in the $100k Scenario, but for both scenarios round to $100 thousand). Decommissioning the facilities will result in a $300 thousand per year decommission rent on the eleven closed facilities.

The total savings due to closure of these eleven facilities is thus estimated to be $2.1 million per year. This action is estimated to free seven FTEs from testing for assignment elsewhere and reduce the need for contractor-support by two FTEs.

Anecdotal evidence indicates that four facilities (electro-static discharge, the burn site, the static lab, and the mass properties lab) may have significant amounts of testing other than system-level. These should be investigated further before a final closure decision is made.

## *Close All Facilities Scenario*
## *Low Baseline*

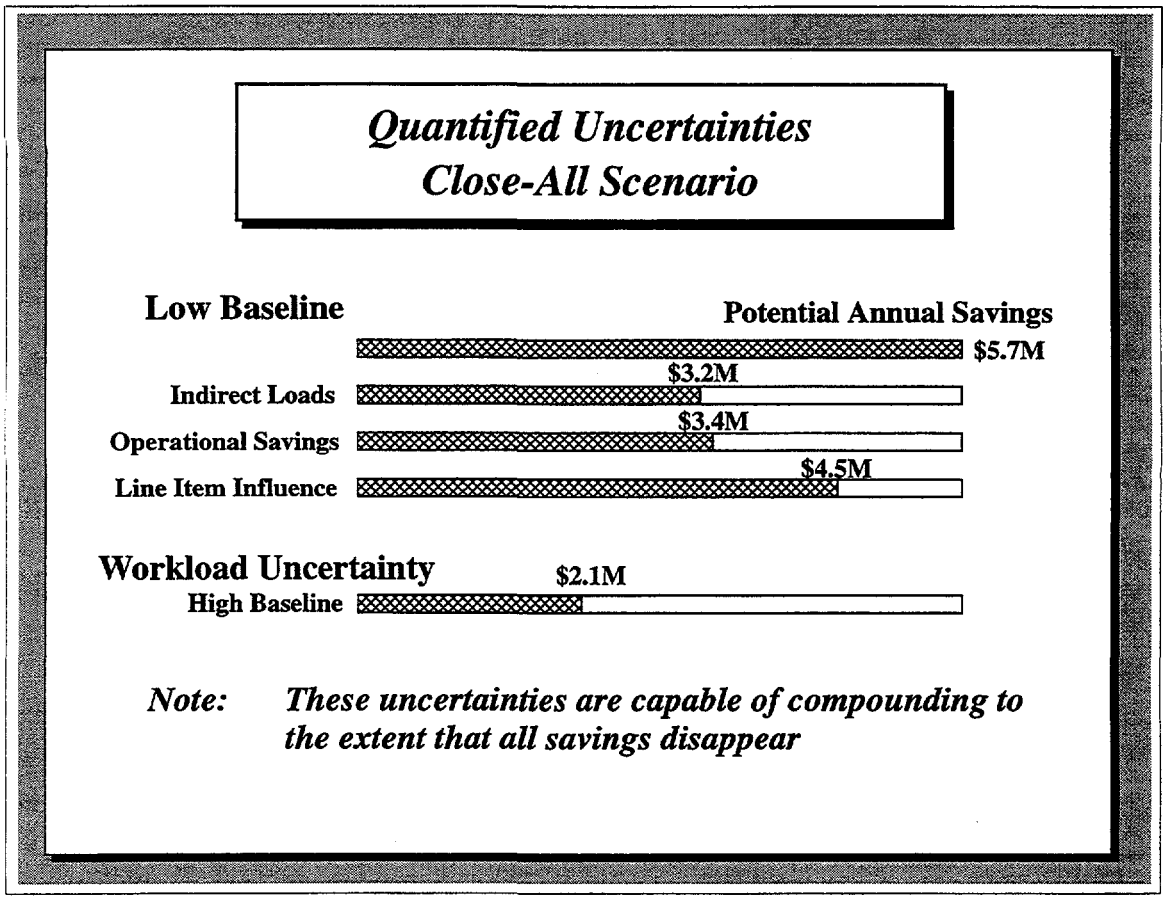
| | |
|---|---|
| **Unused Capacity - Low Baseline** | **$5.6M/yr** |
| **Potential Savings:** | |
| **Reduction in unused capacity** | **$5.6M/yr** |
| **Additional upgrade cost savings** | **$0.6M/yr** |
| **Decommission rent** | **($0.5M)/yr** |
| **Total saving** | **$5.7M/yr** |
| **Test FTE Reduction** | |
| **Sandia** | **28** |
| **Contractors** | **6** |

All system-level test facilities are closed in this scenario. Even the lightning and centrifuge facilities, which have been identified as unique capabilities, are closed in this scenario, because it is uncertain what structure and organization would be established to operate just two facilities.

Closure of all system-level test facilities would save the estimated $5.6 million per year cost of excess capacity in the low baseline workload. By assuming that Sandia is not charged for maintenance-of-capability at other sites, there will be additional upgrade-cost savings of $600 thousand per year. There will be $500 thousand per year decommission rent on the closed facilities.

The total savings due to closure of all facilities is estimated to be $5.7 million per year.

Since the low-baseline workload was employed and it was assumed that other facilities would not include the cost of upgrades in the price charged to Sandia, these savings estimates are an upper bound. Furthermore, it was assumed that staff reductions would not only save salary expenses but would also save the indirect loads. In reality, these bounding assumptions are not likely to hold. The following chart evaluates the magnitude of these uncertainties.




There are a number of the uncertainties associated with the projected $5.7 million savings in the Close-All Scenario that can be quantified.

1. The indirect loads on the test labor represent $2.5 million of the possible savings. Unless either the corporate and center indirect costs are reduced by this amount or the direct FTEs previously involved in testing are employed in other direct-charge activities, the savings in this scenario will be reduced to $3.2 million.
2. We have assumed that Sandia will not be charged for upgrade costs at other test facilities. These savings will not be realized if alternative sites begin charging for these costs. This would reduce the $5.7 million savings to $3.4 million. Even if other ranges do not charge Sandia for upgrades, it is not clear that current upgrade costs, which are primarily capital expenditures, will be easily converted to discretionary funds in future years.
3. The Area III line item facility is estimated to reduce upgrade costs by 50%. If the line item is realized before closure of all system-level test facilities, the potential savings in this scenario would be reduced to $4.5 million.
4. There is also the issue of workload uncertainty. If the actual workload is closer to the high baseline rather than the low baseline, the savings in this scenario would be reduced by $3.6 million to $2.1 million.

Finally, note that these uncertainties are capable of compounding to the extent that all savings could disappear; i.e. in an informal sense, the uncertainty interval for cost savings includes zero.

## *Unquantified Economic Issues*

- ✓ **Delays in investigating and resolving stockpile maintenance issues**
- ✓ **Delays in development programs**
- ✓ **Reductions in operational efficiency in testing**
- ✓ **Reductions in the spectrum of testing due to environmental issues**
- ✓ **Reductions in savings for maintaining the centrifuge and lightning simulation facilities**
- ✓ **Increases in test costs due to:**
  - **requirements for unique modifications at other facilities**
  - **necessity to provide security for classified materials and hardware at many DoD test facilities**

These are a number of economic issues associated with facility closure that could not be quantified.

Closure of test facilities implies reduced control of schedule. This will result in increased delays and reduced flexibility in test programs. In addition to reduced scheduling flexibility, travel by test and design engineers to other sites will reduce operational efficiency and increase costs. DOD ranges do not in general have experience testing systems containing depleted uranium or special nuclear materials. Sandia will likely be faced with the option of either paying for the environmental assessments or not testing systems containing such materials. The centrifuge and lightning facilities are unique. There will be a cost, dependent on organizational structure, associated with maintaining these facilities that was not estimated in this study.

There will also be increases in test costs for special capabilities not currently at alternative sites. Sandia will almost certainly have to pay for any unique modifications necessary to perform needed tests. An example of such modifications would be pre-test construction and post-test removal of barriers for impact testing at other sled-track facilities. Sandia will also have to provide security for classified materials and hardware at many DOD facilities since once access to the facility is achieved, access to the test site is also achieved.

## *Non-Economic Issues*

- ✓ **The effect of potential loss or degradation of testing expertise under scenarios that close many or all test facilities on Sandia's ability to carry out its primary mission**
  - **– DoD facilities do no provide engineering test support**
  - **– Sandia's ability to maintain necessary test expertise could be jeopardized**
- ✓ **Potential loss of skills and capabilities that provide national recognition and opportunities:**
  - **– Nuclear reactor and power program safety tests, U.S. and Japanese**
  - **– Tests of shipping containers in severe accident scenarios**
  - **– NASA testing**
  - **– Aerial cable facility, White Sands Missile Range**
  - **– Burn facility, China Lake**
  - **– Sled design, Holloman AFB**

***All such risks need to be weighed against estimated economic benefits in making closure decisions***

There are also non-economic issues that must be considered in any closure decision.

Our visits to other facilities revealed that DOD facilities generally do not provide full test engineering support. To use these facilities, Sandia will be required to maintain the necessary expertise to design and specify tests and instrumentation to obtain the desired information. The ability of Sandia to maintain the necessary test expertise under scenarios that close many or all of the system-level test facilities is questionable.

Sandia's expertise in system-level testing has brought the laboratory both national recognition and additional opportunities. Examples of the opportunities include tests for the Nuclear Regulatory Commission and the Japanese nuclear power industry, dramatic full-scale tests of the integrity of shipping containers, and water-impact and acceleration testing for National Aeronautics and Space Administration.

Sandia test engineers have been instrumental in the design and establishment of system-level test facilities at other sites including the aerial cable facility at WSMR and the burn facility at China Lake. Holloman AFB even installed 15,000 feet of narrow-gage track specifically so they could draw on Sandia's expertise in sled design. This level of expertise can not be maintained without test facilities.

## *Study Conclusions*

- ✓ **Significant cost reductions cannot be obtained without closing a majority of the system-level facilities.**
  - **– The campaign mode of operations limits labor savings**
  - **– The large uncertainty in the magnitude of projected cost reductions removes any sound economic support for closing a majority of the system-level facilities.**
- ✓ **There are a few individual facilities with low projected NS use and viable alternatives that can be considered for closure resulting in modest savings ($14k/yr to $200k/yr).**
  - **– These savings have to be weighed against the unquantifiable programmatic risks that will accompany closure of any facilities.**

Significant cost reductions cannot be achieved without closing a majority of the system-level test facilities. A primary reason for this is the efficiencies inherent in the campaign mode of operation that has been instituted by the test organization. In this mode of operation, a limited number of test personnel operate multiple facilities according to need.

The initial candidates for closure are those facilities with low utilization. However, closure of these facilities does not significantly reduce labor requirements. Therefore, the only savings that are possible are those associated directly with the facilities and the mothball operation already minimizes the space charges for low-use facilities. Only when a large majority of facilities are considered for closure are the labor requirements reduced to a great enough extent that significant cost reductions can be realized.

The uncertainty in the savings discussed in the scenarios are as large as the possible savings, thus removing any sound economic support for closure.

There are individual facilities with viable alternatives that could be closed resulting in modest savings. But there are a number of unquantifiable programmatic risks that accompany such closures. These risks may be illustrated by the current situation with the light-initiated high explosive (LIHE) facility: the closure of this facility is being reexamined due to current program needs. Closure decisions concerning these facilities must be made with these programmatic risks in mind.

## *Summary*

- ✓ **There are no compelling economic arguments for closure of the system-level test facilities**
- ✓ **Closure decisions will need to be made on unquantifiable issues concerning Sandia's strategic mission and vision for the future**

The estimates of savings that can be realized through closure of system-level test facilities range from $1 million to $6 million in the three scenarios considered in this study. There are a number of factors that can and will reduce these savings. These factors cast a large uncertainty on the magnitude of the final savings that can be realized and remove any sound economic arguments for closure of system-level test facilities. Savings from closure of individual facilities would be modest at best.

The decision to maintain or close Sandia's system-level test facilities must be based primarily on executive decisions concerning Sandia's strategic mission and vision for the future and consider the complete suite of test capabilities at the laboratory.

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