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Background

In August of 1991, new leadership came to the Facilities Organization for Sandia National Laboratories. As a former disgruntled customer, Jim Jacobs' vision was clear and succinct: He said, "I want our customers to love us, I want to have good business practices, and I want our employees to enjoy and be proud of their work."

After a careful assessment of the situation, Facilities was organized into the following three entities in the Spring of 1992:

1. Program Management Center - responsible for planning, leading, controlling, and monitoring activities. They "owned" the budgets and negotiated with the people who had the resources to accomplish work.
2. Facilities Development Center - responsible for negotiating with the Program Management Center for cost, schedule, and performance parameters and for implementing projects for new construction, modifications, or decontamination and demolition.
3. Operations and Maintenance Center - responsible for negotiating with the Program Management Center for resources necessary to accomplish the operation and maintenance of real property.

In the Spring of 1992, Neil Hartwigsen was chosen as the Director of the new Facilities Development Center. One of the more significant things Hartwigsen did was align his resources with the various programs. Now the project managers could negotiate with three design departments and one construction department instead of seven design departments that were aligned geographically. From the project manager's perspective, it had been like negotiating with seven different companies, each with different business practices.

Jim Jacobs died in December 1993, leaving Facilities with a solid foundation in program and project management. Neil Hartwigsen inherited a significant portion of the program management responsibilities in January 1994, absorbing approximately 50 people and responsibility for the management of \$150 million per year of design and construction activities.

Hartwigsen's message to his new groups, as well as the old ones, was clear and succinct: He said, "I want to see better teaming. I want you to form program coun-

cils. The councils will own the projects and the processes to get them done. Highly recommended reading to get you started is *The Wisdom of Teams* by Jon R. Katzenbach and Douglas Smith¹ and *The Fifth Discipline, the Art and Practice of the Learning Organization* by Peter M. Senge².

The Corporate Construction Program Council

The Corporate Construction Program Council formed as a result of Hartwigsen's direction began with six managers in the Facilities Development Center but soon added managers from two other Centers—the Sites Planning and Integration Center and the Operations and Maintenance Center—to ensure that requirements for the entire project life cycle, from strategic planning to operation and maintenance, would be considered. The Council was charged with creating an integrated program based on a shared vision that would define a cooperative, seamless way of doing business.

To understand the challenge facing the eight separate organizations represented on the Council, the nature of the business of those organizations must be understood. The Facilities Development, or building construction, process is a highly complex process involving the interaction and coordination of the skills, knowledge, experience, and efforts of a large variety of separate organizations. The eight Council organizations must join resources in an effort to effectively carry out the major components of the construction process, including planning, design, procurement, construction, and operations and maintenance.

The process comprises thousands of individual decisions that serve to link the organizations and define how they will operate through the entire facilities construction process. These decisions carry a project through definition of the customer requirements, translation of these requirements into technical designs and specifications, writing and procurement of contracts, and the mobilization of workers and materials to perform the physical construction work. Decisions made earlier in the con-

1. Katzenbach, Jon R. and Douglas K. Smith. *The Wisdom of Teams*. HarperCollins, Publishers, Inc., New York, NY, 1993.

2. Senge, Peter M. *The Fifth Discipline, the Art and Practice of the Learning Organization*. Doubleday/Currency, New York, NY, 1990.

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struction project's life cycle have the greatest influence on the overall success of the project (Figure 1).

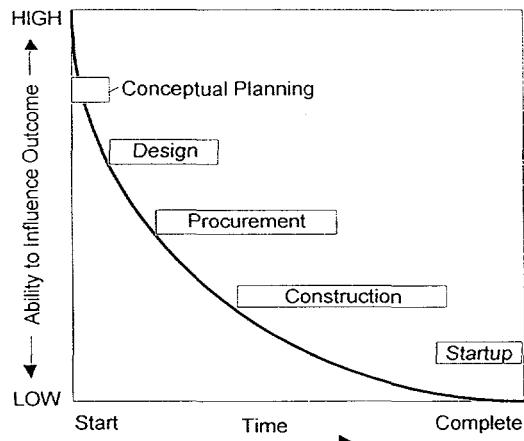
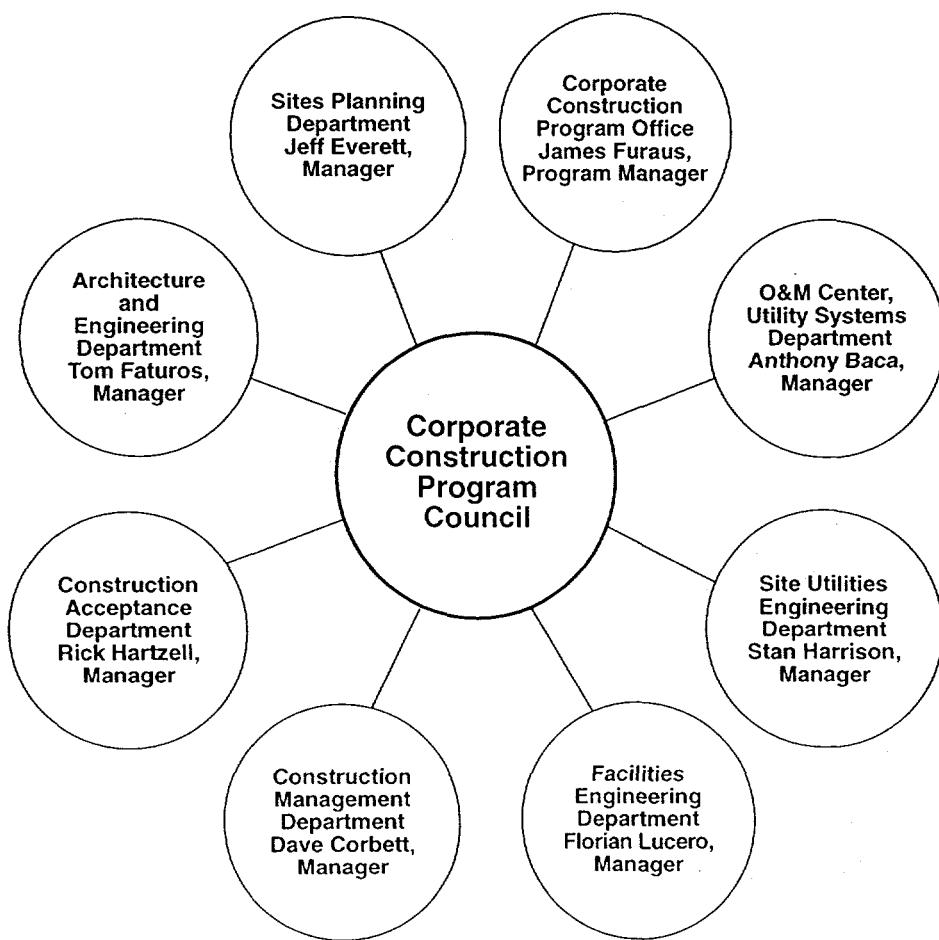


FIGURE 1. ABILITY OF DECISIONS TO INFLUENCE OUTCOME

Since key decisions made early in the life of the project are critical in influencing its overall success, it is essential that these decisions are not made in a vacuum but through full participation and involvement by all organizations. The organization was far from recognizing the need for full participation by all member organizations in early development and key decision making. Instead, each member organization entrusted with managing a separate component of the process operated independently, making key project and process decisions based primarily on their individual organizational needs.

The inability to meet overall project commitments and the numerous internal disputes and finger pointing led to the formation of the Corporate Construction Program Council early in 1994. The Council is a management team with representatives from the eight separate departments tasked with overall management of the Corporate Construction Program (Figure 2).



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FIGURE 2. MEMBERSHIP OF THE CORPORATE CONSTRUCTION PROGRAM COUNCIL

Creating a shared vision even among members of a single organization is difficult. Even so, the Council was able to reach beyond focusing on individual projects or departmental processes to create a common and unified statement of mission, goals, values, visions, strategies, and actual work plans.

The Council was able to bridge the gap between separate organizations by adopting key management and leadership principles outlined in *The Fifth Discipline, The Art and Practice of the Learning Organization*. In his book, Senge makes a statement that is often used to describe how our organization operated prior to the formation of the Council: "When people in organizations focus only on their position, they have little sense of responsibility for the results produced when all positions interact. Moreover, when results are disappointing, it can be very difficult to know why. All you can do is assume that someone screwed up." With the formation of the Council, our separate organizations were able to use Senge's theories of "Systems Thinking, Personal Mastery, Mental Models, Building a Shared Vision, and Team Learning" to help improve our organization.

The concept of "Systems Thinking" helped the Council focus on the entire system process versus individual departments when evaluating improvement opportunities. "Personal Mastery" focused on clarifying, examining, and addressing those issues or opportunities that really mattered to the organization as a whole versus those within the individual departments. "Mental Models" enabled the Council to closely examine deeply ingrained assumptions, generalizations, or opinions about the process and how the organizations interacted and performed. Council members focused on thinking out loud and openly and honestly examining and scrutinizing individual processes and perceptions. Through "Building a Shared Vision" the Council, in Senge's words, was able to "unearth shared pictures of the future" versus the independent futures of our individual organizations. Last, the Council continues to pursue "Team Learning" through open dialogue and recognizing non-productive behaviors such as defensiveness.

Formation of the Corporate Construction Program Council has led to positive steps toward improving the organization as a whole. Efforts to date are summarized in the program plan.

Program Plan

The program plan is a 26-page document defining the Council's Mission, Shared Vision, Core Values, Strategies, Work Breakdown Structure, Roles and Responsibilities, Key Processes, fiscal year (FY) 1995 Case Goals and Objectives, Budget and Planned Costs, Overhead Recovery Analysis, FY95 Performance Goals, Organizational Structure, Monitoring the Plan, Customers/Suppliers/Alliances, and Risk Assessment.

The development of the program plan began with having each council member read a different chapter from *The Fifth Discipline, The Art and Practice of the Learning Organization*. Each manager then presented to the

other managers what he learned from the chapter. The five principles were then applied to developing the program plan. The most talked about principle was "talking from the left side of the page." That is, saying exactly what is on one's mind instead of talking from the right side of the page where we tend to say only what is safe to say. It became very easy to communicate directly by starting a comment with "Speaking from the left side of the page...."

Three non-consecutive days were spent discussing various sections of the program plan and of the overall program. The program plan was finally completed during three two-hour meetings where the managers edited the latest draft. The final version was then presented to the entire staff of the departments affected by the plan. The presentation and the program plan were both well received by the staff. The plan is a living document and it continues to be updated regularly.

One of the crucial areas of concern in working with department interactions was to define the roles and responsibilities for key personnel to prevent redundancies, gaps, and conflicts. Teamwork was listed as the first responsibility of all personnel, and recognition and reward for teamwork was stressed. Defining roles and responsibilities was one of the most time-consuming and difficult parts of the process, but also one of the most rewarding. It was also something the staff asked for repeatedly. The responsibilities were defined with the intention of allowing the staff to be responsible and accountable for the end result.

Recognizing that the ultimate objective is teaming for success, the responsibilities for the following key personnel were defined: Corporate Construction Program Council, Site Planner, Project Development Planner, Project Manager, Work Package Manager, Design Team Leader, Construction Management Engineer, Lead Inspector, Inspection Team Leader, Customer, Process Manager, and Operations and Maintenance.

The responsibilities of the key personnel were first defined by the managers, and the list grew when the staff was given the opportunity to add to the list. The managers spent a considerable amount of time discussing who should be responsible for the various activities. Ultimately the overlaps, the gaps, and the conflicts were eliminated.

Results

Developing and following a shared vision resulted in qualitative and quantitative improvements in the Corporate Construction Program. Work has become more congenial with the cooperative atmosphere that has evolved, and the program and work plans developed have eliminated a great deal of confusion.

Quantitatively, the Corporate Construction Program Council realized significant growth in capital expenditures while reducing the durations of projects and reducing staff relative to total capital expenditures. Results of project management are measured in terms of perform-

ance, cost, and schedule. Performance can be indicated by the number of full-time-equivalent Sandia personnel needed to manage the projects; cost refers to the total capital expenditure per fiscal year; and schedule can be represented by the duration of the project's capital funding. Capital expenditures for the facilities managed by the Corporate Construction Program comprise Congressional line item projects and general plant projects (GPPs). These expenditures include architectural and engineering fees, construction, and equipment.

Capital expenditures averaged \$23 million a year for the five fiscal years (FY88 through FY92). In the following two and one-half years, FY93 through the mid-point of FY95, capital expenditures rose approximately 400 percent. Total FY95 capital expenditures are forecasted at \$82 million (Figure 3). At the same time expenditures on projects were growing, the number of personnel (full-

time equivalents, or FTEs) required for total capital expenditures was reduced by approximately 13.5 percent. Growth in annual expenditures occurred mostly in line item projects. GPP expenditures rose modestly by comparison. However, considerable progress was made in working off the backlog of uncommitted (unobligated and uncosted) GPP dollars as shown in Figure 4.

During the 1988 through 1994 time span line item schedules were reduced from approximately seven years to two-to-four years (Figure 5), and GPP schedules were reduced from three-to-five years to one-to-two years (Figure 6). Another significant result from improved teaming was the reduction in schedule variances from literally years for some GPP projects to less than a few weeks. The five-year PSM line item for 1994 represents a power upgrade for the entire Sandia site rather than a building with landscaping.

CAPITAL DOLLARS COSTED BY FISCAL YEAR

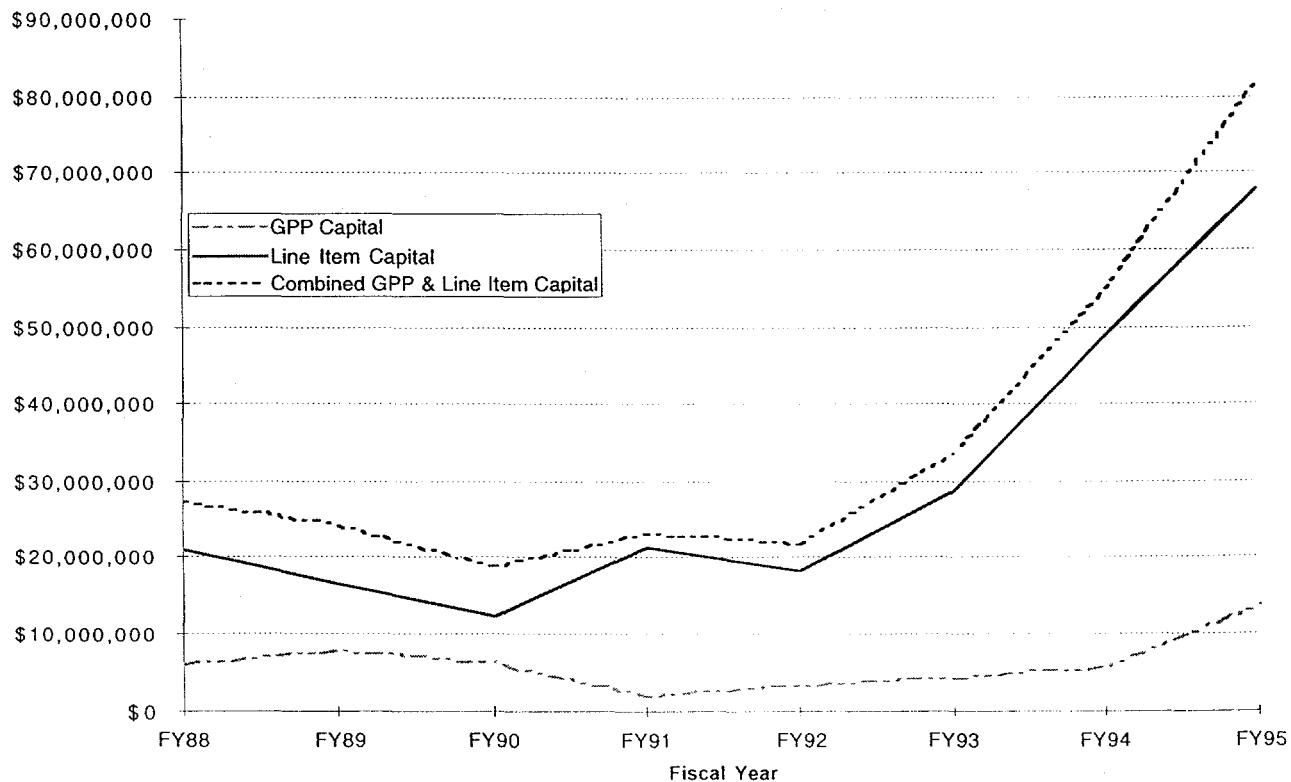


FIGURE 3. INCREASED CAPITAL EXPENDITURES FROM FY88 TO FY95

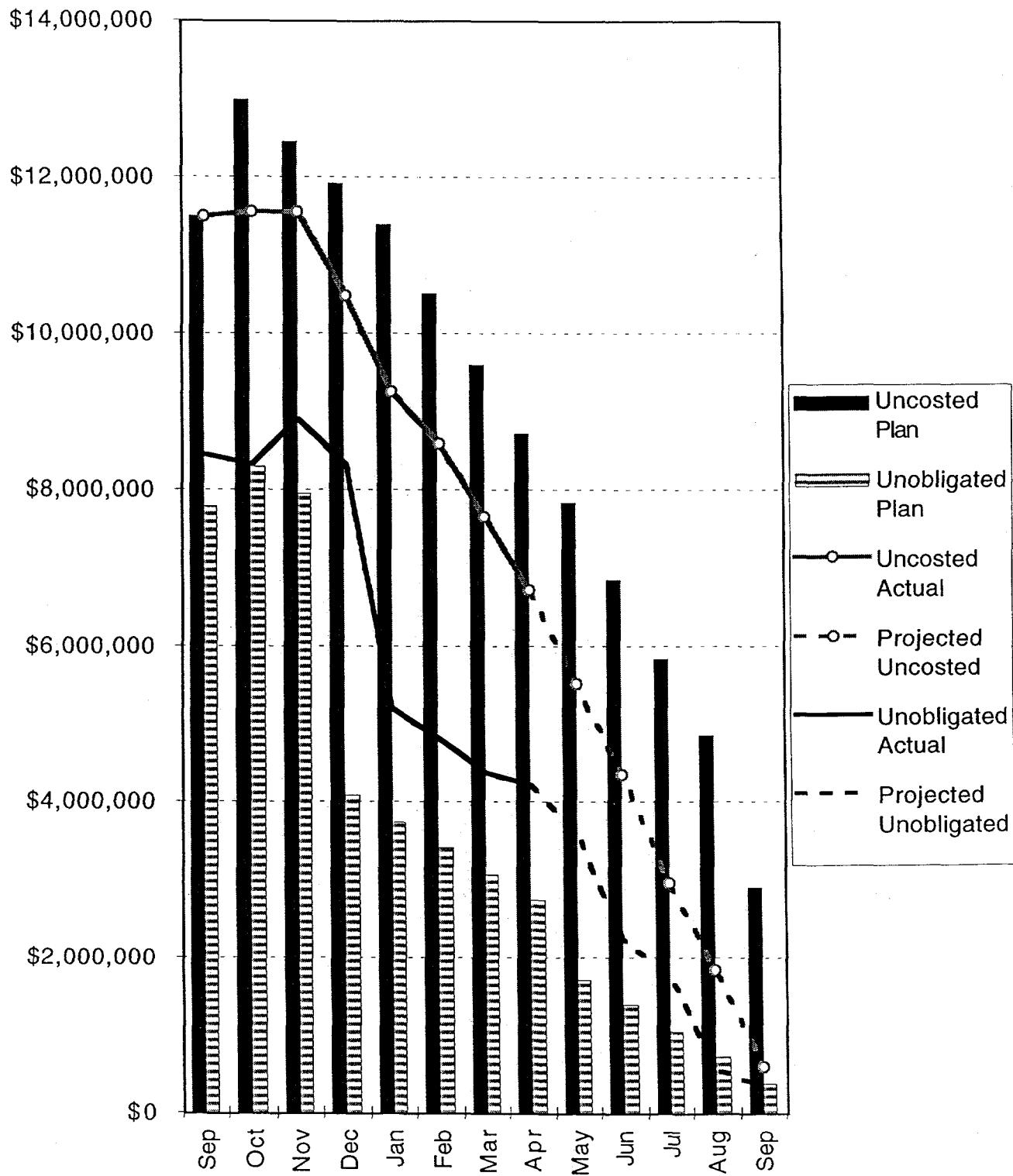


FIGURE 4. REDUCTION OF THE BACKLOG IN UNCOMMITTED GPP DOLLARS

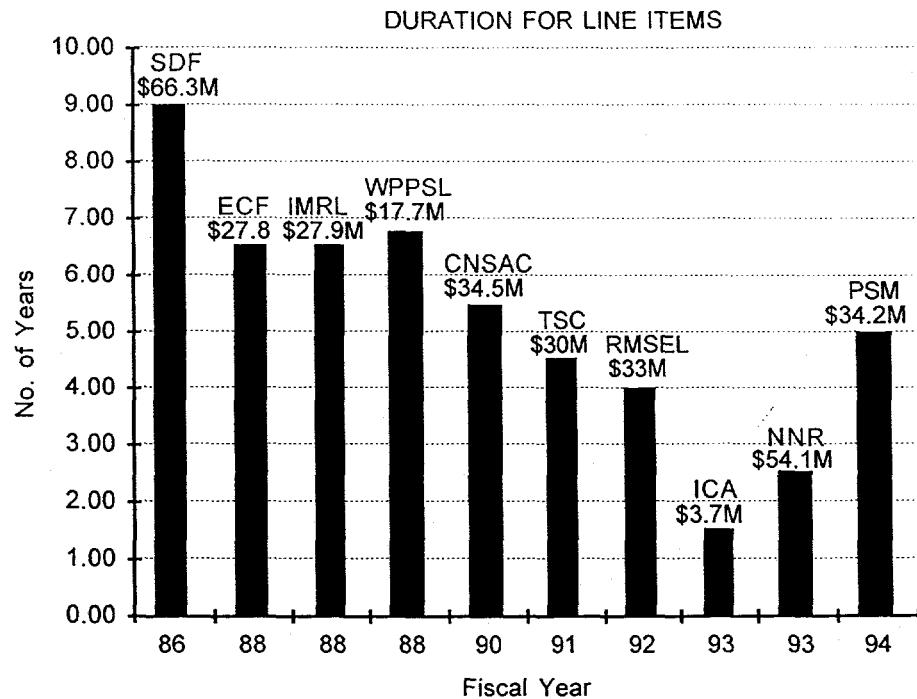


FIGURE 5. REDUCED DURATION FOR LINE ITEMS

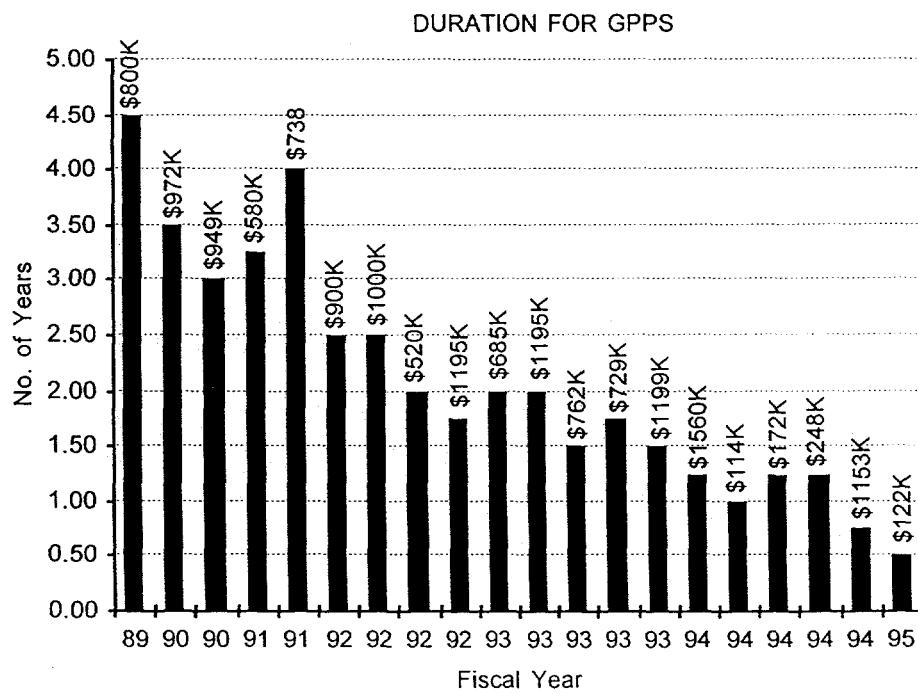


FIGURE 6. REDUCED DURATION FOR GPPS

New World (Future Opportunities)

The shared vision of the Corporate Construction Program Council includes alignment with the Sandia Corporate plans and strategies. The Corporate intent is to coordinate all plans for sites and facilities development and create teams with members who have clear roles and responsibilities, who speak with one voice for the Laboratories, and who reflect priorities that have been established by the Corporate whole. Integrated planning, incorporating the total Laboratories customer requirements with the Corporate Construction Program, will provide a net competitive advantage to Sandia as it enters into new mission areas and works to sustain continuing mission responsibilities during a time of fundamental change.

Sandia National Laboratories is a multi-site organization of the Department of Energy that has evolved from being one of three nuclear weapons laboratories to a true multi-program entity, with technology bases and core competencies capable of making substantial contributions to the nation's security in both defense and economic arenas. Since Sandia has evolved from the weapons program, its sites are primarily closed campuses with extensive limited (secure) areas. Given the continuing national policy to retain a nuclear deterrent, some portion of the sites will need to remain closed. At the same time, much of the physical plant will need to evolve to a more open environment due to changes in Sandia's mission areas, which include more unclassified work with industry, universities, the public, and other public agencies. This will allow greater access to facilities, equipment, and technical capabilities for all of Sandia's customers.

The plan to convert Sandia's two main sites, in New Mexico and California, to more customer-friendly environments is part of the vision that is shared by the members of the Corporate Construction Program Council. The fact that this drive for site conversion is occurring during a time of declining budgets intensifies the challenges facing the Council and the Laboratories in convincing our sponsors to provide the resources necessary to bring these changes about.

The approach that has been adopted is to develop a comprehensive plan for the development and redevelopment of Sandia's sites. Previously independent planning, project development, project execution, and budget processes will be coupled to integrate Sandia's physical plant capabilities with its mission needs. Master plans are being developed to convert the sites so that they will reflect the vision and mission statements in Sandia's strategic and operational plans. The Site Conversion Plan establishes business districts by function, security, and space requirements; establishes land- and building-use policies and zoning; and, for the first time, establishes campus design guidelines that reflect Sandia's role as a major center of science and technology. The Site Conversion Plan will also include the processes and prioritized lists of projects required to match the capabilities of the physical sites with the new and continuing business strategies and mission requirements identified by Sandia's top management and principal sponsors. This Sandia-wide integration and planning will be reflected and supported by the integration and planning of the Corporate Construction Program Council.

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